Estimating the Elasticity of Intertemporal Substitution using Dividend Tax News Shocks

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The views expressed here do not necessarily reflect the views of Norges Bank.

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   - Key behavioral parameter in macro and finance
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   - One of the largest tax reforms in modern European history
   - Dividend tax rate increased by 28 percentage points
   - Planning/announcement (2003/2004) and implementation (2006)

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   - Dividend tax rate increased by 28 percentage points
   - Planning/announcement (2003/2004) and implementation (2006)
3. Compelling quasi-experiment to study the response to *news* about future capital tax changes
   - Anticipatory saving or dis-saving effect?

This Paper

- Norwegian administrative register on the quasi-universe of households
- Rich household and firm balance sheet data due to wealth tax and third-party reporting
- Dynamic diff-in-diff approach identifies (relative) spending response to the reform
- Capitalist-worker model with dividend tax news shocks and flexible pass-through
- Calibrate the model to empirical impulse response and back out the implied EIS (and pass-through)

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  - Consistent with Jakobsen et al. (2020) and evidence from the 1989 Danish wealth tax reform
- Low and heterogeneous reform pass-through

Related literature

1. **Macro/empirical literature on the EIS:**
   Hall (1988), Hansen and Singleton (1983), Campbell and Mankiw (1989), Mankiw and Zeldes (1991), Attanasio and Weber (1993), Blundell et al. (1994), Attanasio and Browning (1995), Beaudry and Van Wincoop (1996), Vissing-Jørgensen (2002), Vissing-Jørgensen and Attanasio (2003), Gruber (2013), Jacob et al. (2015), Cashin and Unayama (2016), Best et al. (2020), Jakobsen et al. (2020), Ring (2020), Calvet et al. (2021), Crump et al. (2022), Flynn et al. (2022)

2. **Real effects of capital income/dividend taxation:**
   Harberger (1962), Hall and Jorgenson (1967), Feldstein (1970), Auerbach (1979), Bradford (1981), Poterba and Summers (1983), Cummins et al. (1994), Chetty and Saez (2005), Auerbach and Hassett (2007), House and Shapiro (2008), Yagan (2015), Alstadsæter et al. (2017), Zwick and Mahon (2017), Barro and Furman (2018), Straub and Werning (2020), Boissel and Matray (2022), Furno (2022), Chodorow-Reich et al. (2024)

3. **Models with limited participation, heterogeneity, news shocks**
   Campbell and Mankiw (1989), Galí et al. (2007), Bilbiie (2008),Bilbiie (2018), Debortoli and Gali (2017), Beaudry and Portier (2004), Beaudry and Portier (2006), Barsky and Sims (2011) Beaudry and Lucke (2010), Beaudry and Portier (2014).

Outline

AN ILLUSTRATIVE MODEL

- Three period-lived agent, $t = 0, 1, 2$ (no discounting)
- CRRA preferences:

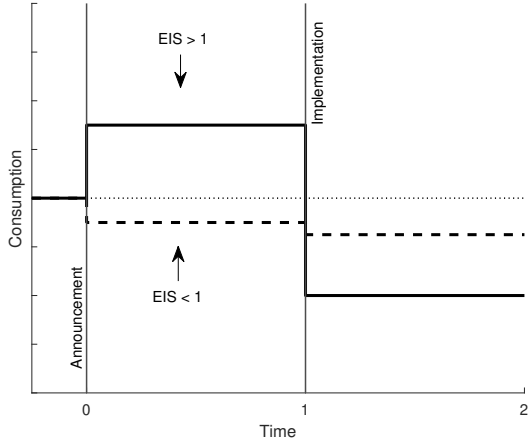
$$u'(C) = C^{-1/\psi},$$

  where $\psi > 0$ is the elasticity of intertemporal substitution (EIS)

- Allocates initial financial wealth A_0 between consumption over $t = 0, 1, 2$.
- No labor endowment (no wealth effects from re-valuation of labor endowment)
- Can save in a portfolio of financial assets with after-tax return of R_t, for $t = 1, 2$

An illustrative model

Change from $R_2 = 1$ to $R_2 < 1$ ($R_1 = 1$)



- Holds more generally: See Flynn et al. (2022).
- Provides a lower bound when wealth effects are also present.

Outline

Institutional Background

- Main goal: reduce difference in tax rates on labor and capital income

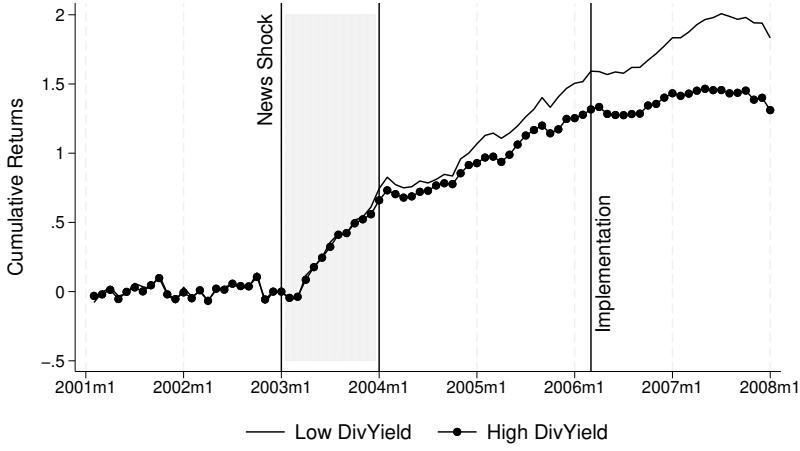
- 2001: Temporary dividend tax of 11%
- January 2002: Expert commission appointment
- February 2003: Commission published findings and submits recommendation
- March 2004: Policy announcement (mostly in line with commission recommendations)
- January 2006: Policy implementation

- Feature 1: 28% tax on dividends and capital gains in excess of riskless return allowance
- Feature 2: top marginal tax on labor income falls from 64.7% to 54.3%

- Sum of taxes paid by the firm and investor on dividends and capital gains increased to 48.2 %

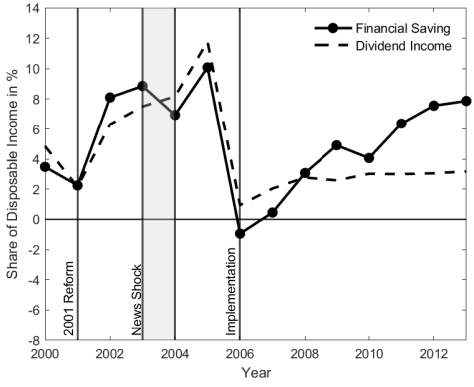
Stock Market Impact

The reform announcement was unanticipated

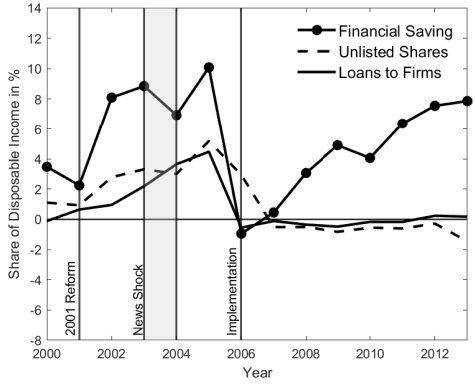


Aggregate Impact

Pass-through of the reform was likely low



(A) Saving and Dividend Income



(B) Saving in Unlisted Shares and Loans to Firms

Notes: Figure (a) shows households' financial saving and dividend income as a share of disposable income. Figure (b) shows households' saving in unlisted shares and loans to non-financial firms as a share of disposable income. All numbers are from the national accounts.

Outline

Data

- The Norwegian registry data:
  - Household balance sheets and income statements from Norwegian tax registers; Data on family status, demographics, education, employment status, etc.; Employer-employee matched data; Housing transaction data; Business ownership data; Firm income statements and balance sheets
  - Deflated to real 2011 US dollars
- Sample:
  - Sample period 2000-2013
  - Individuals between 25 and 65 years in 2000
  - Exclude household with disposable income and spending below 1G ($10,000)
  - Above median within-cohort wealth in 2000
  - Exclude households with very large annual changes in imputed spending

Descriptive statistics

Imputed Spending

Imputed spending: difference between disposable income and (imputed) active saving

- For everyone but incorporated business owners:
  - we follow the literature: Fagereng-Halvorsen (2015) and Eika-Mogstad-Vestad (2020) for Norway
  - Disposable income: labor income + transfers + business income + capital income + other income - taxes
  - (Imputed) saving: change in net worth from depositing/withdrawing resources from asset classes

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  - Integrate the private and business accounts

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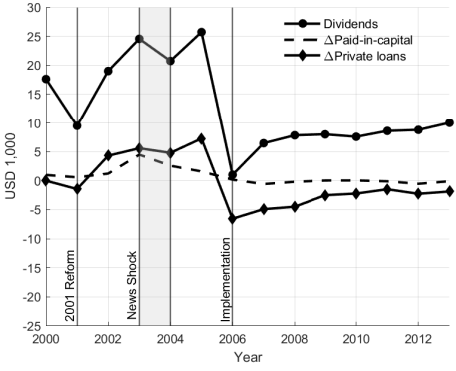
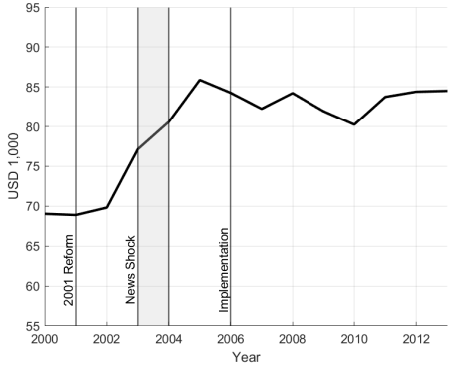
$$\text{spending}_{i,t} = \text{spending}^{\text{npbo}}_{i,t} + \text{dividends from the firm}_{i,t} - \Delta\text{paid-in capital in firm}_{i,t}. \tag{3}$$

SPENDING, DIVIDENDS AND PAID-IN CAPITAL



(A) Average dividends, paid-in-capital and private loans in the treatment group.



(B) Average spending in the treatment group.

EMPIRICAL FRAMEWORK

- Dynamic difference-in-differences:

$$c_{i,2000+h} - c_{i,2000} = \alpha + \sum_{h=\underline{h}}^{H} \beta_h \left(D_{i,2000} \times \omega_{2000+h} \right) + \sum_{h=\underline{h}}^{H} \Gamma_h' \left(\mathbf{X}_{i,2000} \times \omega_{2000+h} \right) + \varepsilon_{i,h} \tag{4}$$

for $h = \{0, 1, 2, \ldots, 13\}$,

- $c_{i,2000+h}$ – log imputed spending in year $2000 + h$
- $D_{i,2000}$ – treatment variable
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- **Treatment variable:** Average dividend income $> 20\%$ of gross income for 2000 and 2002.
- **Control group**: Relatively wealthy non-private business owners.
- Controls: flexible non-financial income, 2-digit NACE emplpoyment fixed effects, age-fixed effects, municipality-fixed effects Dividend share distribution

IDENTIFICATION

- Treatment (T) and control (C) groups' spending would have trended similarly without the tax reform
  - *Not* random assignment of households into T vs C
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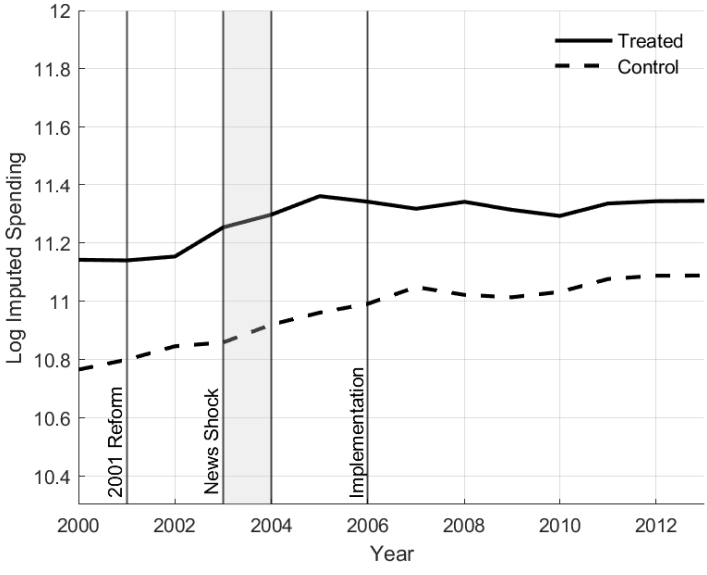
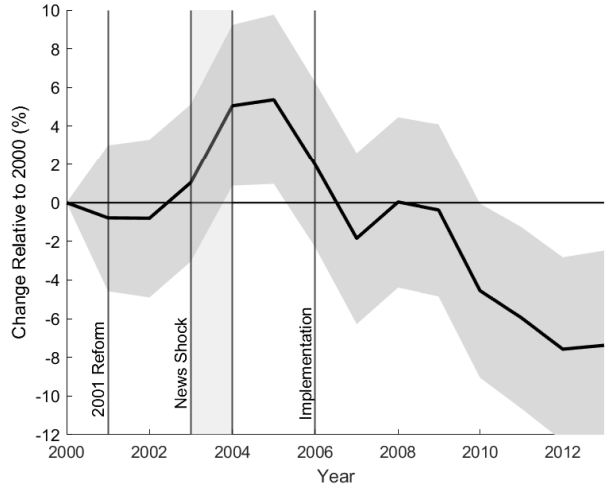
- In robustness:
  - control for systematic differences in exposure to stock market

Outline

RAW TRENDS

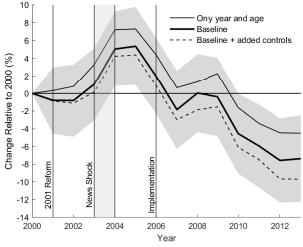

Treated
Control
Log Imputed Spending
12
11.8
11.6
11.4
11.2
11
10.8
10.6
10.4
2001 Reform
News Shock
Implementation
2000
2002
2004
2006
2008
2010
2012
Year

Main Empirical Result

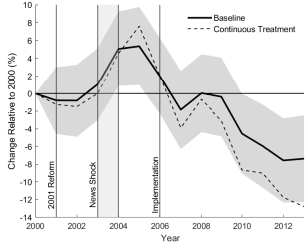


Notes: The figure displays the estimated coefficients of equation (4) with 95% confidence bands computed using standard errors clustered at the individual level.

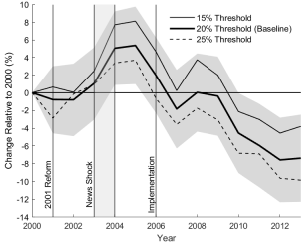
ROBUSTNESS



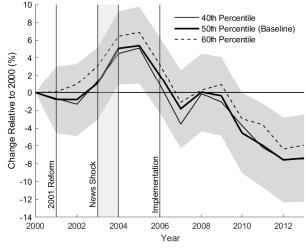
(A) Alternative sets of controls.



(B) Continuous treatment definition.



(C) Alternative treatment thresholds.



(D) Alternative sample restrictions.

TAKING STOCK

- Anticipatory dis-saving effect of the reform
- Relative spending rose by 5 % in 2004-2006
- Fell gradually to around 8 in 2011-2013
- Robust to alternative treatment thresholds or treatment definition
- Consistent with EIS>1
- Next: back out a specific value of the EIS

Outline

Structural Model

- Two-agent real business cycle framework [Mankiw (2000), Gali et al (2007), Bilbiie (2008), Debortoli and Gali (2018)]

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- Labor: endowments (exogenous wage in baseline model)
- Firms: standard. Pay dividends to capitalists subject to cost [Jermann and Quadrini (2012)]
- Policy: news shocks about future dividend and labour income taxes [Beaudry and Portier (2004, 2006)]

HOUSEHOLDS

- Capitalists

$$\max_{\{C_{k,t},S_{t+1}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{C_{k,t}^{1-1/\psi} - 1}{1 - 1/\psi}$$

$$\text{s.t. } S_{t+1}P_t + C_{k,t} \leq (1 - \tau_{k,t})N_k + S_t(D_t + P_t), \forall t$$

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- Workers

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$$\text{s.t. } C_{w,t} + \frac{B_{w,t+1}}{R_t^B} = (1 - \tau_{w,t})N_w + B_{w,t} + T_{w,t}, \forall t$$

Closely Held Firms

$$V(K) = \max_{\{D,K'\}} [D + \mathbb{E}m'V(K')]$$

s.t.

$$\varphi(D) + K' \leq (1-\delta)K + F(A,K,N) - N,$$

where

$$\varphi(D_t) = D_t(1+\tau_t)^{\kappa} \tag{5}$$

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κ: long-run pass-through parameter – reduced-form way to capture many possible mechanisms

- Allow for slow adjustment to the dividend tax news.
- Dividend tax impacts capitalists with probability $1-\theta$
- Over time the economy converges to the new tax regime

Tax Policy

Tax processes:

$$\log \tau_t = \log \tau_{t-1} + \sigma_d \varepsilon_{d,t-j},$$
$$\log \tau_{k,t} = \log \tau_{k,t-1} + \sigma_k \varepsilon_{k,t-j},$$
$$\log \tau_{w,t} = \log \tau_{w,t-1} + \sigma_w \varepsilon_{w,t-j},$$

News: $\epsilon_{d,t-j}$, $\epsilon_{k,t-j}$, $\epsilon_{w,t-j}$

In Norwegian context, $j = 3$

Numerically, assume a very persistent AR(1) process.

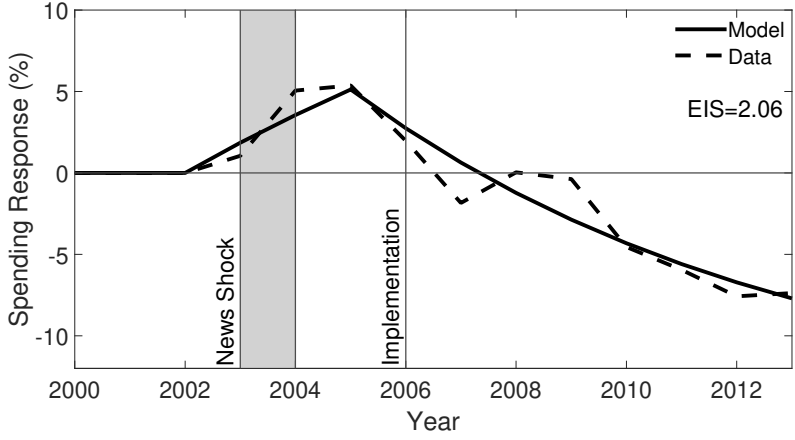
▸ Market clearing conditions ▸ Equilibrium definition ▸ Fixed parameters

Outline

Calibration Strategy

- Impulse response matching: simultaneous shocks to dividend and labor tax news
- Large three-dimensional grid for ψ, κ, and θ
- Calibration targets: differential spending response over 2003-2013.
- Calibrated EIS: minimizes squared error between model-implied and data responses

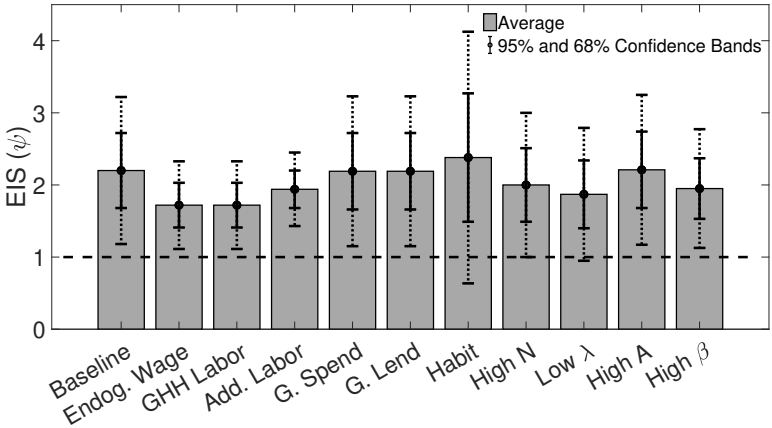
Spending Response: Model Meets Data



$\kappa = 0.02$ and $\theta = 0.9$

▸ IR matching results ▸ Additional results

ROBUSTNESS



Notes: The figure reports average EIS values as well as 68% and 95% bootstrapped confidence bands implied by each alternative model. Model versions, from left to right, correspond to: the baseline and extensions with endogenous wages, endogenous GHH labor supply, endogenous additively separable labor supply, fiscal rule with government spending instead of lump-sum taxes, fiscal rule with government bond lending instead of lump-sum taxes, habit formation instead of heterogeneous tax incidence, high value of the labor endowment, low share of workers, low productivity, and high discount factor.

Conclusion

- Leverage unique institutional features of the 2006 Norwegian dividend tax reform
- Administrative household-level data and a diff-in-diff approach
- Estimate an anticipatory spending response – consistent with EIS>1 for treated individuals
- Using a calibrated structural model, we back out an EIS of around 2
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- Other implications:
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  - dividend taxation may impact activity via spending/aggregate demand

Appendix

DESCRIPTIVE STATISTICS FOR 2000

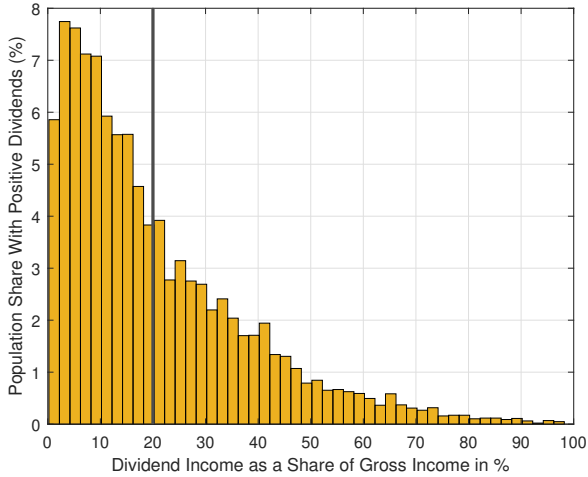
BACK

	Control		Treated	
	Mean	S.D.	Mean	S.D.
Age	45.49	11.14	50.71	8.71
Spending	43.68	38.45	86.07	145.04
Disposable income	39.38	18.22	94.67	142.8
Labor income	46.55	28.81	56.51	29.52
Transfers	8.84	11.67	4.49	8.39
Dividend income from private businesses	.	.	57.33	131.31
Taxes	15.07	10.98	26.75	22.68
Gross wealth	310.96	276.85	695.31	658.06
Housing wealth	283.62	269.38	548.34	543.89
Deposits	16.38	34.15	63.75	148.9
Public Stocks	0.32	20.02	8.22	56.1
Mutual Funds	2.21	9.22	11.92	36.84
Private Business Wealth	.	.	156.37	401.22
Net Wealth	410.09	294.83	715.72	663.84
Debt	59.42	60.75	71.04	117.09
Exposure to the reform (dividend share of gross income in %)	.	.	36.68	21.69
Number of individuals	1,320,970	.	2,959	.

DIVIDEND SHARE DISTRIBUTION

BACK

FIGURE: The distribution of dividend income as a share of gross income.



Notes: The figure shows the distribution of dividends from private business as a share of gross income among (majority) private business owners in 2000.

Aggregation and Market Clearing

BACK

$$G_t = \tau_t D_t + \tau_{w,t} N_w + \tau_{k,t} N_k$$

Firm shares: $S_t = \frac{1}{1-\lambda}$

Labor endowments: $N = \lambda N_w + (1-\lambda) N_k$

Consumption: $C_t = \lambda C_{wt} + (1-\lambda) C_{kt}$

Goods market: $Y_t = C_t + I_t$

EQUILIBRIUM DEFINITION

BACK

DEFINITION 1

A rational expectations general equilibrium, given tax policy innovation shocks $\{\varepsilon_{d,t}, \varepsilon_{k,t}, \varepsilon_{w,t}\}$ and the tax policy processes, is defined as a set of policies for (i) capitalists: C_k and S_k; (ii) policies for workers: C_w and B_w; (iii) policies for firms: K' and D; (iv) firm market value $V(K)$; (v) and aggregate prices m' and R^b, such that: all policies solve the respective agents' optimization problems, $m' = \beta \frac{U_c(c_k')}{U_c(c_k)}$, and all markets clear at any given time t.

PARAMETERS FIXED EXTERNALLY

BACK

TABLE: Model parameters fixed externally

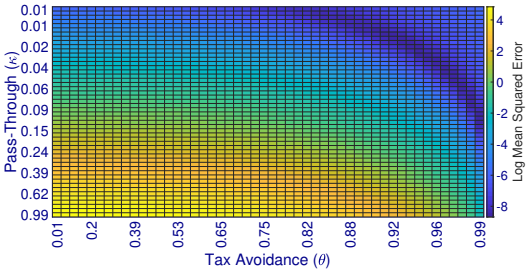
Parameter	Value	Description
λ	0.975	Share of workers
β	0.98	Discount factor
δ	0.075	Depreciation rate
α	0.33	Capital share
N	0.3	Labor endowment
A	1	Productivity
σ_d	0.28	St. dev., capitalist dividend tax news
σ_l	0.104	St. dev., capitalist labor tax news

Parameterization frequency: annual

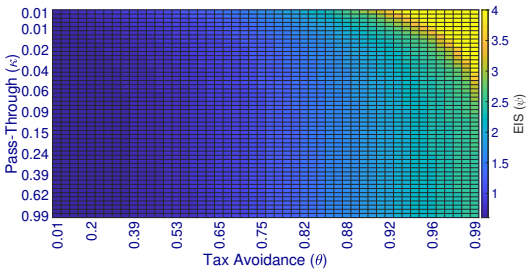
We fix these parameters by relying on prior literature and institutional details of the tax reform

IMPULSE RESPONSE MATCHING RESULTS

BACK



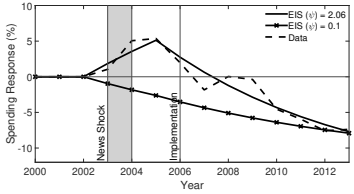
(A) IRF Matching Errors



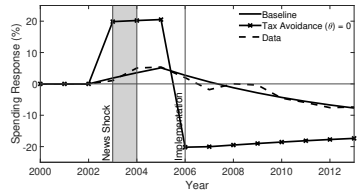
(B) Implied EIS (ψ)

ADDITIONAL MODEL RESULTS

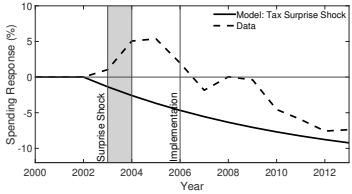
BACK



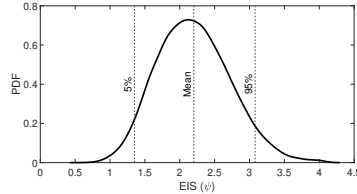
(A) Setting the EIS to 0.1



(B) Setting Tax Avoidance to 0



(C) The Impact of Surprise Tax Shocks



(D) Bootstrap Density

REFERENCES I

ALSTADSÆTER, A., M. JACOB, AND R. MICHAELY (2017): "Do dividend taxes affect corporate investment?" *Journal of Public Economics*, 151, 74–83.

ATTANASIO, O. P. AND M. BROWNING (1995): "Consumption over the Life Cycle and over the Business Cycle," *American Economic Review*, 1118–1137.

ATTANASIO, O. P. AND G. WEBER (1993): "Consumption growth, the interest rate and aggregation," *Review of Economic Studies*, 60, 631–649.

AUERBACH, A. J. (1979): "Wealth maximization and the cost of capital," *Quarterly Journal of Economics*, 93, 433–446.

AUERBACH, A. J. AND K. A. HASSETT (2007): "The 2003 Dividend Tax Cuts and the Value of the Firm: An Event Study," in *Taxing Corporate Income in the 21st Century*, ed. by A. J. Auerbach, J. R. Hines, Jr., and J. Slemrod, Cambridge University Press, 93–126.

BARRO, R. J. AND J. FURMAN (2018): "Macroeconomic effects of the 2017 tax reform," *Brookings Papers on Economic Activity*, 2018, 257–345.

BARSKY, R. B. AND E. R. SIMS (2011): "News shocks and business cycles," *Journal of Monetary Economics*, 58, 273–289.

References II

Beaudry, P. and B. Lucke (2010): "Letting Different Views about Business Cycles Compete," *NBER Macroeconomics Annual*, 24, 413–456.

Beaudry, P. and F. Portier (2004): "An exploration into Pigou's theory of cycles," *Journal of Monetary Economics*, 51, 1183–1216.

——— (2006): "Stock prices, news, and economic fluctuations," *American Economic Review*, 96, 1293–1307.

——— (2014): "News-driven business cycles: Insights and challenges," *Journal of Economic Literature*, 52, 993–1074.

Beaudry, P. and E. Van Wincoop (1996): "The intertemporal elasticity of substitution: An exploration using a US panel of state data," *Economica*, 495–512.

Best, M. C., J. S. Cloyne, E. Ilzetzki, and H. J. Kleven (2020): "Estimating the elasticity of intertemporal substitution using mortgage notches," *Review of Economic Studies*, 87, 656–690.

Bilbiie, F. (2008): "Limited asset markets participation, monetary policy and (inverted) aggregate demand logic," *Journal of Economic Theory*, 140, 162–196.

——— (2018): "Monetary Policy and Heterogeneity: An Analytical Framework," *Working Paper*.

References III

Blundell, R., M. Browning, and C. Meghir (1994): "Consumer demand and the life-cycle allocation of household expenditures," *Review of Economic Studies*, 61, 57–80.

Boissel, C. and A. Matray (2022): "Dividend Taxes and the Allocation of Capital," *Working Paper*.

Bradford, D. F. (1981): "The incidence and allocation effects of a tax on corporate distributions," *Journal of Public Economics*, 15, 1–22.

Calvet, L. E., J. Y. Campbell, F. Gomes, and P. Sodini (2021): "The cross-section of household preferences," *Working Paper*.

Campbell, J. Y. and N. G. Mankiw (1989): "Consumption, income, and interest rates: Reinterpreting the time series evidence," *NBER Macroeconomics Annual*, 4, 185–216.

Cashin, D. and T. Unayama (2016): "Measuring Intertemporal Substitution in Consumption: Evidence from a VAT Increase in Japan," *Review of Economics and Statistics*, 98, 285–297.

Chetty, R. and E. Saez (2005): "Dividend taxes and corporate behavior: Evidence from the 2003 dividend tax cut," *Quarterly Journal of Economics*, 120, 791–833.

Chodorow-Reich, G., M. Smith, O. M. Zidar, and E. Zwick (2024): "Tax policy and investment in a global economy," Tech. rep., National Bureau of Economic Research.

References IV

Crump, R. K., S. Eusepi, A. Tambalotti, and G. Topa (2022): "Subjective intertemporal substitution," *Journal of Monetary Economics*, 126, 118–133.

Cummins, J. G., K. A. Hassett, R. G. Hubbard, R. E. Hall, and R. J. Caballero (1994): "A reconsideration of investment behavior using tax reforms as natural experiments," *Brookings Papers on Economic Activity*, 1994, 1–74.

Debortoli, D. and J. Gali (2017): "Monetary Policy with Heterogeneous Agents: Insights from TANK models," *Working Paper*.

Feldstein, M. S. (1970): "Corporate taxation and dividend behaviour," *Review of Economic Studies*, 37, 57–72.

Flynn, J. P., L. D. Schmidt, and A. A. Toda (2022): "Robust Comparative Statics for the Elasticity of Intertemporal Substitution," *arXiv preprint arXiv:2201.10673*.

Furno, F. (2022): "The Macroeconomic Effects of Corporate Tax Reforms," *Working Paper*.

Galí, J., J. D. López-Salido, and J. Vallés (2007): "Understanding the effects of government spending on consumption," *Journal of the European Economic Association*, 5, 227–270.

Gruber, J. (2013): "A Tax-Based Estimate of the Elasticity of Intertemporal Substitution." *Quarterly Journal of Finance*, 3, 1 – 20.

References V

Hall, R. E. (1988): "Intertemporal Substitution in Consumption," *Journal of Political Economy*, 96, 339–357.

Hall, R. E. and D. W. Jorgenson (1967): "Tax policy and investment behavior," *American Economic Review*, 57, 391–414.

Hansen, L. P. and K. J. Singleton (1983): "Stochastic consumption, risk aversion, and the temporal behavior of asset returns," *Journal of political economy*, 91, 249–265.

Harberger, A. C. (1962): "The incidence of the corporation income tax," *Journal of Political Economy*, 70, 215–240.

House, C. L. and M. D. Shapiro (2008): "Temporary investment tax incentives: Theory with evidence from bonus depreciation," *American Economic Review*, 98, 737–68.

Jacob, M., R. Michaely, and A. Alstadsæter (2015): "Taxation and dividend policy: The muting effect of diverse ownership structure," *Accounting Research Centre, Chicago Booth*.

Jakobsen, K., K. Jakobsen, H. Kleven, and G. Zucman (2020): "Wealth taxation and wealth accumulation: Theory and evidence from Denmark," *Quarterly Journal of Economics*, 135, 329–388.

Mankiw, N. G. and S. P. Zeldes (1991): "The consumption of stockholders and nonstockholders," *Journal of Financial Economics*, 29, 97–112.

References VI

Poterba, J. M. and L. H. Summers (1983): "Dividend taxes, corporate investment, and 'Q'," *Journal of Public Economics*, 22, 135–167.

Ring, M. A. K. (2020): "Wealth taxation and household saving: Evidence from assessment discontinuities in Norway," *Working Paper*.

Straub, L. and I. Werning (2020): "Positive long-run capital taxation: Chamley-Judd revisited," *American Economic Review*, 110, 86–119.

Vissing-Jørgensen, A. (2002): "Limited asset market participation and the elasticity of intertemporal substitution," *Journal of Political Economy*, 110, 825–853.

Vissing-Jørgensen, A. and O. P. Attanasio (2003): "Stock-market participation, intertemporal substitution, and risk-aversion," *American Economic Review*, 383–391.

Yagan, D. (2015): "Capital tax reform and the real economy: The effects of the 2003 dividend tax cut," *American Economic Review*, 105, 3531–63.

Zwick, E. and J. Mahon (2017): "Tax policy and heterogeneous investment behavior," *American Economic Review*, 107, 217–48.