Dividend Imputation, Investment and Capital Accumulation in Open Economies

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Double taxation of company income/profit

- A classical income tax system: Two separate legal tax entities
  1. Firms/businesses: Company/corporate income tax
     - Corporate income/profits: total revenue - expenses and operating costs (including labor costs)
  2. Individuals/households/shareholders: Personal income tax
     - Income sources: labor, **capital/assets** and others
     - **Capital income**: dividends, capital gains, non-corporate business distributions, rent and interests
- Capital income being taxed twice:
  - First, company income tax at the firm side;
  - Second, personal income tax at the household side
- Question: How to address the double taxation issue?

Solutions

- USA: Lower taxes on dividend and capital gains
- AUS: Exemption, discount and **dividend imputation** (i.e. franking tax credits)

US income taxation: Lower capital tax rates

- After the US Tax Cuts and Jobs Act 2017 (Trump's tax cuts)
  - Corporate income tax: 21%
  - Capital gains and dividend tax rates: 15%

- A history of cutting capital income taxes in the US
  - Before 2003
    - Corporate income tax: 35%
    - Capital gains and dividend tax rates: 25%
  - Job and Growth Tax Relief Reconciliation Act 2003: Bush's tax cuts
    - Corporate tax: Kept at 35%
    - Capital gains and dividend tax rates: Down to 15% (temporary)

Dividend imputation/franking tax credit

- How:
  - The company income/profit tax paid by firm is attributed, i.e. imputed, to shareholders in form of franking tax credits
  - Households as shareholders use franking credits to reduce the personal income tax payable or get a refund of franking credits
- Where:
  - Current: **Australia**, Canada, Chile, Korea, Mexico and New Zealand
  - Before: Germany, Finland, France, Italy, Norway, Singapore and UK

Australia: The Income Tax (Franking Deficit) Act 1987

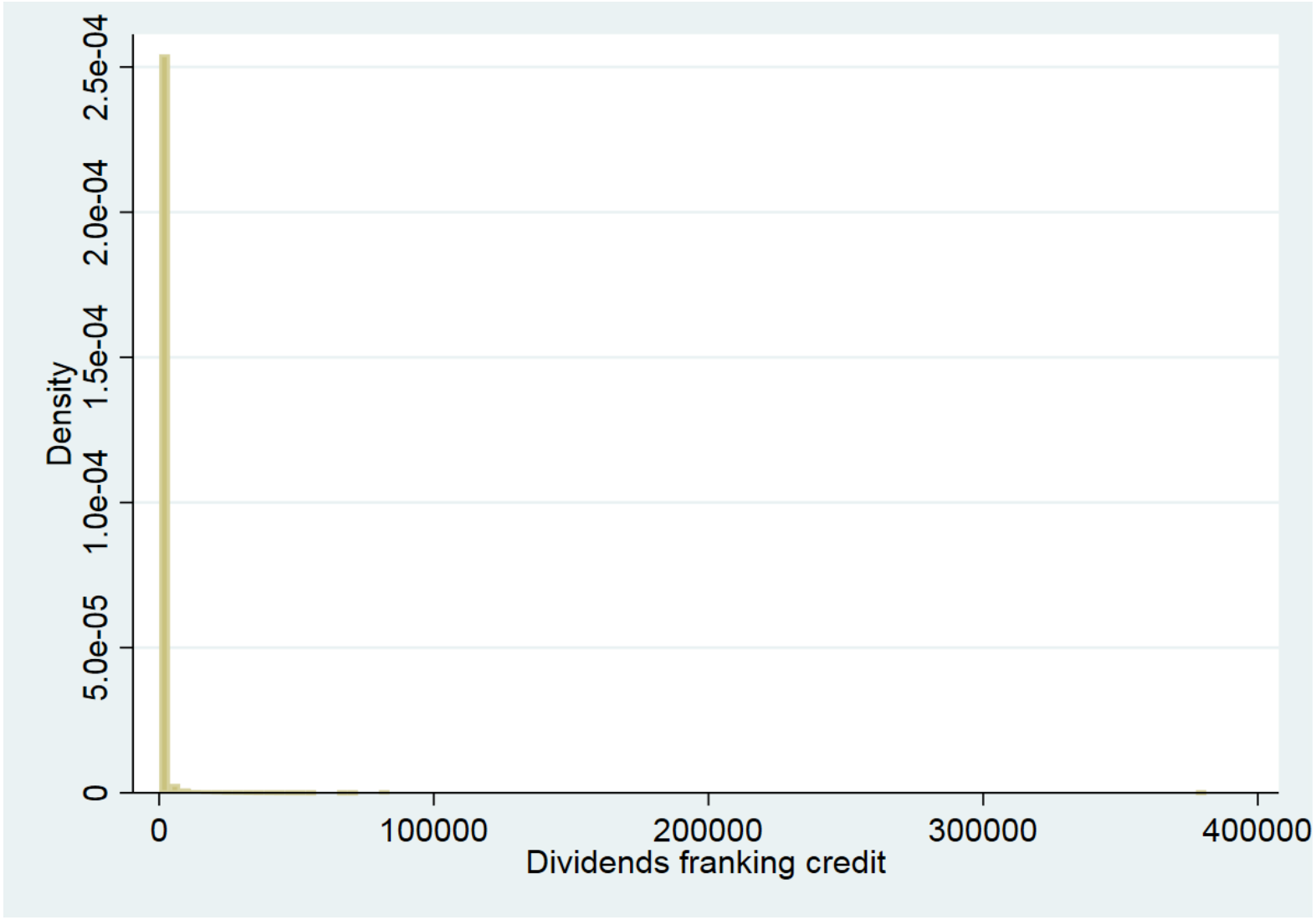
- Residents: Domestic investors
  - Receive franking credits for company tax paid by corporations
  - Only receive franking credits in proportion to dividends paid
  - Pay personal income tax on dividends and franking credits
  - Pay capital gains tax at half the personal income tax rate
- Foreigners: International investors
  - Do not receive franking credits
  - Do not pay capital gains tax in Australia
  - Dividend withholding tax for some foreign investors
  - Most countries tax capital gains at lower rate than dividends

Stylized facts from 2019 ATO tax sample

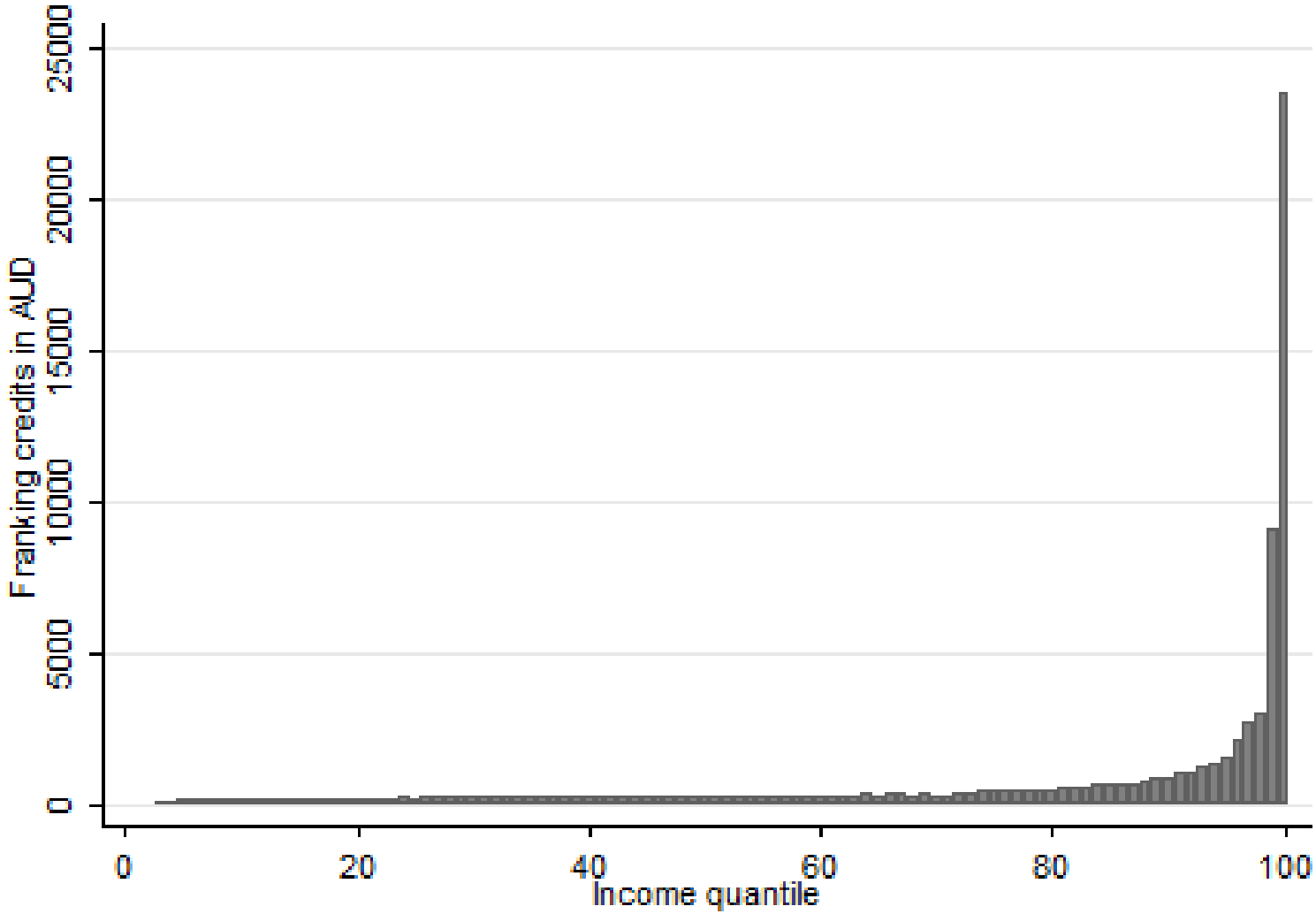
The sample contains 2% of individuals tax file records in the 2018-19 income year.

Variable	Obs	Mean	Std.	Min	Max
Franking credits	279,327	773	8,996	0	381,269
Total income	279,327	67,634	95,357	0	4,372,735
Tax payment	279,327	15,628	40,962	0	1,893,586
Age range	279,327	41.79	14.9	20	70

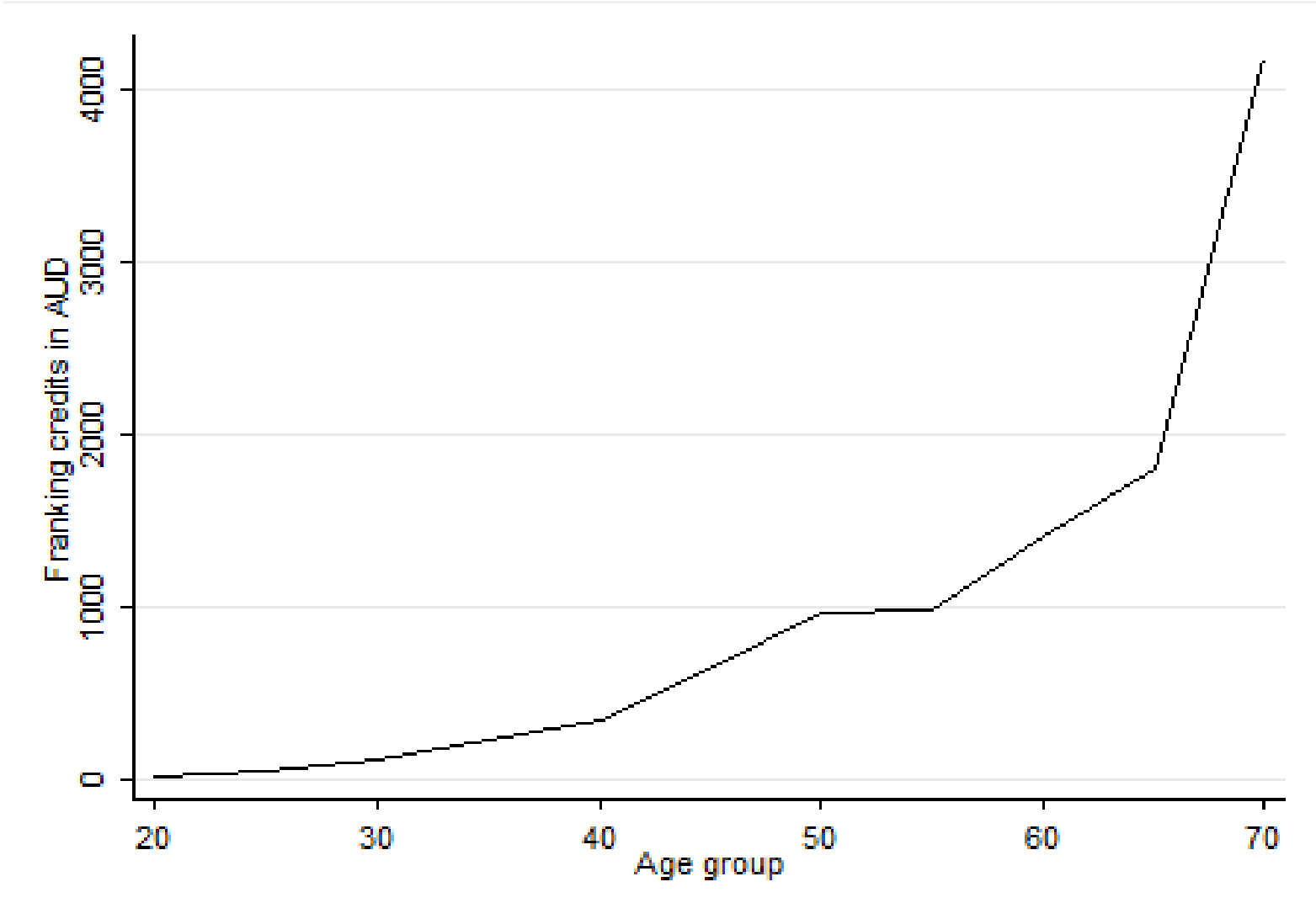
Fact 1: Distribution of franking credits



Fact 2: Franking credits by income



Fact 3: Franking credits by age



This paper

- What are the effects of dividend imputation on investment, capital accumulation and output?
- in a small open economy model with lifecycle households and heterogeneous firms

New insights

- Dividend imputation induces to opposing effects on investment
  - Mitigating the double taxation issue (Positive), while raising investment cost for firms not fully imputed (Negative)
  - Quantitatively the positive force is dominant
- Removing dividend imputation negatively affects on investment and capital accumulation
  - Lower output with welfare losses for high income households
  - but welfare gains for low income households
  - and overall welfare improving
- Introducing the American solution mitigates welfare losses
  - but it fails to overturn output losses
- Domestic saving and foreign capital are not perfectly substitutable
  - Heterogeneity in firm investment and valuation due to differences in tax treatment

Related literature

- Taxation of capital income in open economies
  - Classic work: Diamond and Mirrlees (1971), Feldstein and Horioka (1980), Gordon (1986), Gordon (1992) and Auerbach and Devereux (2013))
- Optimal capital income taxation
  - Judd (1985), Chamley (1986)
  - Erosa and Gervais (2002), Aiyagari (1995), Imrohoroglu (1998) and Conesa, Krueger and Kitao (2009)
  - Krueger, Ludwig and Villalvazo (2021)
- Capital taxation, corporate finance and macroeconomic aggregates
  - Dividend and capital gains taxes: Gourio and Miao (2010) and Gourio and Miao (2011)
  - Corporate taxes: Anagnostopoulos, Carceles-Poveda and Lin (2012), Anagnostopoulos, Carceles-Poveda and Lin (2012) and Anagnostopoulos, Atesagaoglu and Carceles-Poveda (2022)

Model

Model overview

1. Heterogeneous households in the spirit of Auerbach and Kotlikoff (1987)
   - Overlapping generations with labor productivity differences
2. Heterogeneous firms similar to Gourio and Miao (2010)
   - Continuum of firms with idiosyncratic productivity shocks and financing constraints.
   - Firms can be owned by either foreigners or residents
3. Government: a tax and transfer system with dividend imputation
4. Small open economy with free capital mobility
   - Foreign investors: Willing to buy equity while the world rate of return is met.
   - Residency rule: Different capital income tax treatments for foreigners
   - One good economy: perfect substitute with goods from rest of the world.

Households I

- Demographics: 20 to 100 years
- Preferences: Households value consumption and leisure and maximize the discounted lifetime utility
- Endowments: Newborns with different skills that define the life-cycle profiles of labor efficiency units

- A household begins with zero assets and chooses consumption, labor supply and asset holdings to maximise its utility over its lifetime.
- Saving technology: equity, $\theta_{i,j,t}$, but can not short sell equity $\theta_{t,j,i} \geq 0$.
- Income sources: labor income, dividends, $d_t(\mu_t)$, capital gains, interest payments, accidental bequests, $bq_{t,i}$, and government transfers $tr_{t,j,i}$.

Households II

- Four taxes: Consumption tax τ^c, labor income tax τ^l, dividend tax τ^d, and capital gains tax τ^g.

- The household problem is given by

$$U = \sum_{j=20}^{100} S_j \beta^j \frac{\left(c_j^\gamma l_j^{1-\gamma}\right)^{1-\sigma}}{1-\sigma}$$

subject to

$$\begin{aligned}
&(1+\tau^c)c_j + \int p_t \theta_{j+1} d\mu_t \\
=&(1-\tau^l)W_t(1-l_t)e_j + tr_j + bq_j \\
+&\int \left(p_t^0 + (1-\tau^d)d_t - \tau^g\left(p_t^0 - p_{t-1}\right)\right)\theta_j d\mu_{t-1}.
\end{aligned}$$

Simplified household problem I

- Assuming that households hold similar an equal share of each firm, so that we can express asset portfolios in terms of the representative asset

$$a_{t+1,j+1,i} = \left(\int p_t \theta_{t+1,j+1,i} d\mu_t \right)$$

and the return on the asset, r_t^a, is given by

$$r_t^a = \frac{\int \left[(1-\tau^d) d_t + (1-\tau^g)(p_t - p_{t-1}) \right] d\mu_{t-1}}{\int p_{t-1} d\mu_{t-1}}.$$

- The household's budget constraint can be re-written as

$$(1-\tau^c) c_{t,j,i} + a_{t+1,j+1,i} = (1-\tau^l) W_t (1-l_{t,j,i}) e_{j,i} + (1+r_t^a) a_{t,j,i}$$

$$+ \mathrm{tr}_{t,j,i} + bq_{t,i}.$$

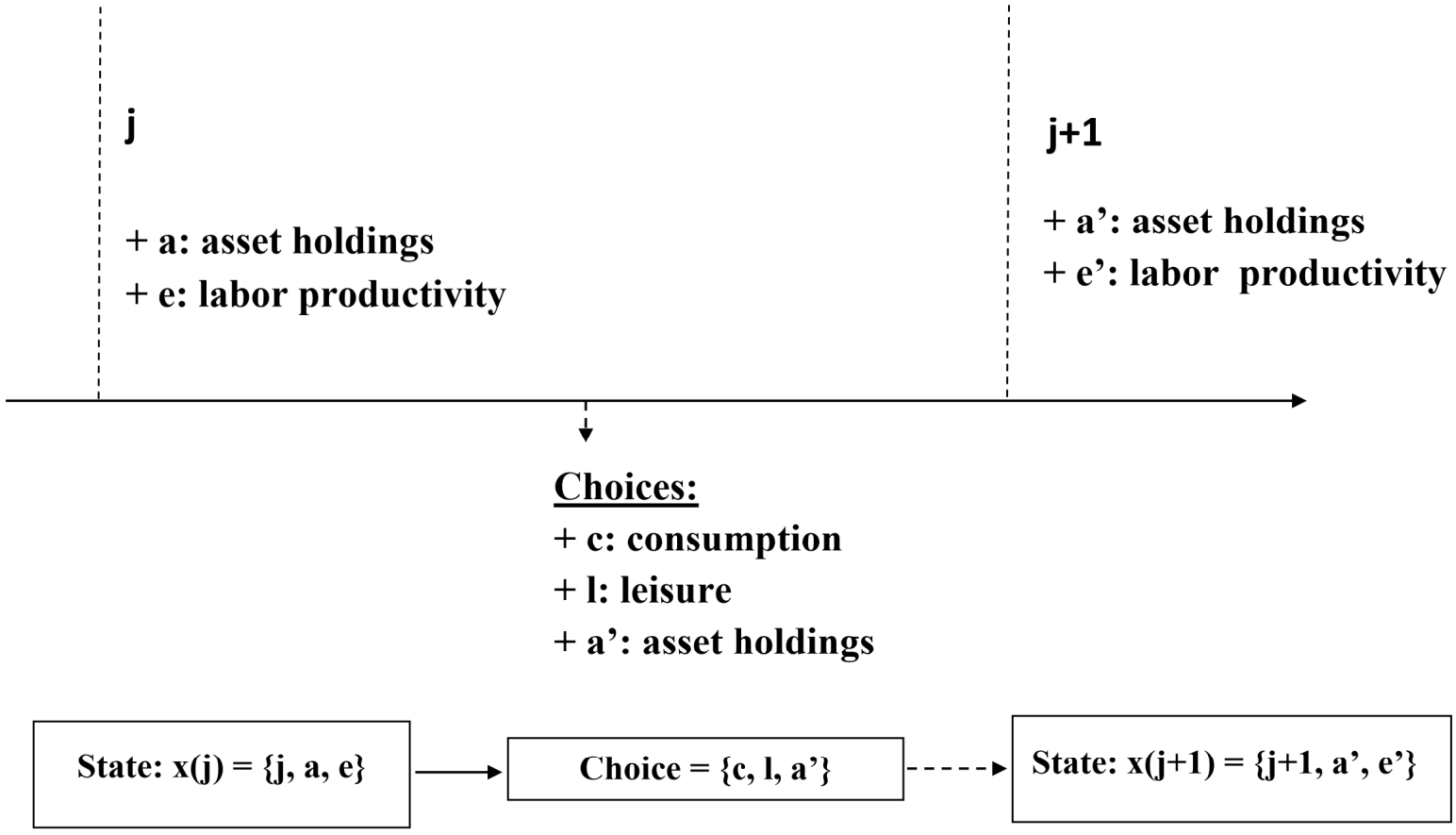
Simplified household problem II

- The household's dynamic programming problem is given by

$$V_j(a_{t,j,i}) = \max_{\{c_{t,j,i}, l_{t,j,i}, a_{t+1,j+1,i}\}} \left\{ u\left(c_{t,j,i}, l_{t,j,i}\right) + \hat{\beta} sp_{j+1} V_{j+1}\left(a_{t+1,j+1,i}\right) \right\}$$

  subject to the household's budget constraint, the credit constraint, $a_{t+1,j+1,i} \geq 0$, and the non-negativity of leisure and consumption $c_{t,j,i} > 0$ and $1 \geq l_{t,j,i} > 0$.

Household: Timing of household decision



Firm: Production technology

- The production function is given by

$$y_t\left(k_t, n_t; z_t\right) = z_t k_t^{\alpha_k} n_t^{\alpha_n},$$

where α_k and α_n are capital and labor income share with $\alpha_k + \alpha_n < 1$: decreasing return to scale. z_t is firm-specific productivity that follows an AR(1) process $\ln z_t = \rho \ln z_{t-1} + \epsilon_t$

- There are quadratic investment adjustment costs

$$0.5\psi \left(\frac{i_t}{k_t}\right)^2 k_t.$$

Firm: Resource and financial constraints

- Firm's constraints are given by

$$d_t + i_t = (1-\tau^k)(z_t k_t^{\alpha_k} n_t^{\alpha_n} - w_t n_t - \frac{\psi i_t^2}{2k_t}) + \tau^k(\chi^\delta \delta k_t + \chi^I i_t) + s_t$$

$$d \geq 0, \qquad s \geq 0, \qquad s * d = 0$$

Franking credits constrained by tax paid and dividends

$$FC = \max(0, \min(tax^k, \tau^k/(1-\tau^k)d_t))$$

Firm: Valuation I

- Return for foreign investors (i.e., foreigners)

$$E_t(r^f_{t+1}) = \frac{E_t\left[(1-\tau^{d,f})d_{t+1} + p^0_{t+1} - \tau^{g,f}(p^0_{t+1} - p_t) - p_t\right]}{p_t}$$

where p^0_t is the before equity issuance or buy backs price and $p^0_t = p_t + s_t$ with p_t is the after equity issuance price.

- $\hat{p}^f_t$ is the maximum price that foreigners would pay for the firm

$$\implies \hat{p}^f_t = \frac{E_t\left[(1-\tau^{d,f})d_{t+1} + (1-\tau^{g,f})(p_{t+1} + s_{t+1})\right]}{r^f_{t+1} + 1 - \tau^{g,f}}$$

Note that, $r^f_{t+1} = r^f$ is the world interest rate.

- Return for domestic investors/households (i.e., residents)

$$E_t(r^h_{t+1}) = \frac{E_t\left[(1-\tau^{d,h})(d_{t+1} + FC_{t+1}) + p^0_{t+1} - \tau^{g,h}(p^0_{t+1} - p_t) - p_t\right]}{p_t}$$

Firm: Valuation II

- $\hat{p}_t^h$ maximum price households would pay for for the firm

$$\implies \hat{p}_t^h = \frac{E_t\left[(1-\tau^{d,h})(d_{t+1}+FC_{t+1})+(1-\tau^{g,h})(p_{t+1}+s_{t+1})\right]}{r_{t+1}^h+1-\tau^{g,h}}$$

Note that, r^h is domestic return on assets. r^h is determined when the stock of assets that households buy equals total household equity purchases (domestic stock of assets).

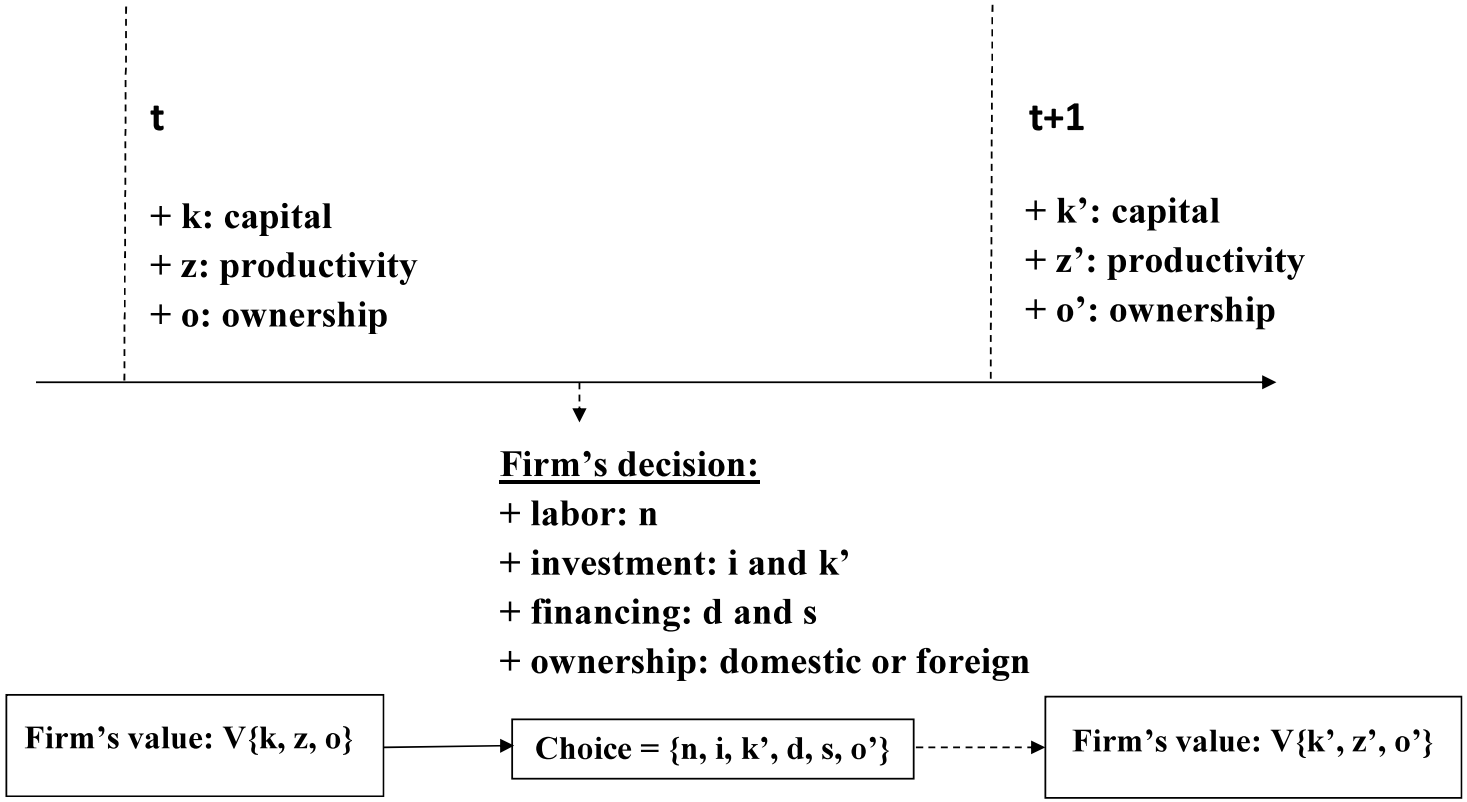
- The firm value is given by

$$p_t = \max(\hat{p}_t^h, \hat{p}_t^f)$$

Firms' and investors' decisions

- Firms start each period with capital determined by previous period investment, productivity determined by Markov process and ownership in determined in previous period.
- Each firm make decisions to maximise returns to owners. Choose labour demand, dividends, equity issuance and investment.
- Residents and foreigners buy equity at the end of every period. Know next period capital stock and current productivity.
- Two rates of return exist, the domestic and foreign.
  - The foreign rate of return is set internationally.
  - The residents rate of return is by the domestic demand for assets
  - For any r^f and r^d, such there exist a mixed of foreign and domestic ownership, there is a firm whose asset residents and foreigners value the same. to residents

Firm: Timing of firm decisions



Firm problem I

- Firms choose investments, dividends, issuance and labour s.t.

$$d_t + i_t = (1-\tau^k)(z_t k_t^{\alpha_k} n_t^{\alpha_n} - w_t n_t - \frac{\psi i_t^2}{2k_t}) + \tau^k(\chi^\delta \delta k_t + \chi^I i_t) + s_t$$

and
$d \geq 0, s \geq 0, s \times d = 0, FC = \max(0, \min(tax^k, \frac{\tau^k}{(1-\tau^k)} d_t))$

- Each firm is managed to maximise the return to it's owners.

$$V_t^h(k_t, z_t) = \max_{i,d,s,n} \left(1 - \tau^{d,h}\right)(d_t + FC_t) + (1 - \tau^{g,h})(p_t(k_{t+1}, z_t) + s_t)$$

$$V_t^f(k_t, z_t) = \max_{i,d,s,n} \left(1 - \tau^{d,f}\right) d_t + (1 - \tau^{g,f})(p_t(k_{t+1}, z_t) + s_t)$$

Firm problem II

- Gives dynamic problems

$$V_t^h(k_t, z_t) = \max_{i,d,s,n} \left(1 - \tau^{d,h}\right)(d_t + FC_t) + (1 - \tau^{g,h})s_t + (1 - \tau^{g,h}) \max\left(\frac{E_t\left[V_{t+1}^h\right]}{r_{t+1}^h + 1 - \tau^{g,h}}, \frac{E_t\left[V_{t+1}^f\right]}{r_{t+1} + 1 - \tau^{g,f}}\right)$$

$$V_t^f(k_t, z_t) = \max_{i,d,s,n} \left(1 - \tau^{d,f}\right) d_t + (1 - \tau^{g,f})s_t + (1 - \tau^{g,f}) \max\left(\frac{E_t\left[V_{t+1}^h\right]}{r_{t+1}^h + 1 - \tau^{g,h}}, \frac{E_t\left[V_{t+1}^f\right]}{r_{t+1} + 1 - \tau^{g,f}}\right)$$

Firm problem III

- Ownership is a state variable.

$$V_t(k_t, z_t, o_t) = \max_{i,d,s,n} \begin{cases} \left(1-\tau^{d,f}\right) d_t + (1-\tau^{g,f}) s_t, & \text{if } o = f \\ \left(1-\tau^{d,h}\right) \left(d_t + FC_t\right) + (1-\tau^{g,h}) s_t, & \text{if } o = h \end{cases}$$
$$+ (1-\tau^{g,o}) \max_{o'} \left(\frac{E_t\left[V_{t+1}^{o'}\right]}{r_{t+1}^{o'} + 1 - \tau^{g,o'}} \right)$$

s.t.

$$d_t + i_t + \frac{\psi i_t^2}{2k_t} = (1-\tau^k)(z_t k_t^{\alpha_k} n_t^{\alpha_n} - w_t n_t) + \tau^k(\chi^\delta \delta k_t + \chi^I i_t) + s_t$$

and $d \geq 0, s \leq 0, s \times d = 0, FC = \max(0, \min(tax^k, \frac{\tau^k}{(1-\tau^k)} d_t))$

Government I

- The government collects taxes to finance government consumption G_t and transfers T_t. The government budget is given by

$$B_{t+1} = TAX_t - G_t - T_t - (1 + r_t) B_t.$$

- B_{t+1} is new government debt issued at time t and B_t outstanding government debt issued at time $t - 1$.
- The total tax revenue is a sum of five tax revenues:

$$TAX_t = TAX_t^k + TAX_t^n + TAX_t^d + TAX_t^g + TAX_t^c.$$

The company income tax revenue is given by

$$TAX_t^k = \sum_o \int tax^k(x) \mu_t(dx, o).$$

The labor income tax revenue is given by

$$TAX_t^n = \tau^n w_t N_t.$$

Government II

The dividend tax revenue is given by is given by

$$TAX_t^d = \sum_o \int \tau^{d,o} d_t(x) - (1-\tau^{d,o})\chi^{FC,o} FC_t(x)\mu_t(dx,o).$$

The capital gains tax revenue is given by

$$TAX_t^g = \sum_o \tau^{g,o} \left(\tilde{P}_t^o - P_{t-1}^o\right).$$

The consumption tax revenue is given by

$$TAX_t^c = \tau_t^c C_t,$$

Analysis of Firm Decisions

Firm problem I

- The Lagrangian

$$
\begin{aligned}
\mathcal{L} =& E_0 \sum_{t=0}^{\infty} \frac{1}{\prod_{s=1}^{t} 1 + r_s^{o_s^*} / (1 - \tau^{g,o_s^*})} \Bigg[\frac{1 - \tau^{d,o_t}}{1 - \tau^{g,o_t}} (d_t + \chi^{FC,o_t} FC_t) - s_t \\
& - \lambda_t \Bigg(\left(1 - \tau^k\right) \left(z_t n_t^{\alpha^n} k_t^{\alpha^k} - \frac{\psi}{2} \left(\frac{i_t}{k_t} - \delta \right)^2 k_t - w_t n_t \right) + \tau^k (\chi^\delta \delta k_t + \chi^I i_t) + s_t - i_t - d_t \Bigg) \\
& - \frac{1 - \tau^{d,o_t}}{1 - \tau^{g,o_t}} \lambda_t^{FCd} \left(FC - \frac{\tau^k}{1 - \tau^k} d_t \right) \\
& - \frac{1 - \tau^{d,o_t}}{1 - \tau^{g,o_t}} \lambda_t^{FC\tau} \left(FC - \tau^k(\pi^\tau) \left(z_t n_t^{\alpha^n} k_t^{\alpha^k} - \frac{\psi}{2} \left(\frac{i_t}{k_t} - \delta \right)^2 k_t - w_t n_t - \chi^\delta \delta k_t - \chi^I i_t \right) \right) \\
& - q_t \left((1 - \delta) k_t + i_t - k_{t+1} \right) - \lambda_t^d d_t - \lambda_t^s s_t - \lambda_t^{ds} d_t s_t \Bigg],
\end{aligned}
$$

where λ_t, λ_t^{FCd}, $\lambda_t^{FC\tau}$, q_t, λ_t^d, λ_t^s, and λ_t^{ds} are the Lagrange multipliers.

Investment financing and dividend payment

1. Equity issuance regime: External financing $s_t > 0$ and no dividend distribution $d_t = 0$

2. Liquidity constrained regime: Internal financing $s_t = 0$ and no dividend distribution $d_t = 0$

3. Dividend distribution regime: Internal financing $s_t = 0$ and dividend distribution $d_t > 0$

Dividend imputation

- The dividend paying firms also distribute franking credits

$$FC = \max(0, \min(\frac{\tau^k}{1-\tau^k} d_t, tax^k))$$

- There are three dividend imputation regimes:

1. Partially imputed/franked: $FC = \frac{\tau^k}{1-\tau^k} d_t < tax^k$
2. Fully franked: $FC = \frac{\tau^k}{1-\tau^k} d_t = tax^k$
3. Fully imputed: $FC = tax^k < \frac{\tau^k}{1-\tau^k} d_t$

Five financial regimes

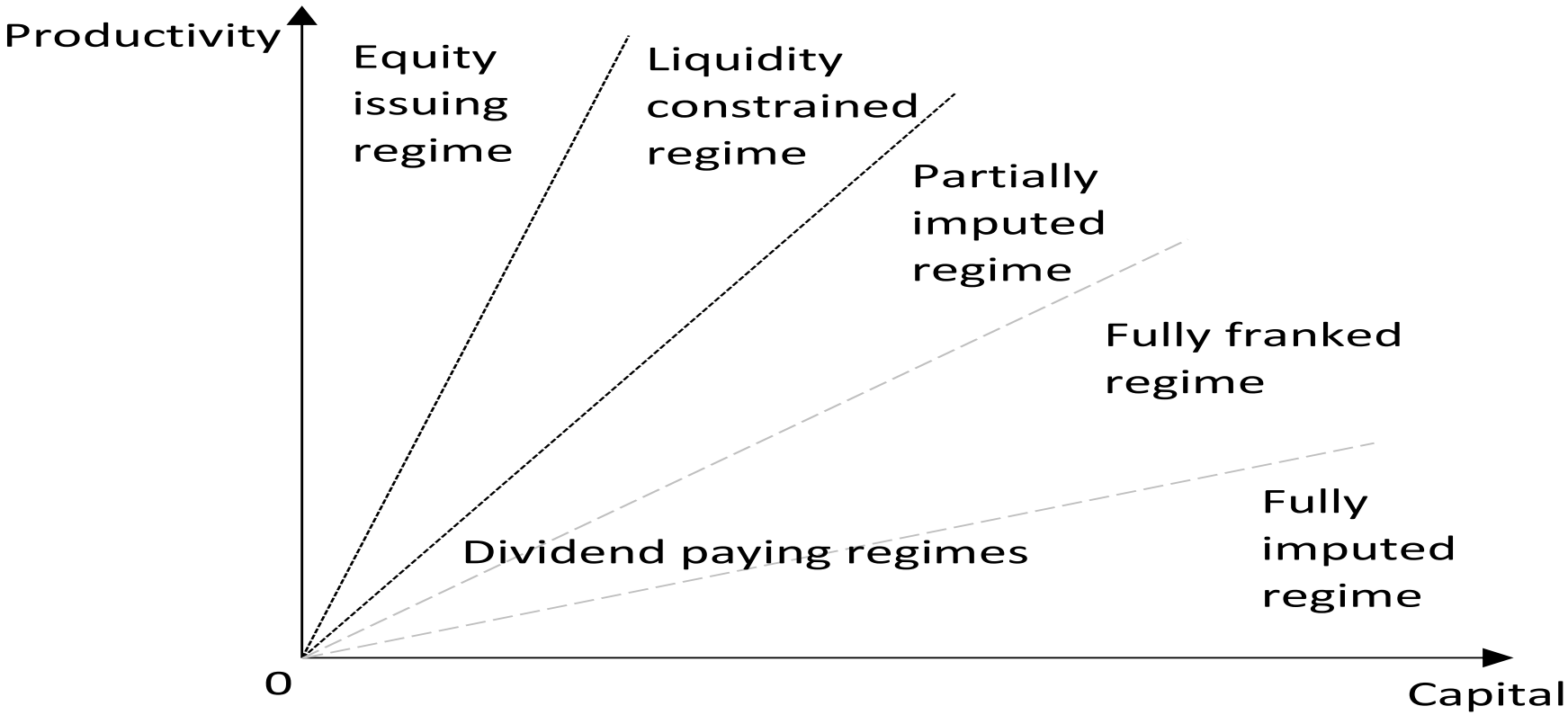


Figure: **Five financial regimes**

A simple example: Illustration of a firm's optimal choices

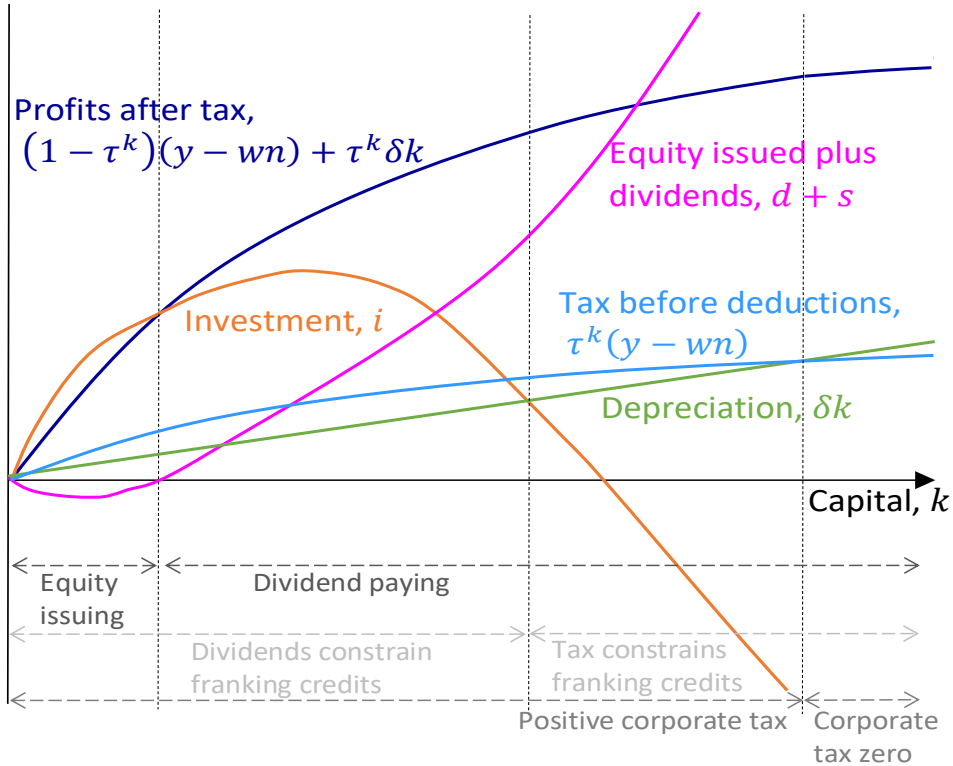


Figure: **Firms optimal decisions based on current capital (k_t) at a given level of productivity (z_t).** The illustration assumes no capital gains or dividend taxes, depreciation is fully deductible while investment is not. The illustration shows the ranges over which different constraints bind.

Calibration

Benchmark calibration

- Target: To match the Australia economy in early 2010s
- Macro aggregates: ABS
- Household sector: HILDA
- Firm sector: Firm-specific productivity shocks based on an estimate from the US

Calibration value: External parameters

Parameters:		**Explanation/Source:**
- Periods working	$J_1 = 45$	
- Periods retired	$J_2 = 35$	
- Labor productivities by skill	$\{e_j\}_{j=1}^{J_1}$	Calculated from HILDA data
- Productivity shock persistence	$\rho = 0.767$	Gourio and Miao (2010)
- Productivity shock std	$\sigma = 0.211$	Gourio and Miao (2010)
- World interest rate	$r^f = 0.03$	Gourio and Miao (2010)
- Labour income share	$\alpha_n = 0.65$	Gourio and Miao (2010)
- Capital income share	$\alpha_k = 0.311$	Gourio and Miao (2010)
- Capital depreciation	$\delta = 0.095$	Gourio and Miao (2010)
- Corporate tax	$\tau^k = 0.3$	Headline rate
- Resident's dividend tax	$\tau^{d,h} = 0.3$	Approximate average rate
- Resident's FC deductibility	$\chi^{FC,h} = 1$	Headline rate
- Resident's capital gains tax	$\tau^{g,h} = 0.15$	Half of dividend rate
- Foreigner's dividend tax	$\tau^{d,f} = 0.1$	Approximate average rate
- Foreigner's FC deductibility	$\chi^{FC,f} = 0$	Headline rate
- Foreigner's capital gains tax	$\tau^{g,f} = 0$	Half of dividend rate
- Investment tax credit share	$\chi^I = 0$	Headline rate
- Depreciation deduction share	$\chi^d = 1$	Headline rate

Calibration value: Internal parameters

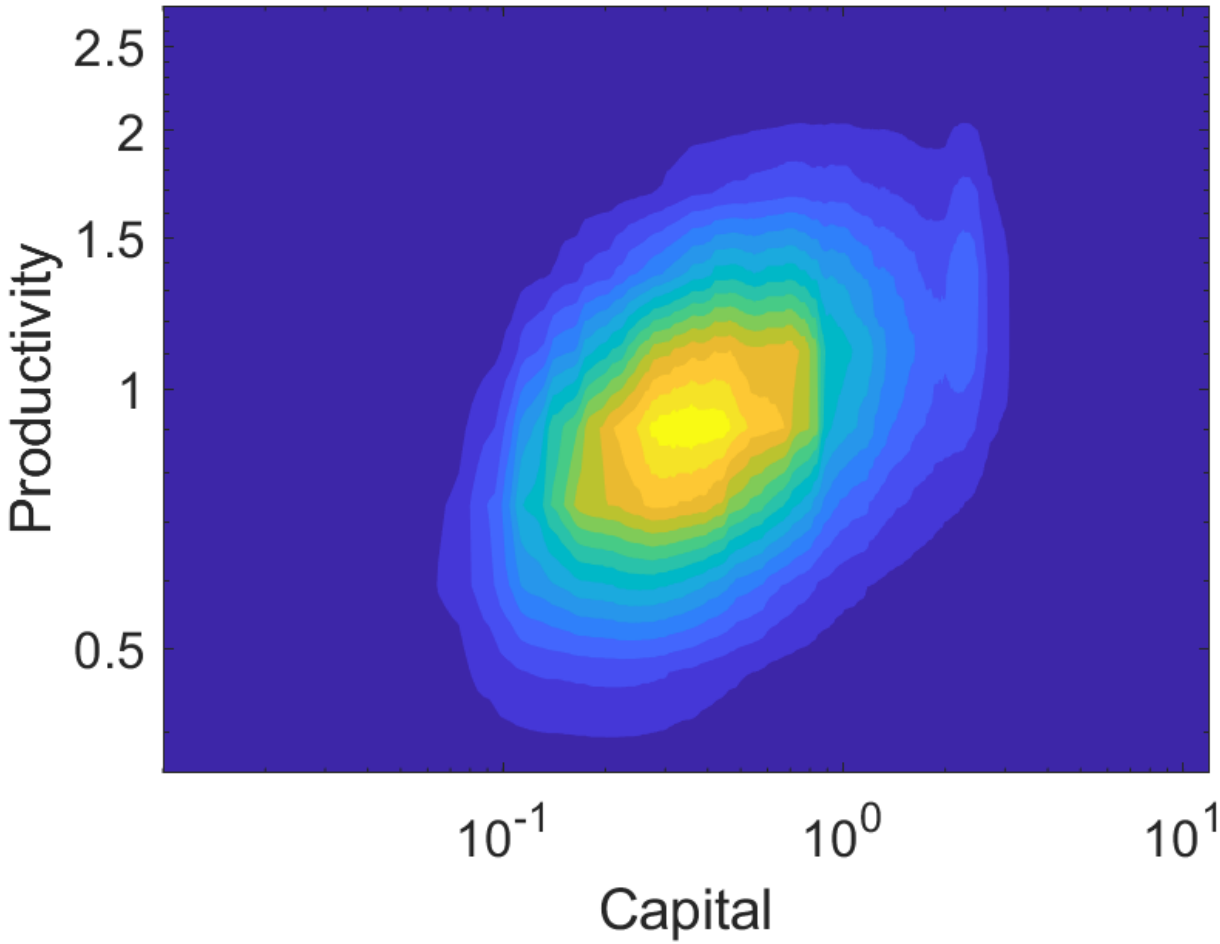
Parameters:		**Explanation/Source:**
- Relative risk aversion	$\sigma^h = 2.5$	previous studies
- Preference on cons.	$\gamma = 0.25$	match labor supply
- Discount factor	$\beta = 0.960$	match foreign ownership
- Capital adjustment cost	$\psi = 1.08$	Gourio and Miao (2010)
- Labor income tax	$\tau^n = 0.17$	balance gov. budget
- Consumption tax	$\tau^c = 0.062$	match to cons. tax to GDP
- Resi. gov. spend.	$G/Y = 0.115$	match to gov. spend. to GDP

Firm productivity

$z =$	0.36	0.47	0.59	0.73	0.90	1.11	1.36	1.69	2.13	2.79
$\pi =$	0.31	0.46	0.20	0.03	0.00	0.00	0.00	0.00	0.00	0.00
	0.06	0.33	0.40	0.17	0.03	0.00	0.00	0.00	0.00	0.00
	0.01	0.11	0.35	0.36	0.14	0.02	0.00	0.00	0.00	0.00
	0.00	0.02	0.17	0.37	0.32	0.11	0.01	0.00	0.00	0.00
	0.00	0.00	0.04	0.22	0.39	0.27	0.07	0.01	0.00	0.00
	0.00	0.00	0.01	0.07	0.27	0.39	0.22	0.04	0.00	0.00
	0.00	0.00	0.00	0.01	0.11	0.32	0.37	0.17	0.02	0.00
	0.00	0.00	0.00	0.00	0.02	0.14	0.36	0.35	0.11	0.01
	0.00	0.00	0.00	0.00	0.00	0.03	0.17	0.40	0.33	0.06
	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.20	0.46	0.31

Table: Productivity levels and probability transition matrix

Mass of firms by capital and productivity



Firm distribution

	Resident	Foreigner	Total
Regime 1: Equity Issuance	15	8	23
Regime 2: Liquidity constrained	0	12	12
Regime 3: Partially imputed	2	0	2
Regime 4: Fully franked	25	0	25
Regime 5: Fully imputed	11	26	37
Total	54	46	100

Table: Firms by ownership and financial regime

Ownership of firms

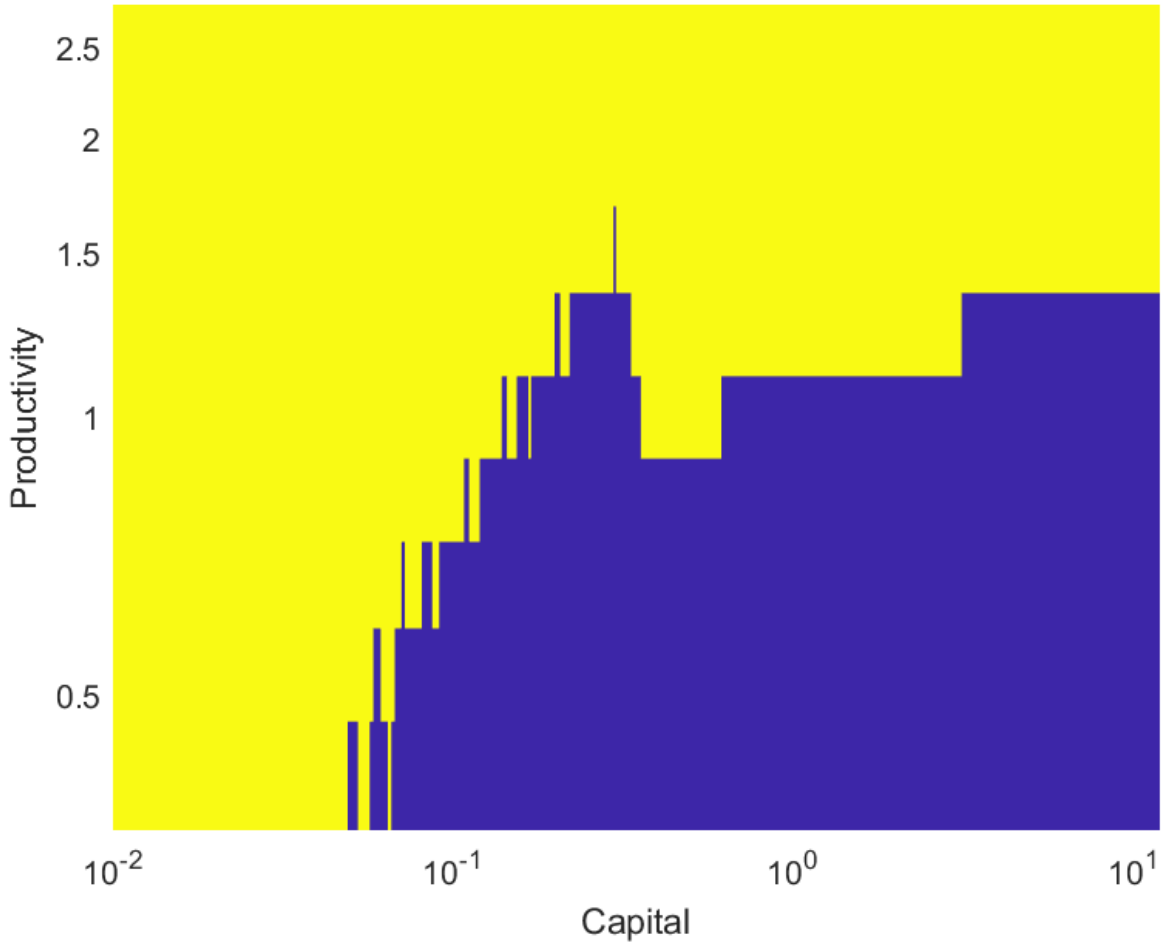
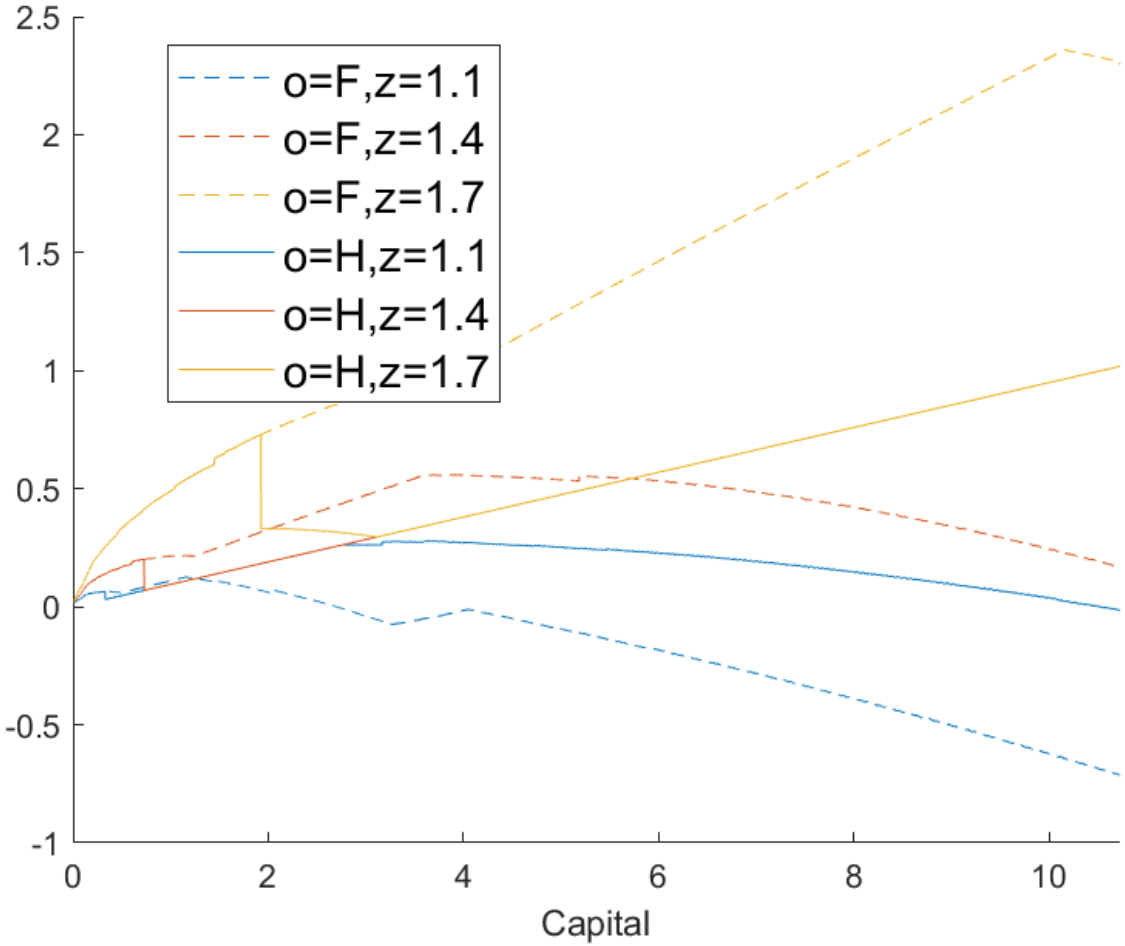
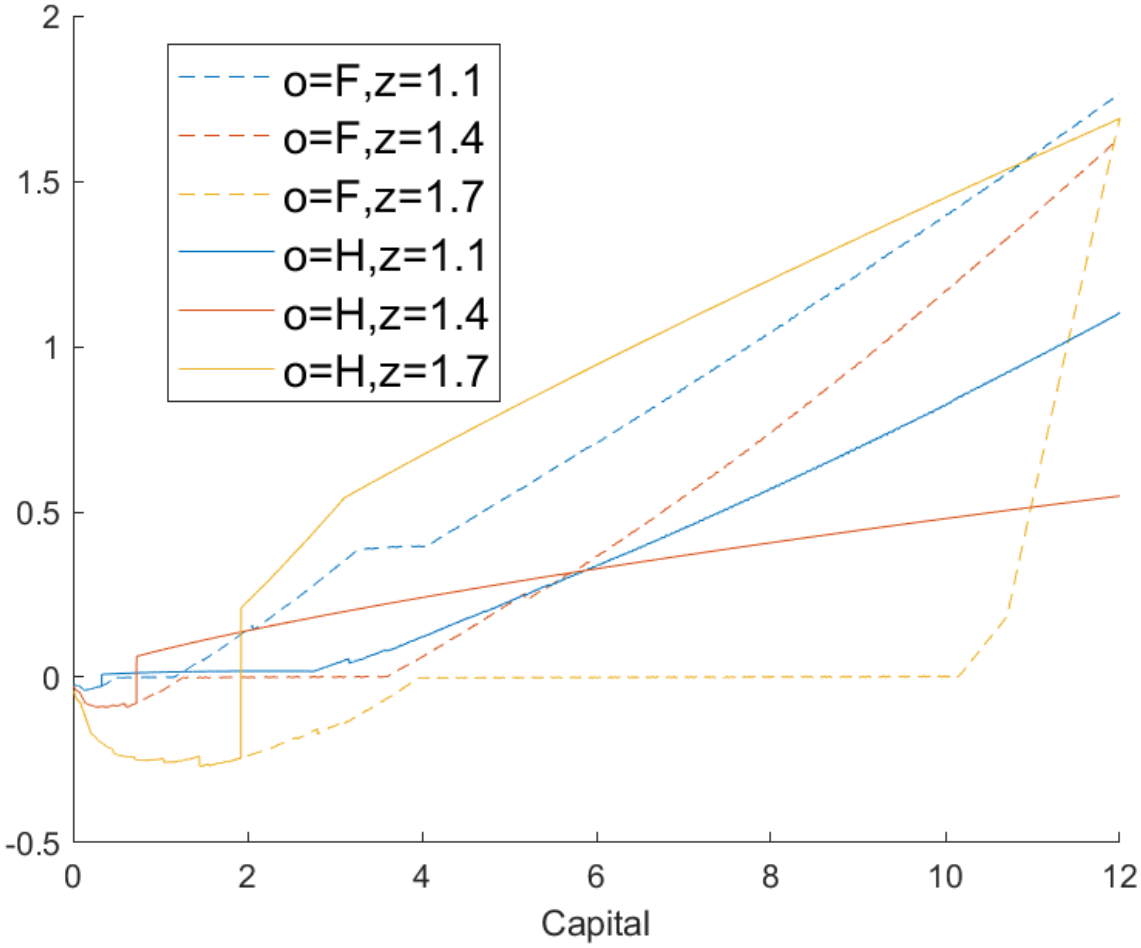


Figure: **The end of period ownership of firms by next period capital and current productivity.** Note that, blue indicates foreign ownership and yellow indicates domestic ownership.

Investment by capital, productivity and ownership



Payments to investors by capital, productivity and ownership



Quantitative analysis

Policy experiments

- Benchmark model: Different tax treatments for residents and foreigners
  - Resident: $\tau^k = 0.3$, $\chi^{FC,h} = 1$, $\tau^{d,h} = 0.3$ and $\tau^{g,h} = 0.15$
  - Foreigner: $\tau^k = 0.3$, $\chi^{FC,f} = 0$, $\tau^{d,f} = 0.1$ and $\tau^{g,f} = 0.0$
- Experiment 1: No resident franking credits (NFC)
  - Add: lower dividend tax rate for domestic investors (NFCLD)
- Experiment 2: Equal tax treatments for domestic and foreign investors (ET)
  - Add: no franking credits (ETNFC)

NFC: Ownership change

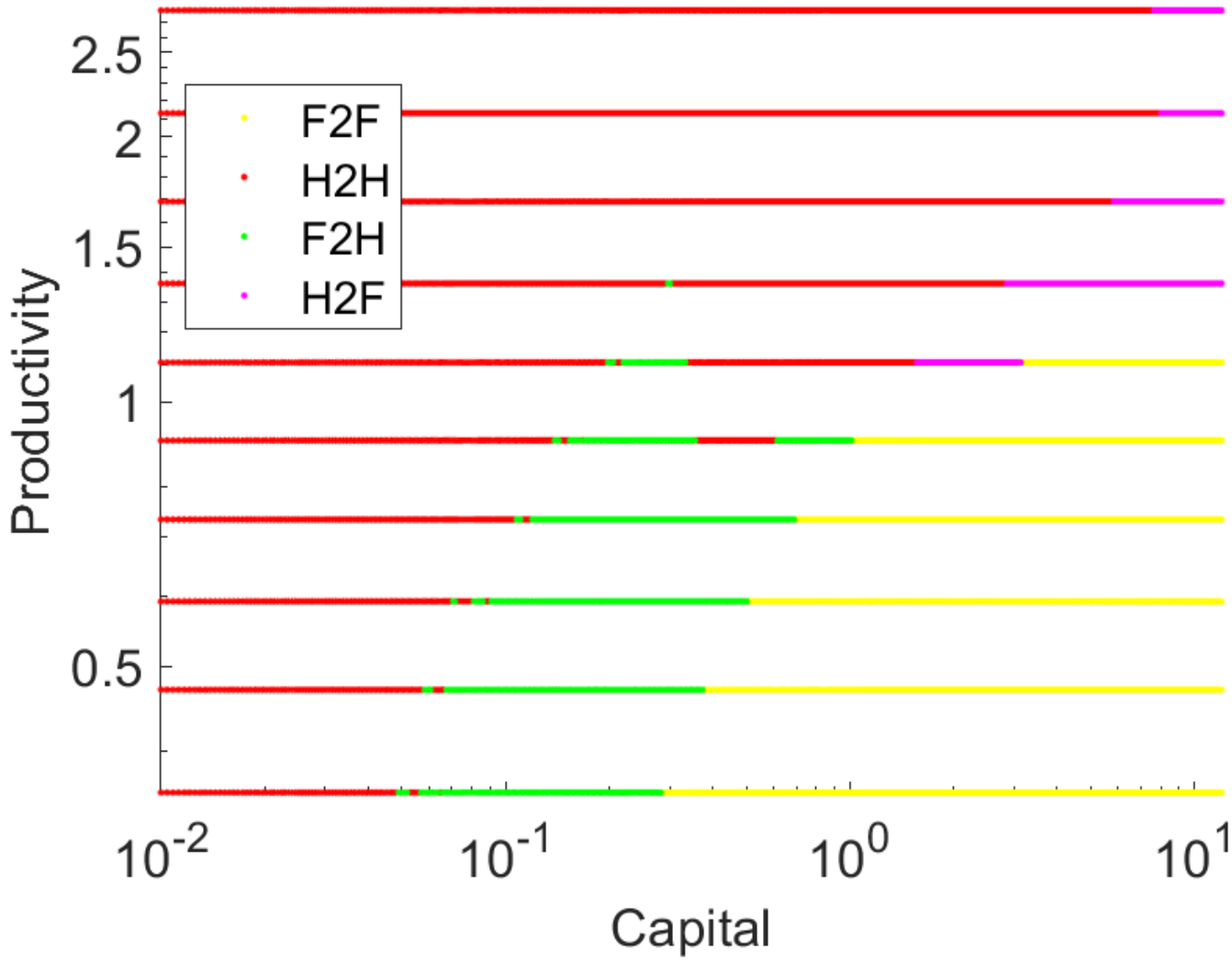


Figure: No Resident Franking Credits (NFC)

NFC: Output change

	NFC
Output: total	-2.0
Output: resident capital	-4.8
Output: foreign capital	2.9
Output: labour	-0.9
Output: TFP	0.2
Output: adjustment costs	0.5

Table: No Resident Franking Credits (NFC) setting $\chi^{FC,h} = 0$. Changes in output as a per cent of initial output decomposed into contributions.

NFC: Welfare change

	NFC
Welfare: aggregate	0.2
W: low income	0.6
W: middle income	0.3
W: high income	-0.2

Table: No Resident Franking Credits (NFC) by setting $\chi^{FC,h} = 0$. Changes in compensating welfare as a per cent of initial output decomposed by type and decomposed into contributions.

NFCLD: Ownership change

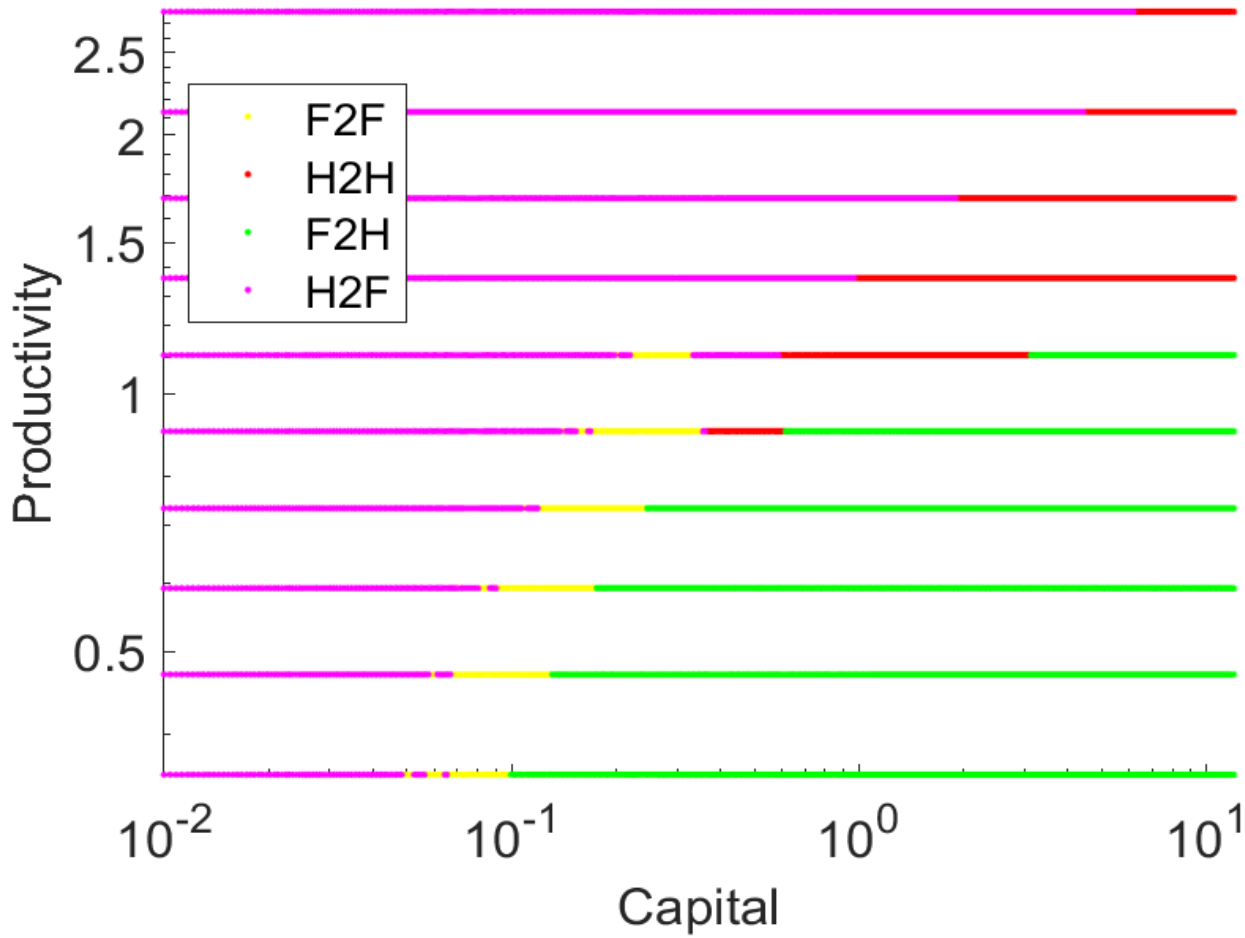


Figure: No Residents Franking credits and lowering Dividend rate (NFCLD): $\chi^{FC,h} = 0$ and $\tau^{d,h} = 0.1$

NFCLD: Output change

	NFC	NFCLD
Output total :	-2.0	-1.9
Output: resident capital	-4.8	+2.7
Output: foreign capital	+2.9	-5.5
Output: labour	-0.9	-0.4
Output: TFP	+0.2	+2.0
Output: adjustment costs	+0.5	-0.6

Table: No Residents Franking credits and Lower Dividend rate (NFCLD): $\chi^{FC,h} = 0$ and $\tau^{d,h} = 0.1$

Equal tax treatments (ET)

- Apply resident's tax treatment to foreigner investors (ET)
  - $\chi^{FC,f} = 1$, $\tau^{d,f} = 0.3$ and $\tau^{g,f} = 0.15$
- ET plus no franking credits (ETNFC)
  - $\chi^{FC,d} = 0$, $\tau^{d,f} = 0.3$ and $\tau^{g,f} = 0.15$

Equal tax treatments: Output change

	ET	ETNFC
Output total :	-2.5	-6.4
Output: resident capital	+5.0	+5.2
Output: foreign capital	-6.9	-11.
Output: labour	-0.6	-2.0
Output: TFP	-0.3	+0.2
Output: adjustment costs	+0.4	+0.9

Table: Apply resident's tax treatment to foreigner investors (ET)

Role of firm heterogeneity

		NFC	NFCLD	ET	ETNFC
Output	Baseline	-2.1	-1.9	-2.6	-6.8
	PS2	-1.1	-1.6	-1.3	-5.7
	PS10	-0.0	-0.5	0.3	-4.7
Government revenue	Baseline	1.5	0.6	0.3	2.3
	PS2	1.7	0.9	0.1	2.4
	PS10	1.2	0.5	-0.1	2.3
Welfare: Aggregate	Baseline	0.2	0.2	-0.3	-0.2
	PS2	1.2	0.5	-0.3	1.0
	PS10	0.6	-0.4	-0.6	0.3

Table: Impacts of policy changes with different standard deviations of firm productivity shocks. PS2: reducing standard of firm productivity shocks by half. PS10: reducing the standard of firm productivity shocks to a tenth.

Concluding remarks

- Dividend imputation and the double taxation issue
  - Positive effects on capital accumulation and output
- Domestic saving and capital flows
  - A small open macroeconomy model with heterogeneous firms
- New insights to capital income taxation in open economies
  - Efficiency gains vs. distributional concerns

Thank You!

More Info @ Macro Public Finance Lab

Back Pocket

Initial dividend tax setting

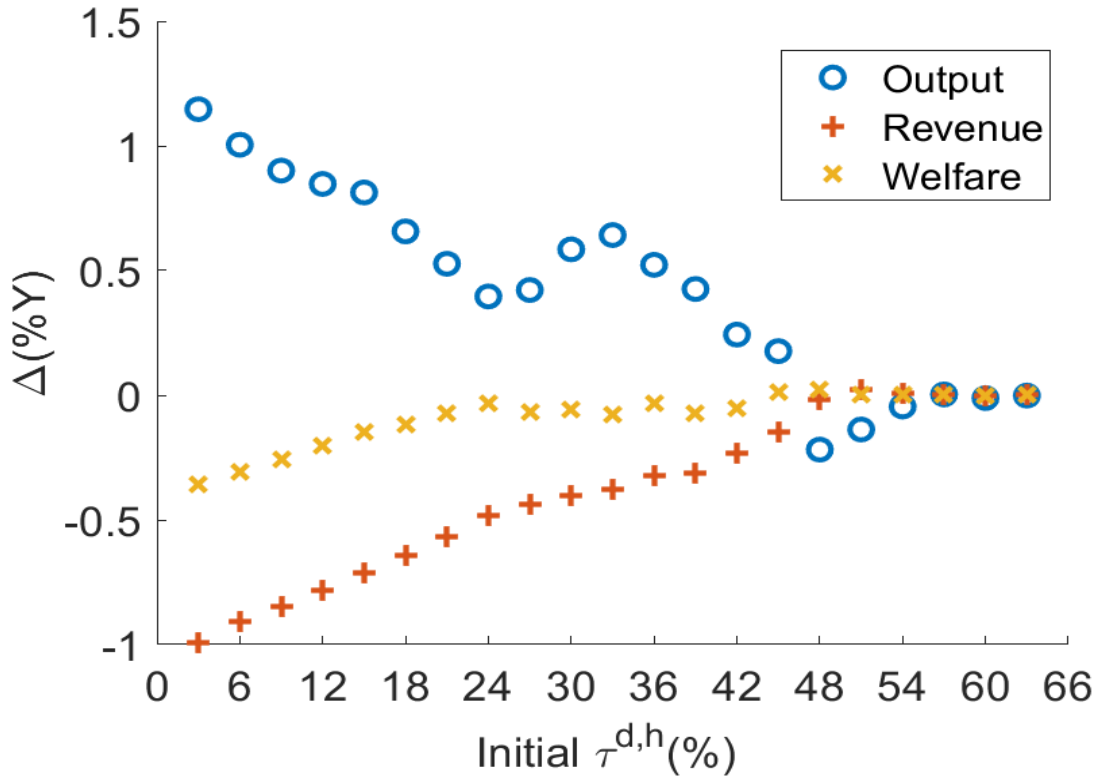


Figure: **Impact of reducing resident's dividend tax rate by initial setting.** Changes in key variables that result from lowering resident's dividend tax rate by 3 per cent by initial policy setting. The figure shows the change in the variables as a per cent of output in the baseline.

Initial franking credit setting

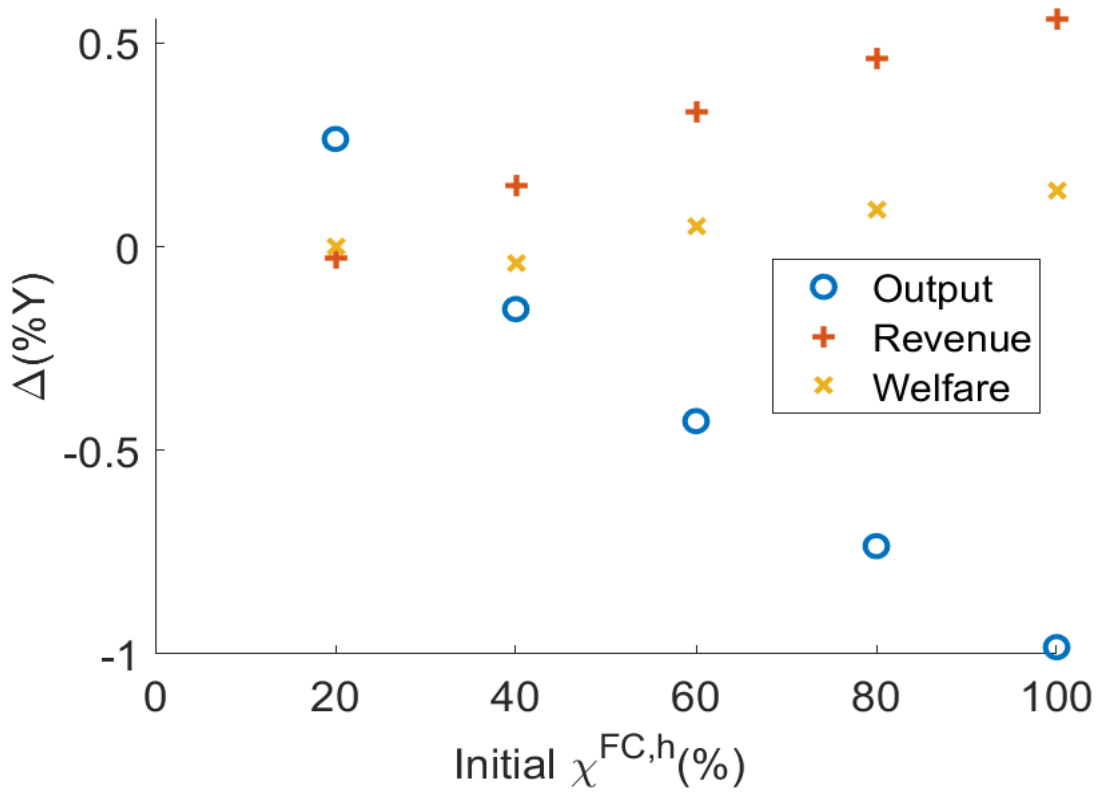


Figure: **Impact of reducing resident's franking credit deductibility tax rate by initial setting.** Changes in key variables that result from lowering resident's franking credit deductibility by 20 per cent against initial policy setting. The figure shows the change in the variables as a per cent of output in the baseline.

Other reforms

Reform	RD	RF	RG	FD	FF	FG	C	D	ID
Output	7.3	-2	-0.9	0.5	2.6	-0.7	7.6	-8.4	5.8
Government revenue	-6.8	1.5	0.4	-0.4	-0.8	-0.2	-2.2	1.2	-1.4
Welfare: Aggregate	-1.6	0.2	0.2	0.0	-0.1	-0.0	0.9	-2.6	1.3

Table: **Impacts of changing capital taxes as a per cent of initial output.** Note that,

RD: resident's dividend tax rate set to zero, $\tau^{d,h} = 0$;
RF: resident's franking deductibility set to zero, $\chi^{FC,h} = 0$;
RG: resident's capital gains tax rate set to zero, $\tau^{g,h} = 0$;
FD: foreigner's dividend tax rate set to zero, $\tau^{d,f} = 0$;
FF: foreigners' franking deductibility set to one, $\chi^{FC,f} = 1$;
FG: foreigner's capital gains tax rate = dividend rate, $\tau^{g,f} = 0.1$;
C: corporate tax rate set to zero, $\tau^{k} = 0$;
D: depreciation deductibility set to zero, $\chi^{\delta} = 0$;
ID: investment deductibility set to one, $\chi^{I} = 0, \chi^{\delta} = 0$.

Competitive equilibrium I

A comeptitive equilibrium is defined by a set of household decisions for consumption, labour supply and equity and bonds holdings $\{C_{j,i}, l_{j,i}, A_{j,i}\}_{j\in\mathbb{J},i\in\mathbb{I}}$; a set of firm decisions including labour demand, capital stock, investment, dividends payments and equity issuance and debt $\{n_t(x), k_t(x), i_t(x), d_t(x), s_t(x)\}_{x\in\mathbb{X}}$; asset market outcomes consistent the firm decisions $\{\Omega(x), p(x)\}_{x\in\mathbb{X}}$; with a set of relative prices for wages, domestic rate of return and assets prices $\{w_t, r_t\}$; accidental bequests $\{BQ_i\}_{i\in\mathbb{I}}$; government policy settings $\{\tau^n, \tau^k, \tau^{d,h}, \tau^{d,f}, \tau^{g,h}, \tau^{g,f}, \tau^i, \tau^c, \chi^\delta, \chi^I, T_{j,i,t}, G_t\}_{j\in\mathbb{J},i\in\mathbb{I}}$ such that the following hold:

1. the choice of leisure, asset accumulation and consumption are consistent with solutions to the household's problem,
2. the choice of investment, capital stock, dividends and equity issuance are consistent with the solution firm's problem,
3. the price of each firm, the dividends it pays out and its equity issuance, is consistent with the residents and foreigners valuations and asset market outcomes,
4. the government's budget is balanced,

$$\sum_{t=0}^{\infty} \frac{TAX_t}{(1+r)^t} = \sum_{t=0}^{\infty} \frac{G_t + T_t}{(1+r)^t}. \tag{1}$$

Competitive equilibrium II

5. The sum of individual consumption, labour supply, share holdings, debts holdings and asset holdings equals aggregate consumption, labour demand, share issuance, debt and value of firms and debt,

$$\sum_{i\in\mathbb{I},j\in\mathbb{J}} C_{i,j,t} M_{i,j,t} = C_t, \tag{2}$$

$$\sum_{i\in\mathbb{I},j\in\mathbb{J}} \epsilon_{i,j,t} M_{i,j,t} (1 - l_{i,j,t}) = N_t, \tag{3}$$

$$\sum_{i\in\mathbb{I},j\in\mathbb{J}} \theta_{i,j,t} M_{i,j,t} = 1, \tag{4}$$

$$\sum_{i\in\mathbb{I},j\in\mathbb{J}} B_{t+1,j+1,i} M_{i,j,t} = B_{t+1}, \tag{5}$$

$$\sum_{i\in\mathbb{I},j\in\mathbb{J}} A_{i,j+1,t+1} M_{i,j,t} = p_t^h, \tag{6}$$

Competitive equilibrium III

6. the sum of output, labour demand, investment and adjustment costs from the continuum of firms equals aggregate output, labour demand and investment as in equations

   aggregate output,

$$Y_t = \sum_o \int y_t(x)\mu_t(dx, o), \tag{7}$$

   labour demand,

$$N_t^d = \sum_o \int n_t(x)\mu_t(dx, o), \tag{8}$$

   aggregate investment,

$$I_t = \sum_o \int i_t(x)\mu_t(dx, o), \tag{9}$$

7. the value of and the return on the representative asset is consistent with the value of and returns on individual firms,
8. the aggregate resource constraint holds, with aggregate output equalling the sum of aggregate household consumption, government consumption, aggregate investment and net exports

$$Y_t = C_t + G_t + I_t + NX_t, \tag{10}$$

Competitive equilibrium IV

9. net exports are consistent with the balance of payments, that is net exports plus net foreign income equals the net value of assets acquired by foreigners

$$NX_t = \int (1 - \tau^{d,f}) d_t(x, f) \mu_t(dx, f) - \tau^{g,f} \left(\tilde{P}_t^f - P_{t-1}^f \right) + P_t^f - \tilde{P}_t^f, \tag{11}$$

10. bequests are equal to the deceased's assets, including returns, evenly distributed amongst the remaining agents of that type as given by

$$BQ_{t,j,i} = \frac{\sum_{j \in \mathbb{J}} \left(M_{t-1,j,i} - M_{t,j+1,i} \right) (p_t^a + r_t^a) A_{t,j+1,i}}{\sum_{j \in \mathbb{J}} M_{t,j,i}}, \tag{12}$$

11. the law of motion for the distribution of firms is satisfied

$$\mu_{t+1}(K \times Z \times O) = \sum_o \int \mathbf{1}_{\Omega(x) \in O} \mathbf{1}_{g(x) \in K} \mathrm{Q(z,Z)} \mu_t(\mathrm{dx,o}). \tag{13}$$

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