HARVARD Kennedy School
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Macroeconomic Effects of the 2017 Tax Reform

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Outline

1. GDP
2. National Income
3. Welfare
4. How Will We Know?
5. What's Next?

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Modelling strategy for long-run estimates

- **Cobb-Douglas production function**
  - Five types of capital: equipment, structures, residential, R&D and other IP
  - Three sectors: corporate (39%), passthrough (36%) and government/household (25%)

- **Infinitely elastic supply of capital** (small open economy or long-run Ramsey model with offsetting effects from upward-sloping supply of capital and falling rate of time preference or intertemporal substitution)

- **Supply of capital determined competitively based on user costs.**

- **Perfect foresight, unchanging tax code, lump sum financing.**

User cost of capital with equity finance

$$\Psi_t = (1-\tau_t)(Y_t - w_t L_t) - (1-\tau_t\lambda_t)(K_t - K_{t-1} + \delta K_{t-1}),$$

$$MPK_t = \Omega = \left(\frac{1-\tau\lambda}{1-\tau}\right)\cdot\left(r^k + \delta\right)$$

User cost

Effective expensing rate

where Y is output, w is the real wage rate, L is labor, K is capital, τ is the tax rate on profits, λ is the effective expensing rate on purchases of capital goods, and δ is the true proportionate depreciation rate on capital.

Adding debt finance

Additional term: $\tau_t \cdot i_{t-1} \cdot \frac{B_{t-1}}{P_t} - \Phi\left(\frac{B_t}{P_t K_t}\right) \cdot K_t,$

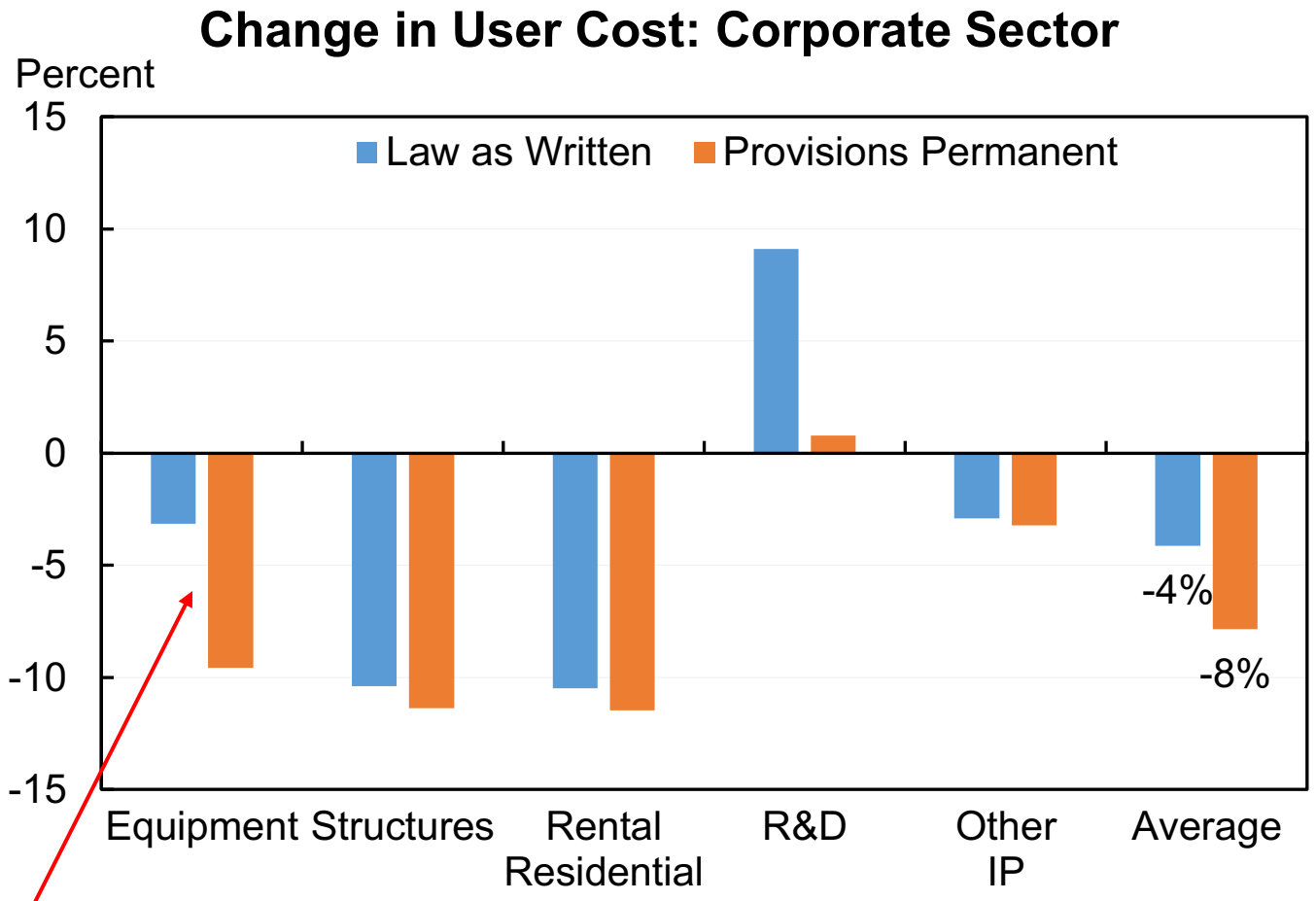
Cost of bankruptcy

$$\boldsymbol{MPK_t = \Omega = \left(\frac{1-\tau\lambda}{1-\tau}\right) \cdot (r^k + \delta) - \left(\frac{\theta-1}{\theta}\right) \cdot \left(\frac{\tau}{1-\tau}\right) \cdot \left(\frac{B_t}{P_t K_t}\right) \cdot i}$$

where B_t is the nominal quantity of the corporation's bonds, P_t is the price level, and i_t is the nominal interest rate on corporate bonds.

Tax scenarios modelled

Law As Written ($1.5T conventional cost)	Provisions Permanent ($2.2T conventional cost)
21% corporate rate	
Eliminate the Section 199 Domestic Activities Deduction	
Net Operating Loss Carrybacks Repealed and Carryforwards Limited	
Normal depreciation for equipment	Expensing for equipment
5-year amortization for R&D	Expensing for R&D
Interest capped at 30% of EBIT	Interest capped at 30% of EBITA
Miscellaneous offsets	Smaller miscellaneous offsets
39.6% top rate + chained CPI	37.0% top rate, State and local deduction capped at $10,000 and 20% passthrough deduction with guardrails



Relative to 2017:
Law as Written: +2%
Provisions Permanent: -5%

Source: Calculations based on Barro and Furman (2018).

From user costs to capital and output

$$\frac{\Delta\left(\frac{K}{L}\right)}{K/L} = -\frac{1}{(1-\alpha)} \cdot \left(\frac{\Delta\Omega}{\Omega}\right)$$

$$\frac{\Delta\left(\frac{Y}{L}\right)}{Y/L} = -\frac{\alpha}{(1-\alpha)} \cdot \left(\frac{\Delta\Omega}{\Omega}\right)$$

For $\alpha = 0.38$ the elasticity of capital with respect to labor is 1.6

(Can generalize this to multiple forms of capital in which case you also get cross elasticities.)

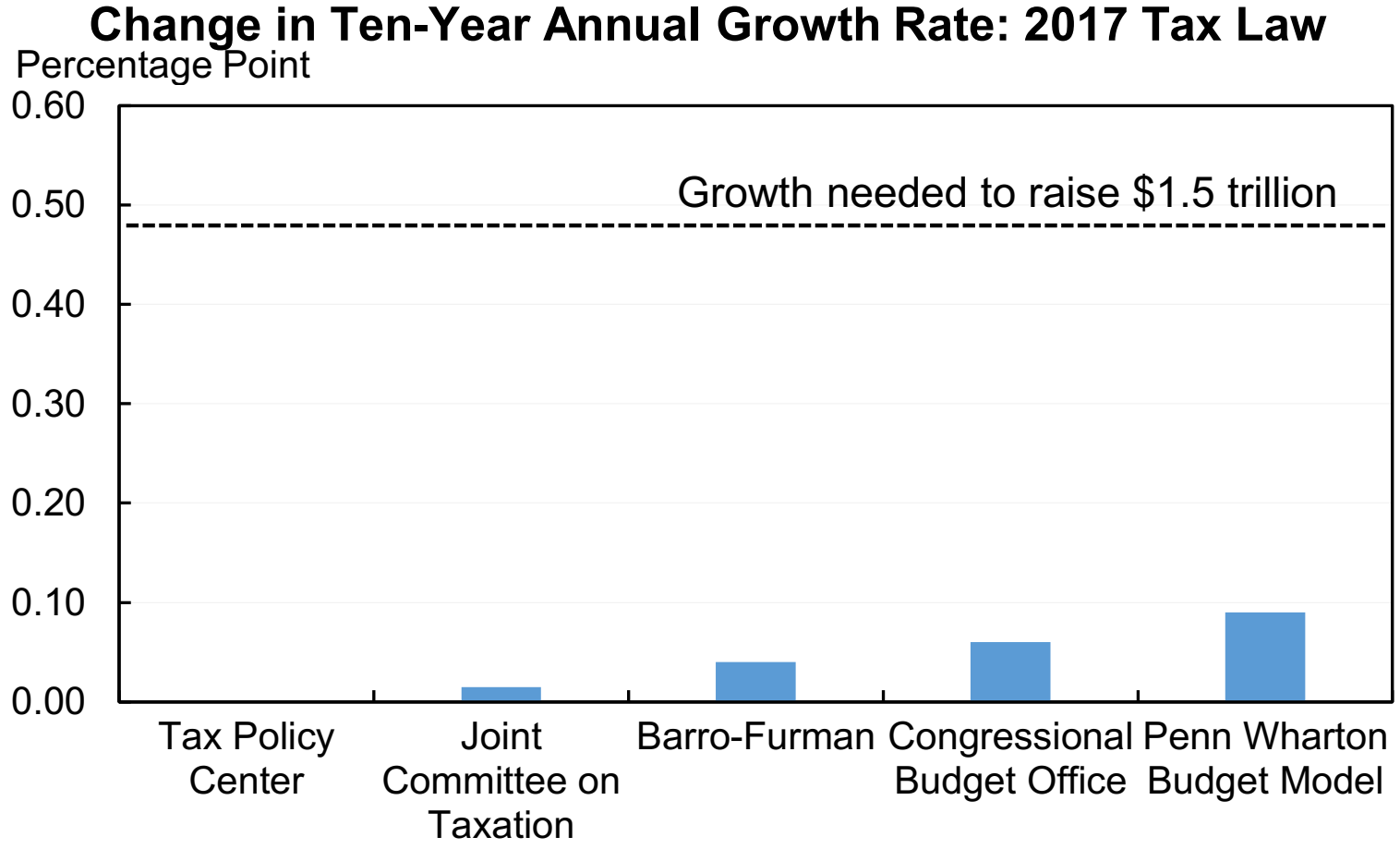
Modelling the time path using a 5% convergence rate

Estimated Effects over 10-year Horizon

	Law as written	Provisions permanent
Change in GDP: Long-run	0.9%	3.1%
Change in GDP: 10 years out	0.4%	1.2%
Change in 10-year annual growth rate	0.04 p.p.	0.13 p.p.

Note: The proportionate changes in GDP over the long run come from Table 9, with the employment-population ratio unchanged. The proportionate changes in GDP after 10 years come from applying a convergence rate of 5 percent per year to the long-run results.
Source: Barro and Furman (2018).

Broad agreement tax bill will add less than 0.1pp to annual GDP growth



Note: Estimates for the Joint Committee on Taxation and Penn Wharton Budget Model represent midpoint from range of estimates.
Source: Based on sources listed; Office of Management and Budget; author's calculations.

Sensitivity analysis for crowd out through higher interest rates

Cost of the 2017 Tax Law with Conventional and Dynamic Scoring ($ billions), 2018-2027

	Law as written	Provisions permanent
JCT Conventional Score	$1,500	$2,200
Dynamic Feedback	-$250	-$450
Net Cost (assuming JCT conventional score)	**$1,200**	**$1,700**
Annual Cost per Household	$900	$1,400
Increase in r^k and i in crowd out scenario (bp)	14	20
GDP after 10 years without crowd out	0.4%	1.2%
GDP after 10 years with crowd out	0.2%	1.0%
Change in annual growth rate with crowd out	0.02 p.p.	0.10 p.p.

Note: Cost per household is per year for 10 years. Assumes payments start in 2018. Detail does not add to total because of rounding.
Source: Barro and Furman (2018).

Some of what these growth estimates miss

- **Improvements in the composition of investment could result in larger output effects:**
  - Reduces the dispersion of average tax rates across sectors, including much larger rate reductions for current high tax sectors (e.g., retail and wholesale trade, utilities and transportation) and smaller reductions for current low tax sectors (e.g., manufacturing).

- **Higher tax rates on R&D could result in lower output/growth effects in the law as written case.**

- **International considerations**

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What is national income?

	2017 Values
GDP	**19,485**
+ Net Receipts/Payments from World	244
- Depreciation of Fixed Capital	-3,116
- Statistical Discrepancy	-143
National Income	**16,756**

National Income is a much better measure of the resources available to Americans.

Normally it moves with GDP but certain policies can introduce systematic differences in their movements.

It used to be standard to report national income for dynamic analysis

TABLE 4—BASE CASE RESULTS, FIVE TAX REFORMS

	Year	National income[a]	Capital stock[a]	Labor supply[a]	Net saving rate	Before-tax wage[a]	Interest rate	Normalized Tobin's q	Tax rate[b]
	1996	1.000	1.000	1.000	0.051	1.000	0.083	1.000	0.216
Proportional income tax	1997	1.038	1.002	1.051	0.056	0.988	0.088	1.037	0.135
	2010	1.044	1.030	1.050	0.054	0.995	0.083	1.028	0.131
	2145	1.049	1.056	1.047	0.052	1.001	0.083	1.019	0.130
Proportional consumption tax	1997	1.044	1.010	1.063	0.073	0.987	0.079	0.960	0.142
	2010	1.063	1.108	1.054	0.067	1.013	0.076	0.934	0.138
	2145	1.094	1.254	1.046	0.059	1.046	0.073	0.906	0.127
Flat tax (standard)	1997	1.010	1.006	1.016	0.065	0.997	0.076	0.964	0.214
	2010	1.022	1.059	1.013	0.061	1.011	0.078	0.958	0.211
	2145	1.045	1.150	1.013	0.056	1.032	0.080	0.941	0.199
Flat tax (transition relief)	1997	0.995	1.003	0.994	0.059	1.002	0.081	1.001	0.241
	2010	1.005	1.031	0.998	0.057	1.008	0.080	0.994	0.234
	2145	1.019	1.083	0.998	0.055	1.021	0.078	0.983	0.226
X tax	1997	1.018	1.009	1.027	0.069	0.996	0.063	0.949	0.178
	2010	1.031	1.076	1.019	0.064	1.014	0.077	0.910	0.177
	2145	1.064	1.210	1.020	0.059	1.044	0.074	0.882	0.157

Macroeconomic Effects of Tax Reform Options: Percentage Change from Initial Steady-State for Selected Variables and Years After Reform

	PCT			GIT			SIT		
	Budget Window*	Year 20	Long-run	Budget Window*	Year 20	Long-run	Budget Window*	Year 20	Long-run
National Income									
Ramsey Growth Model	2.3%	4.5%	6.0%	1.9%	3.7%	4.8%	0.0%	0.2%	0.3%
OLG Model	0.7%	2.6%	2.8%	1.5%	2.1%	2.2%	0.4%	0.8%	0.9%
Solow Growth Model	0.2%	0.6%	1.9%	0.1%	0.4%	1.4%	0.0%	0.1%	0.2%

Source: Altig et al. (2001); Carroll et al. (2006).

Capital tax reforms result in smaller increases in national income

- **Additional capital means more depreciation.** So more of GDP is devoted to replacing the capital stock and thus not available for consumption or new investment.

- **Additional capital partly financed from abroad.** Even if the cost of foreign financing is relatively low, the United States is worse off after accounting for foreign financing relative to what it appears when ignoring foreign financing.

- **If tax cuts not paid for, increased deficits partly financed from abroad.** Estimates are that about one-third of deficits are financed from abroad.

For national income to have a different sign than GDP growth is plausible

Change After Ten Years From Law as Written with Crowd Out			
	Baseline	**Law**	**% Change**
GDP	100	100.2	**0.2%**
Depreciation	-16.0	-16.0	
Net Income	+1.3	+1.1	
National Income	86.0	85.9	**-0.1%**

Note: The capital stock remains fixed as a share of GDP and is depreciated at a constant rate. One third of the net additional gross investment and one third of the budgetary cost of the tax plan are each assumed to be financed by foreigners. Interest is paid on the cumulative amount borrowed from abroad at a rate of 6.9 percent, the average of CBO's projections for interest rates on 3-month and 10-month Treasury's for 2018–2027 from the June 2017 Budget and Economic Outlook and the nominal expected rate of return assumed in Barro and Furman (2018). Not shown is statistical discrepancy, which is assumed to be fixed at 0.7 percent of GDP.
Source: Calculations based on Barro and Furman (2018) and Congressional Budget Office.

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Welfare is not the same as growth or even a standard distributional table

Welfare benefits:

- Direct benefit of tax cuts
- Higher GDP means higher wages

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Welfare costs:
- Cost of repaying additional fiscal debt and national borrowing
- Cost of reduced leisure
- Cost of reduced consumption

Note – in some cases the timing differs, for example you need to reduce consumption today to get the additional capital/wage increases in the future.

We should do a much better job capturing these issues for the next tax debate

Alternative macroeconomic metrics

- National Income (or GNP) instead of GDP
- Consumption instead of output
- Welfare in micro-founded models

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Interpretation/presentation of distribution tables

- Distribution tables show welfare for revenue neutral changes and overstate welfare for revenue reducing changes (Furman 2016 and Leiserson 2017)
- Distribution tables with financing (Gale and others 2001 through 2018)
- Dynamic distributional tables incorporating direct and indirect effects (Elmendorf et al. 2007)

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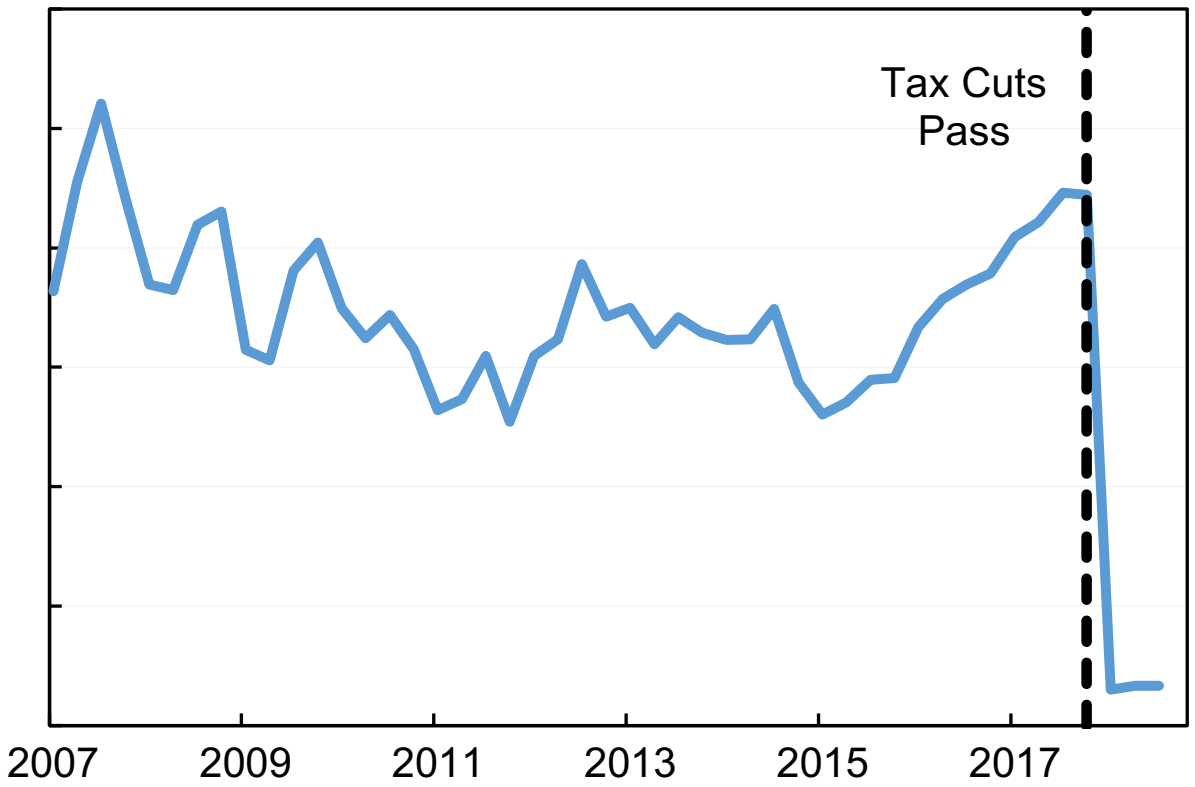
Clear evidence of a discontinuity following the passage of the tax law



Source: Bureau of Economic Analysis.

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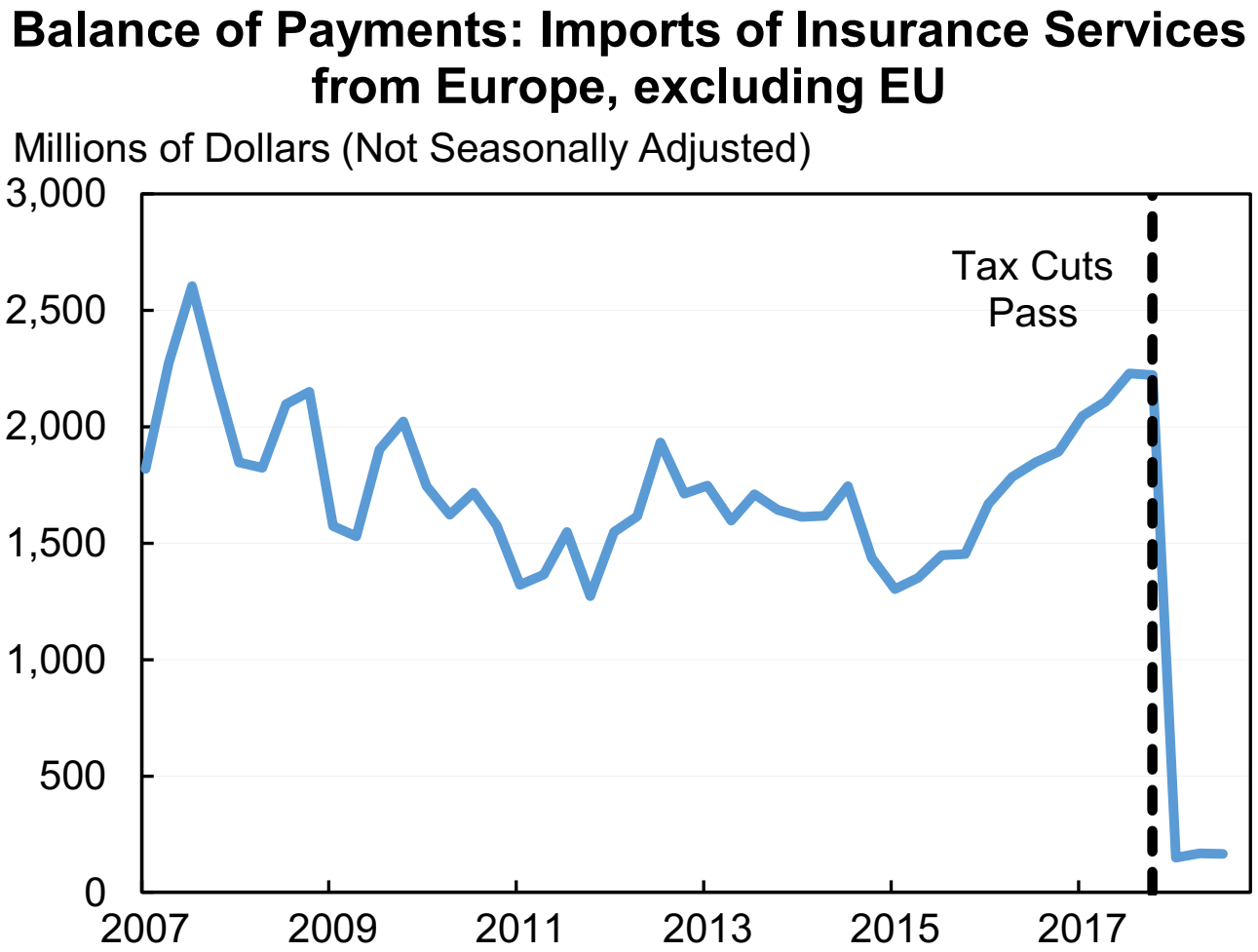
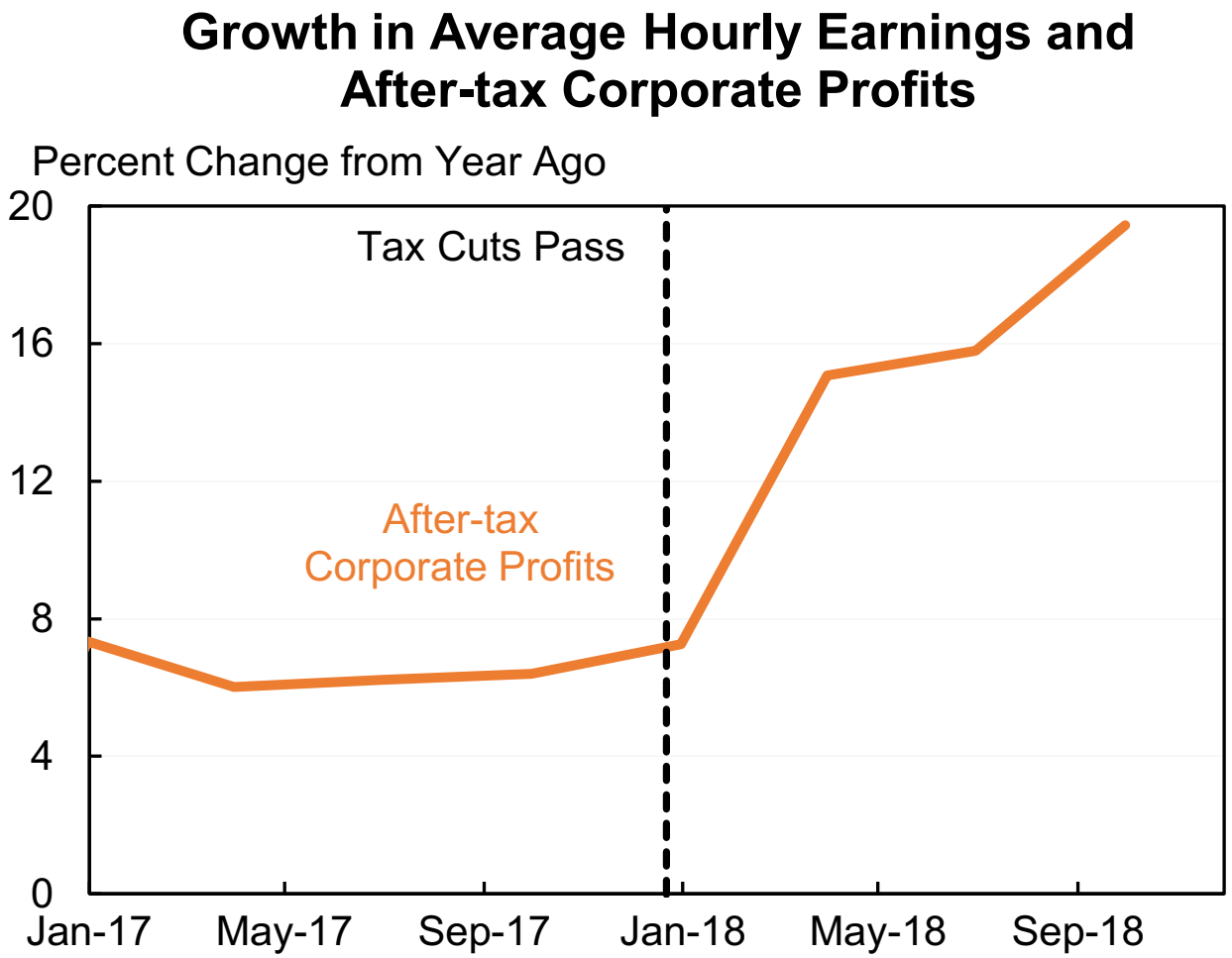


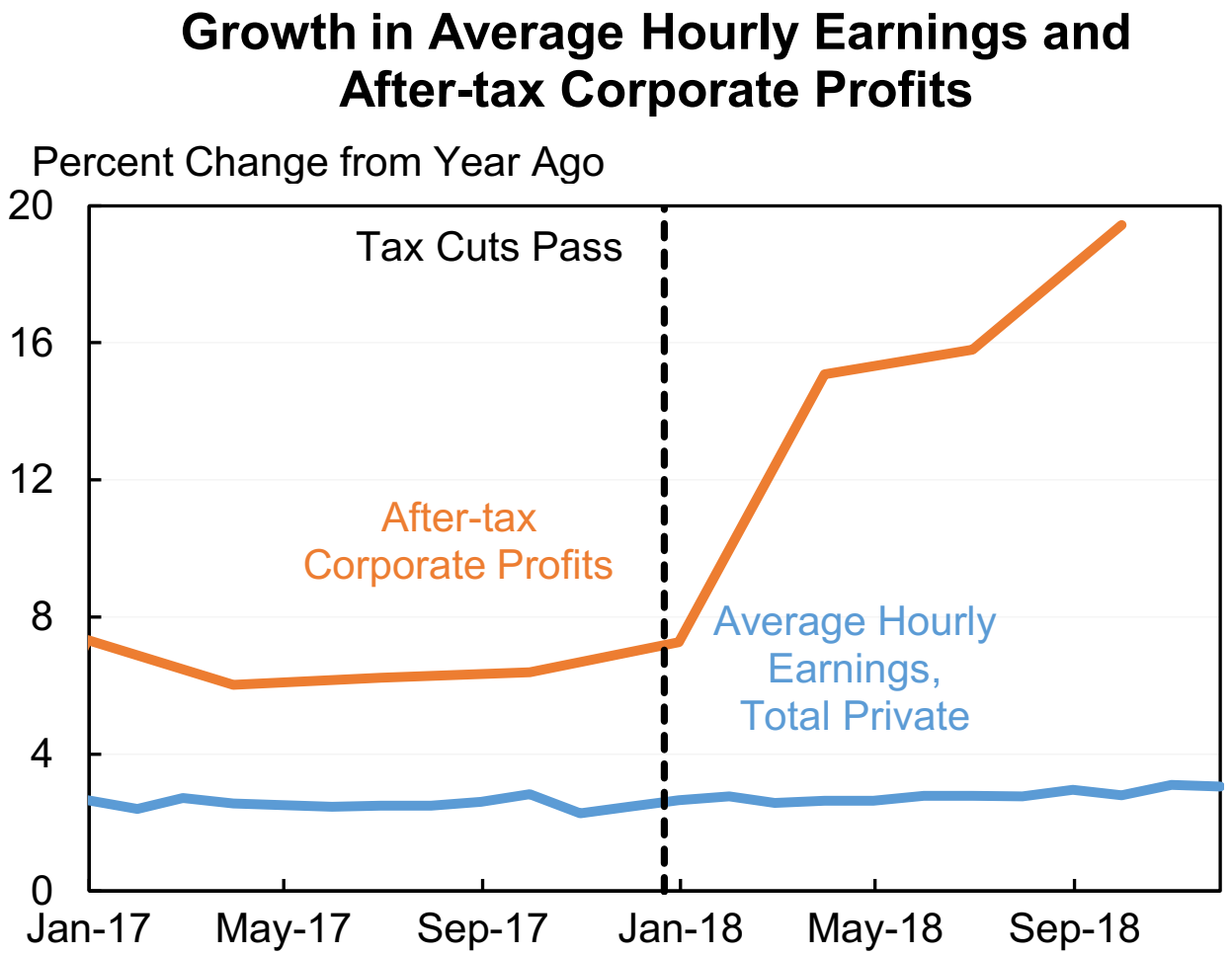
Source: Bureau of Economic Analysis.

Also a discontinuity in the growth of after-tax corporate profits



Source: Bureau of Economic Analysis, FRED, author's calculations.

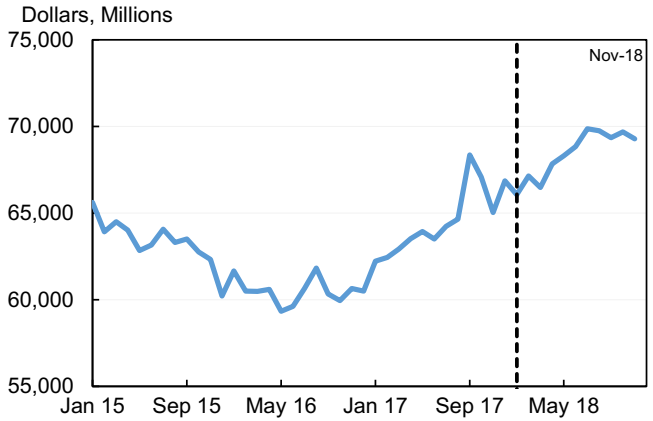
But no discontinuity in wage growth—refutes immediate rent sharing arguments



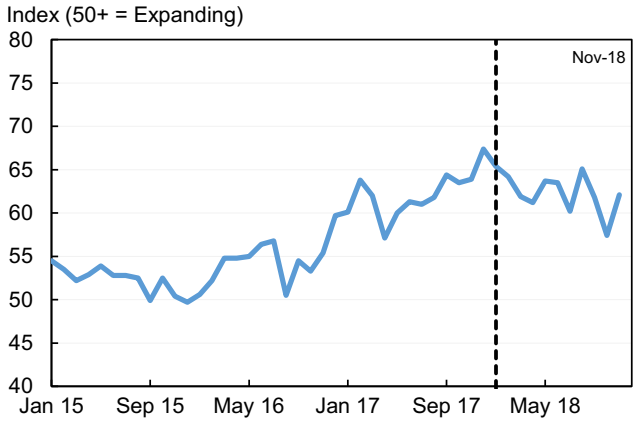
Source: Bureau of Economic Analysis, Bureau of Labor Statistics, FRED, author's calculations.

Forward-looking investment started rising ~2016 & no evidence of positive trend break

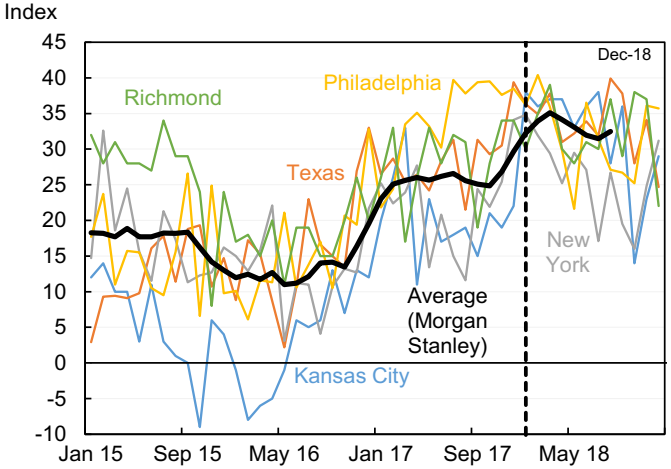
New Orders: Nondefense Capital Goods excluding Aircraft



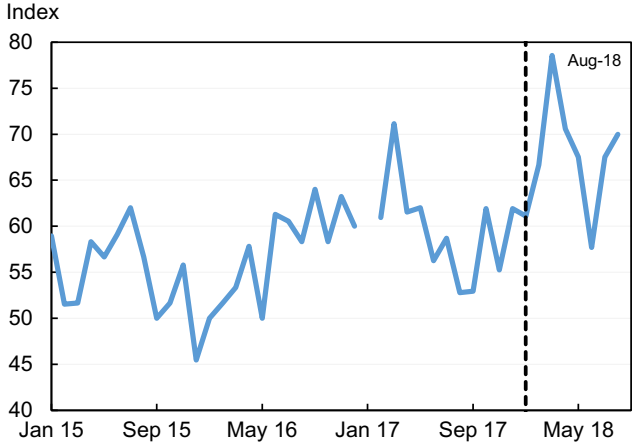
ISM Manufacturing: New Orders Index



Future Capital Expenditures Diffusion Index

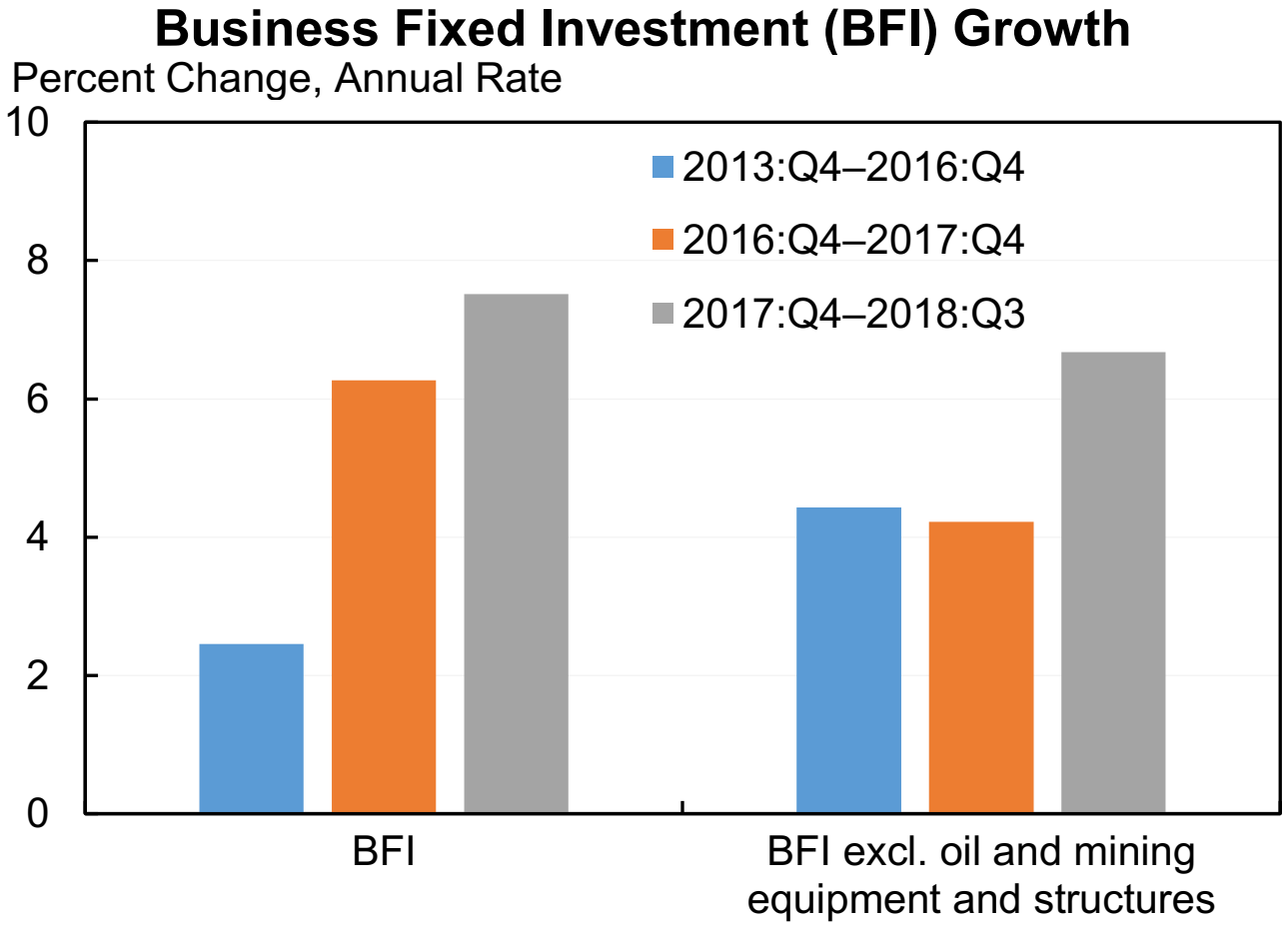


Morgan Stanley Capex Plans Index



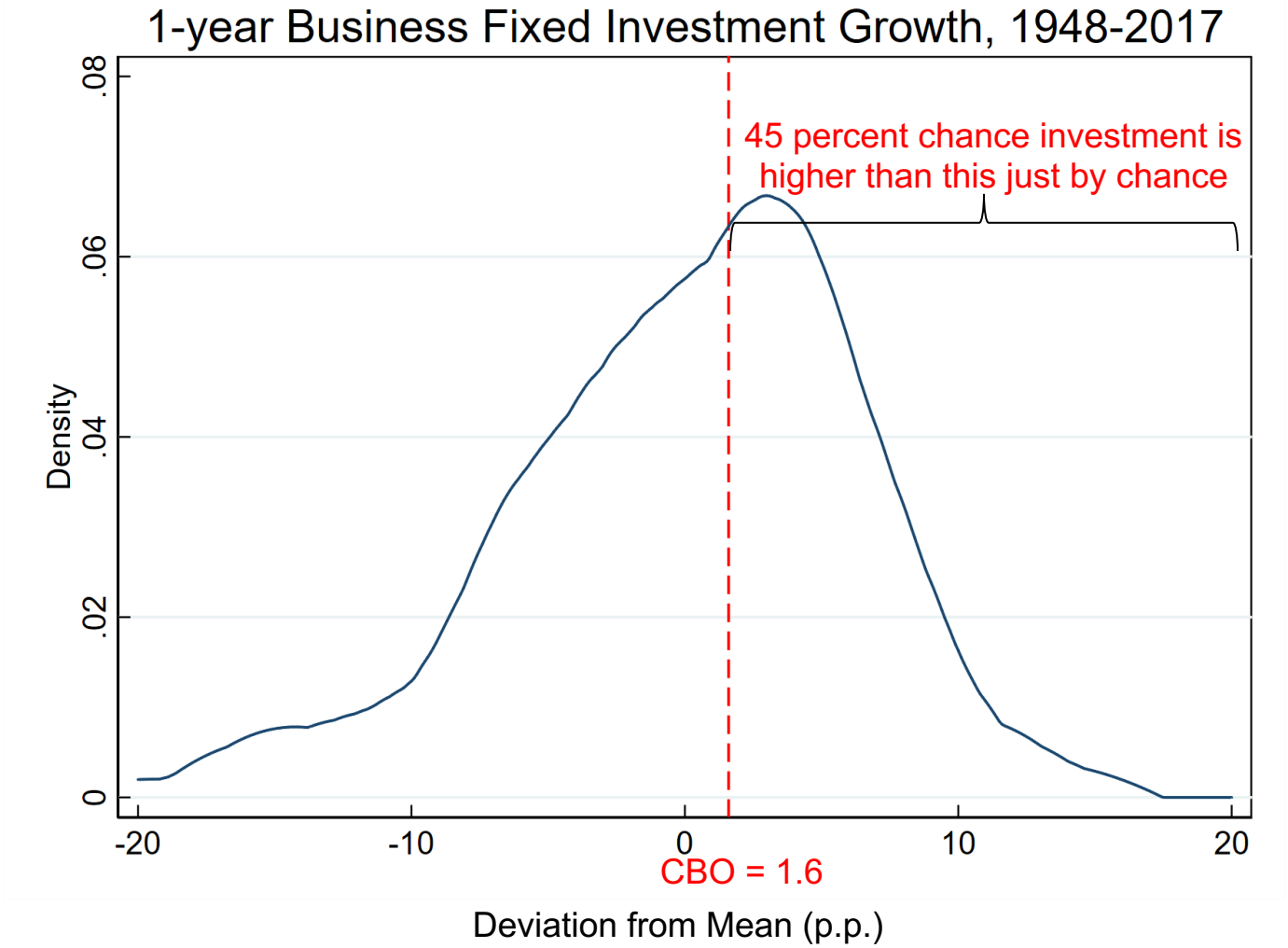
Source: Census Bureau; Institute for Supply Management; Federal Reserve Banks of Kansas City, Dallas, New York, Philadelphia, and Richmond; Morgan Stanley.

Actual investment shows a pickup excluding oil/mining in the first three quarters of 2018



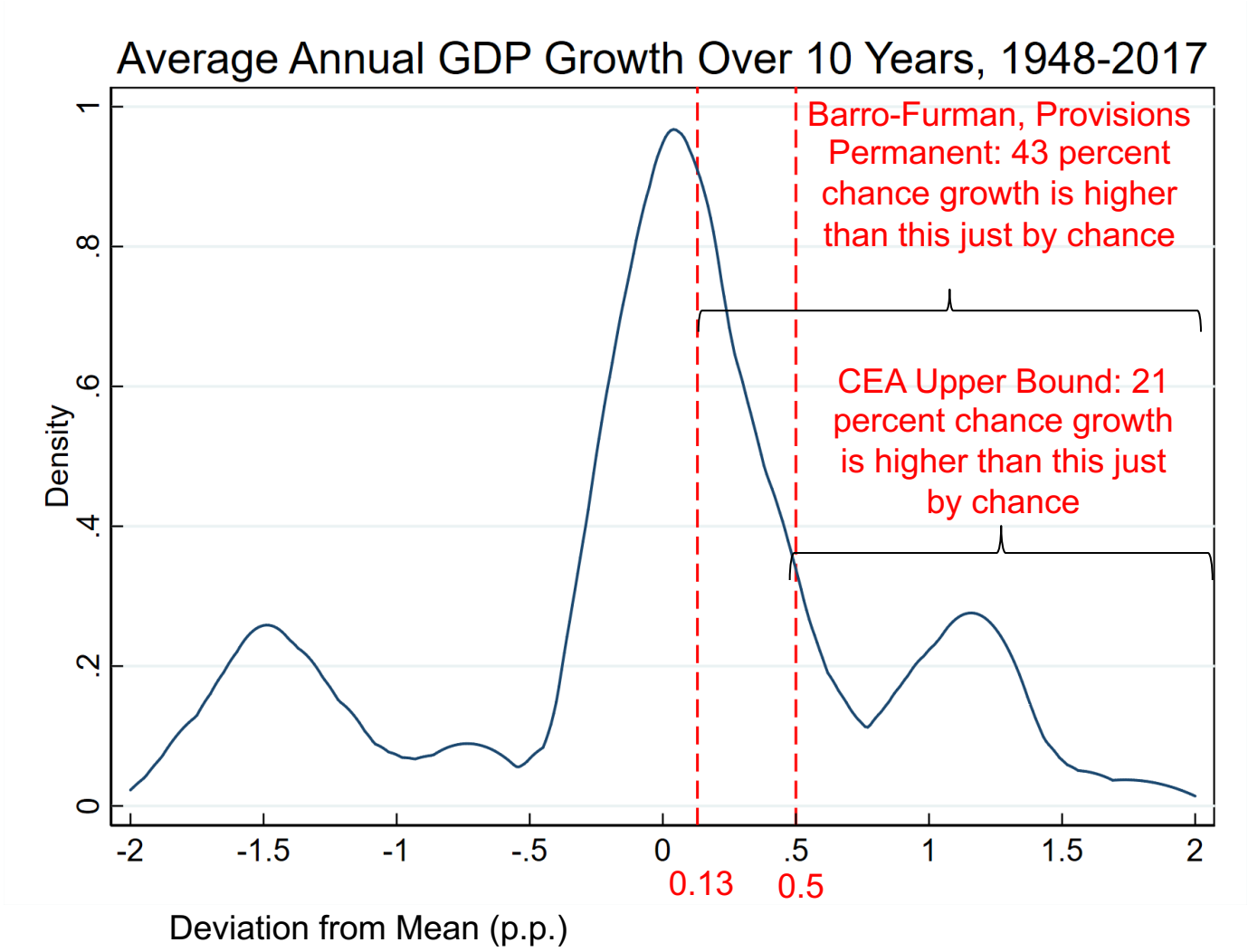
Note: BFI excluding oil and mining equipment and structures calculated using Tornqvist approximation.
Source: U.S. Bureau of Economic Analysis; author's calculations.

Inferring whether the tax cuts worked from one year of spending data is like trying to determine if a coin is really 55-45% from a single toss



Source: U.S. Bureau of Economic Analysis; Congressional Budget Office; Barro and Furman (2018); author's calculations.

The longer-term numbers we really care about are not very different



Source: U.S. Bureau of Economic Analysis; Council of Economic Advisers; Barro and Furman (2018); author's calculations.

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Substantial future tax legislation is inevitable

- **Legislated instability:**
  - Extenders not permanently addressed
  - Backloaded offsets start in 2022
  - Expensing expires after 2022
  - Individual/estate/pass-through end after 2025

- **Economic instability.** Deficits of 5 to 7% of GDP and debt over 100% of GDP make future tax legislation inevitable.

- **Political instability.** Lack of bipartisan buy in.

Tax reform needed now more than ever!!!

- **Revenue.** Will average 17 percent of GDP over the next five years. Bowles-Simpson called for 21 percent of GDP.
- **Progressivity.** The Tax Cuts and Jobs Act will widen the dispersion of after-tax incomes.
- **Efficiency.** Effective marginal tax rates on investment will be *higher* in the future than they were in 2017.
- **Simplicity.** Although for most people less itemizing will increase simplicity, substantial new complexity associated with pass-through provisions.
- **Stability.** Unsustainable fiscal situation colliding with delayed implementation and sunset of major provisions provisions that will cost 0.5 percent of GDP growing to 1.5 percent of GDP.

What the next tax reform should look like

1. **Stability.** Permanent tax law that is fiscally sustainable.

2. **Efficiency.** Improve the base while raising rates. Expensing, end interest deductions, VAT, Carbon Tax, addressing health exclusion.

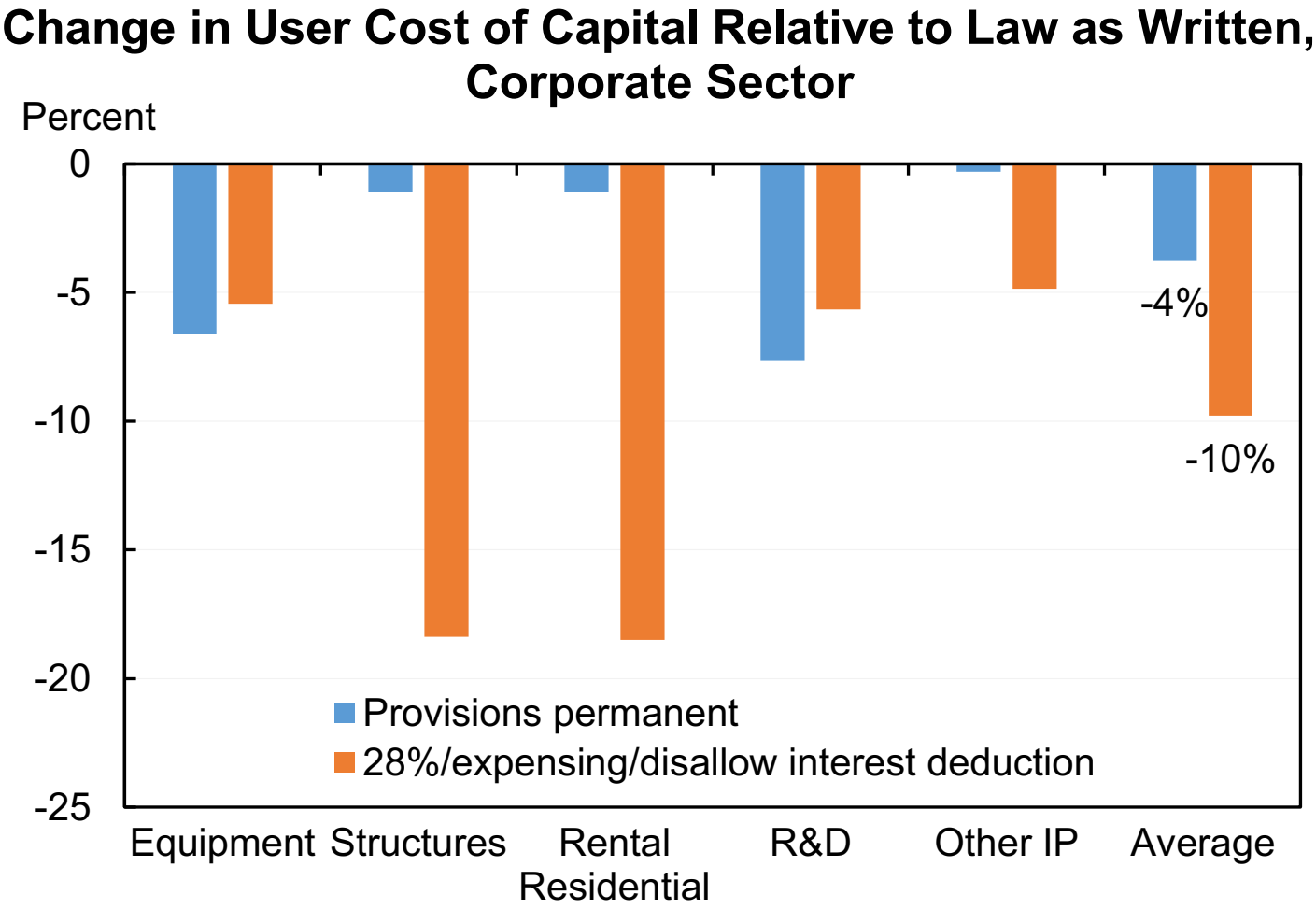
3. **Simplicity.** Return free filing.

4. **Helping working/middle class.** Childless EITC, fully refundable child allowance.

Modelling the corporate component of future reform

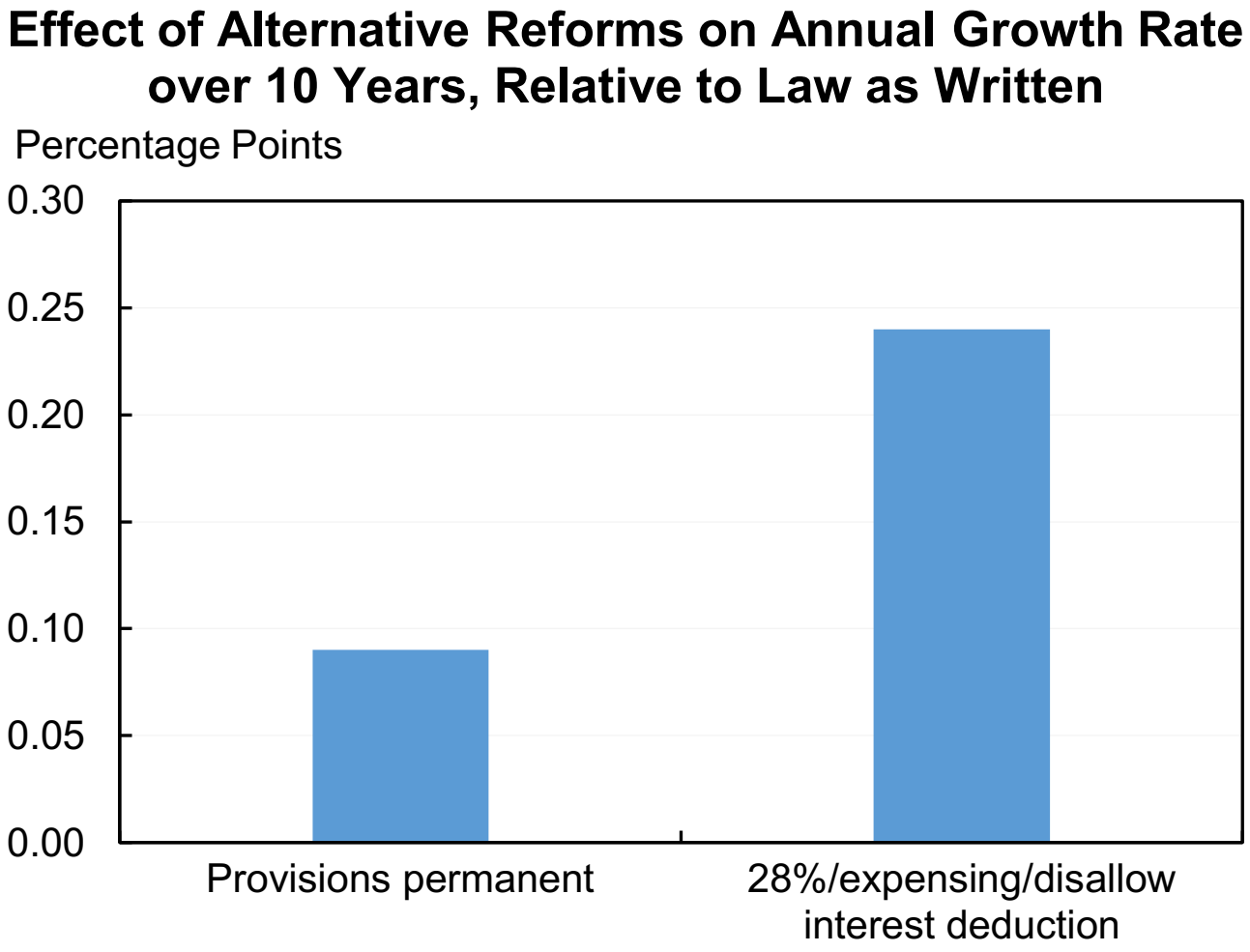
Law As Written ($1.5T conventional cost)	Provisions Permanent ($2.2T conventional cost)	28% Rate, Expensing and Disallow Interest Deductions
21% corporate rate	21% corporate rate	28% corporate rate
Normal depreciation for equipment	Expensing for equipment	Expensing for equipment
5-year amortization for R&D	Expensing for R&D	Expensing for R&D
Normal depreciation for structures etc.	Normal depreciation for structures etc.	Expensing for structures etc.
Interest capped at 30% of EBIT	Interest capped at 30% of EBITA	Disallow interest deductions

Larger user cost reductions under 28 percent rate/expensing than provisions permanent



Source: Calculations based on Barro and Furman (2018).

More growth and revenue from higher rates and full expensing than provisions permanent



Note: Assumes 5 percent convergence rate.
Source: Calculations based on Barro and Furman (2018).

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