

Estimating the Present Value of R&D Tax Benefits in the United States



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Joint Committee on Taxation

This research embodies work undertaken for the staff of the Joint Committee on Taxation to improve macroeconomic modeling, but as members of both parties and both houses of Congress comprise the Joint Committee on Taxation, this work should not be construed to represent the position of any member of the Committee.

How much of the statutory R&D tax benefits do firms actually use?

- ▶ US federal government provides R&D tax incentives through a **deduction** for general R&D expenses and a **nonrefundable credit** for certain R&D activity
- ▶ In 2016, statutory tax value of R&D tax benefits was more than **\$110 billion**—about **4x larger** than direct federal funding for business R&D (NSF/NCSES)
- ▶ But firms cannot always use full value of benefits they generate: **loss status can delay utilization** of deductions and credits, lowering the present value of the tax subsidy

Why should we care?

Statutory tax incentives can be a poor measure of effective R&D tax incentives—
and mismeasurement can distort policy analysis

What do we do?

- ▶ Develop and apply methodology for tracking annual, firm-level cohorts of R&D deductions and credits from **generation** to **usage**
- ▶ Use confidential IRS corporate tax returns for C-corporations over 2012–2016
- ▶ Measure wedge between:
 - ▶ **Statutory R&D tax benefits:** tax value claimed when benefit is generated
 - ▶ **Realized R&D tax benefits:** present discounted tax value actually used

Contribution

First firm-level estimates of intertemporal utilization and realized R&D tax benefits

What do we find?

- ▶ Average firm: **\$0.41** statutory tax benefits per dollar of R&D, but only **\$0.36** realized in present value, which implies about a **12% decrease in R&D tax shield**
- ▶ Realized benefits vary sharply with **loss status, age, and size**
 - ▶ **Young, small firms** in loss status realize an average of **\$0.23** per dollar of R&D in present value, which implies about a **44% decrease in R&D tax shield**

Implication

Tax asymmetries — the unequal treatment of profits and losses — can significantly reduce the R&D tax shield, especially for young and small firms in loss status

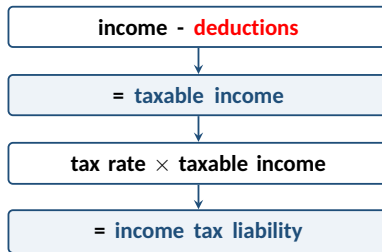
Tax Context

Net operating losses, general business credits, and carryforward rules

Deductions and credits: mechanics without tax asymmetries

§174 R&D deduction

- ▶ Deductions reduce taxable income
- ▶ For **general** expenses incurred to resolve uncertainty about whether or how a product, process, or software can be developed or improved



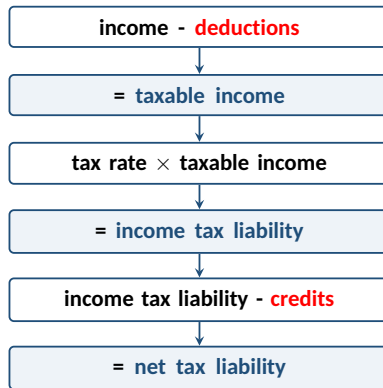
Deductions and credits: mechanics without tax asymmetries

§174 R&D deduction

- ▶ Deductions reduce taxable income
- ▶ For **general** expenses incurred to resolve uncertainty about whether or how a product, process, or software can be developed or improved

§41 R&D credit

- ▶ Credits reduce net tax liability
- ▶ For qualified research expenditures involving a process of **experimentation** for a new or improved business component
- ▶ **Subset of §174 expenditures**; mostly incremental



Net operating losses (NOLs): why *deduction* usage may be delayed

- ▶ **Loss status:** when deductions exceed income; immediate benefit of current-year deductions limited to amount of income
 - ▶ Unused portion of current-year deductions becomes an **NOL carryover**, which may be used to reduce taxable income in other years
 - ▶ Our sample: NOLs could be **carried back 2 years** and **carried forward up to 20 years**
- ▶ **Contemporaneous benefit:** portion of deduction used in current year or carried back

Implication

Loss status can delay deduction utilization and lower the present value of R&D tax benefits

General business credits (GBCs): why *credit* usage may be delayed

- ▶ **Credit-constrained status:** when credits exceed GBC limitation ($\approx 75\%$ of tax before credits); immediate benefit of current-year credits limited to allowable tax offset
 - ▶ Unused portion of current-year credits becomes a **GBC carryover**, which may be used to reduce tax liability in other years
 - ▶ Our sample: GBCs could be **carried back 1 year** and **carried forward up to 20 years**
- ▶ **Contemporaneous benefit:** portion of credit used in current year or carried back

Implication

Credit-constrained status can delay credit utilization — which can be slower than deduction utilization — and lower the present value of R&D tax benefits

First-in First-Out (FIFO): carryforwards must be used in the order they were generated

- ▶ Current deductions or credits not used contemporaneously become **new-vintage** carryforwards
- ▶ However, **old-vintage** carryforwards from previous years must be exhausted first

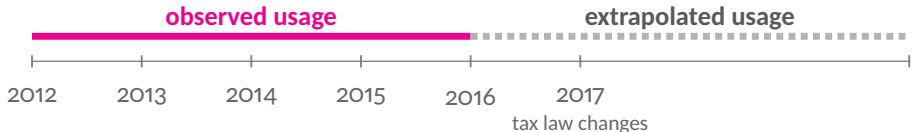
Key Point

Old-vintage carryforward stocks can delay new tax benefits and lower their present value

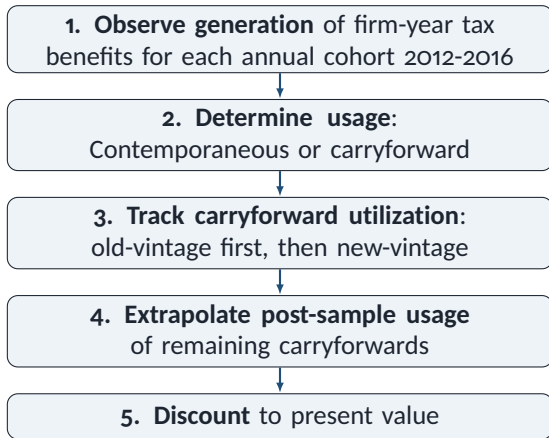
Data and Methods

Data: Confidential Statistics of Income (SOI) corporate tax returns

- ▶ Construct a **balanced panel** of C-corporations from 2012-2016
- ▶ In a typical panel year:
 - ▶ **22k+ firms**, representing roughly **650k weighted filers**
 - ▶ **2.8k+ “R&D firms,”** representing roughly **5.3k weighted filers**
 - ▶ Panel accounts for roughly **70-72%** of R&D credit-eligible corporate expenditures
- ▶ Realized tax shields combine in-panel observed usage with post-panel extrapolation



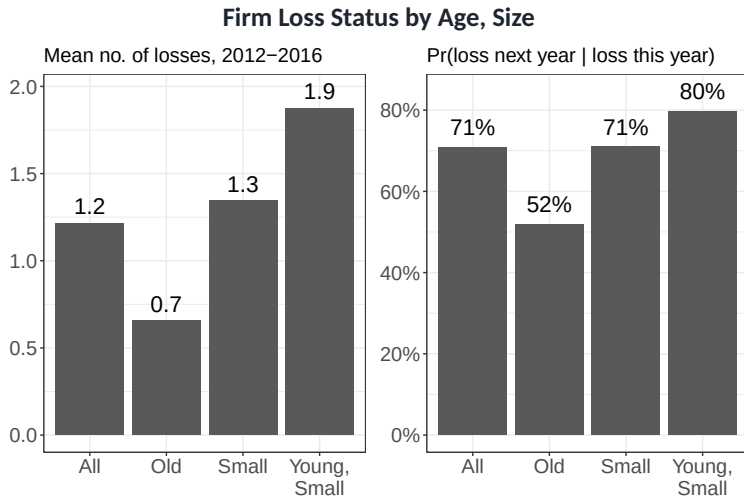
Method: track utilization of each annual cohort's R&D tax benefits



Results

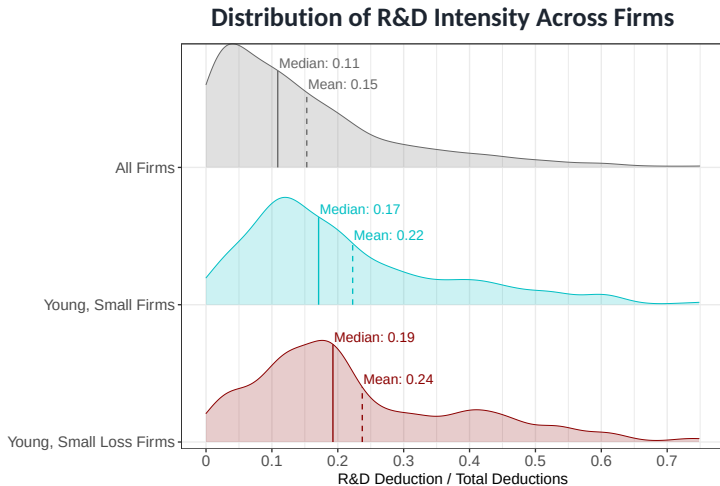
Firm characteristics, utilization paths, and R&D tax shields

Firm Characteristics: losses for young, small firms are more frequent and persistent



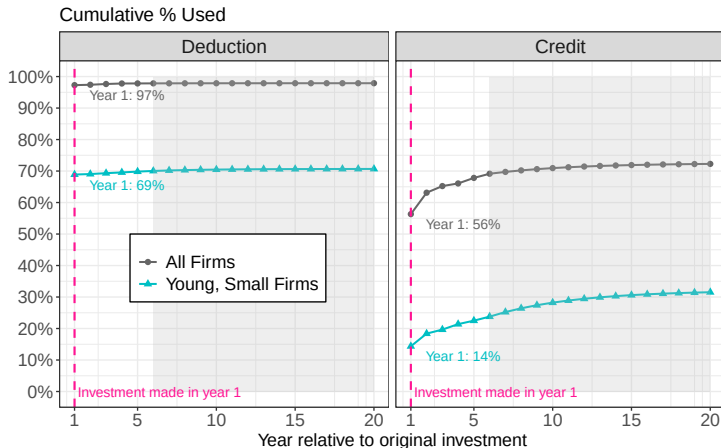
Note: Small firms have < 2012 median assets ($\approx$ \$20m); young firms < 2012 median age (19 years).

Firm Characteristics: young, small firms are more R&D intensive



Timing of realized R&D tax benefits: credit usage is relatively limited

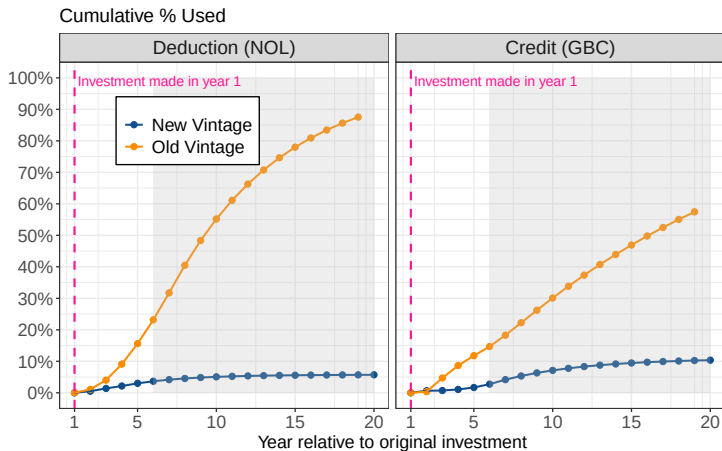
Deduction and Credit Utilization Paths



Note: Values weighted using dollars and sample weights. Gray years fully extrapolated.

Carryforward usage: overhang for young, small firms

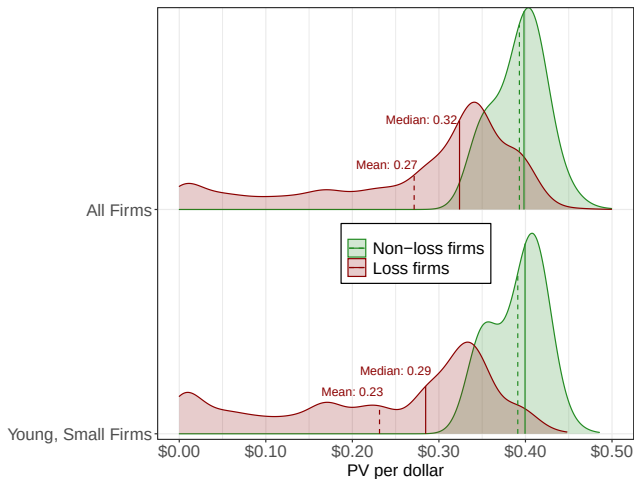
Young, Small firms: Carryforward Utilization Paths



Note: sample restricted to firms with positive NOL and GBC carryforwards after year 1.

Present-value R&D tax shield: loss status sharply reduces realized benefits

Distribution of Realized Per-dollar R&D Tax Benefits



Applications

Investment Incentives, Revenue Estimation

Net Acquisition Price Wedge: Mapping measured tax benefits to incentives

Question now: implications for *investment incentives*?

- ▶ Framework: **cost of capital** (Hall and Jorgenson, 1967)
- ▶ Relevant object: **net acquisition price**, intuitively:

$$P_{i,t} = 1 - \text{Per-dollar PV Tax Shield}_{i,t}$$

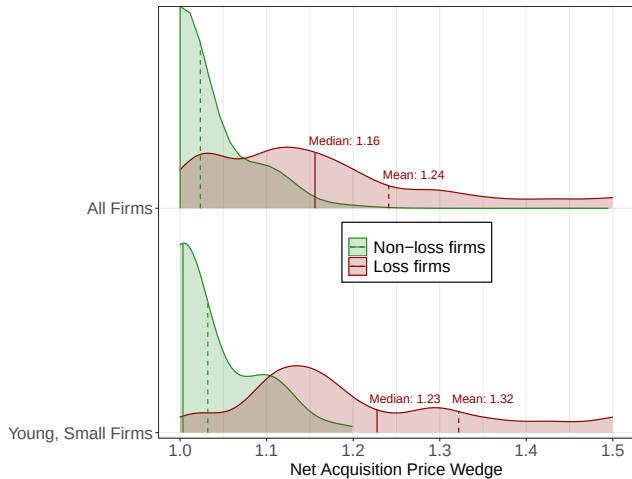
- ▶ We measure *wedge*:

$$\mathcal{W}_{i,t} = \frac{P_{i,t}^{\text{Realized}}}{P_{i,t}^{\text{Statutory}}}$$

Interpretation

Larger wedge → larger discrepancy between **realized** and **statutory** incentives

Net Acquisition Price Wedge: Delayed use increases price for loss firms



Revenue Implications: Refundability Example

R&D credit usage and carryforward pattern (percent)

Year	1	2	3	4	5	6	7	8	9	10
Cumulative usage	56.7	61.4	64.8	66.7	68.3	69.9	70.9	71.4	71.8	72.2
Usage flow	56.7	4.7	3.4	1.9	1.6	1.6	1.0	0.5	0.4	0.3

Revenue cost for a year-1 \$12 billion R&D credit cohort (millions)

Year	1	2	3	4	5	6	7	8	9	10
Without refundability	6,807	564	406	224	198	192	117	60	50	41
With refundability	12,000	-	-	-	-	-	-	-	-	-
Difference	-5,193	564	406	224	198	192	117	60	50	41
Ten-year total										-3,341

- ▶ Refundability: large upfront cost, later offsets as usage accelerated
- ▶ Net cost: credit now *fully* used in window

Main Takeaway

Timing of *usage* has major revenue consequences

Note: This exercise is purely illustrative and is **not** an official JCT revenue estimate.

Conclusion: statutory and realized R&D tax benefits are not the same

1. **Statutory** R&D tax benefits overstate subsidy actually realized by many firms
 - ▶ Realized R&D tax shield **12% lower** on average
2. Largest realization wedges arise for **young, small firms**, especially in **loss status**
 - ▶ Realized R&D tax shield **44% lower**
3. Policy analysis must account for *usage* — not just generation

Appendix: §280C coordination of the deduction and credit

- ▶ The same credit-eligible R&D expenses may also generate a §174 deduction
- ▶ §280C prevents claiming the full value of both benefits on the same expenses
- ▶ A corporation claiming the research credit has two treatments:

1. Default treatment: reduced deduction

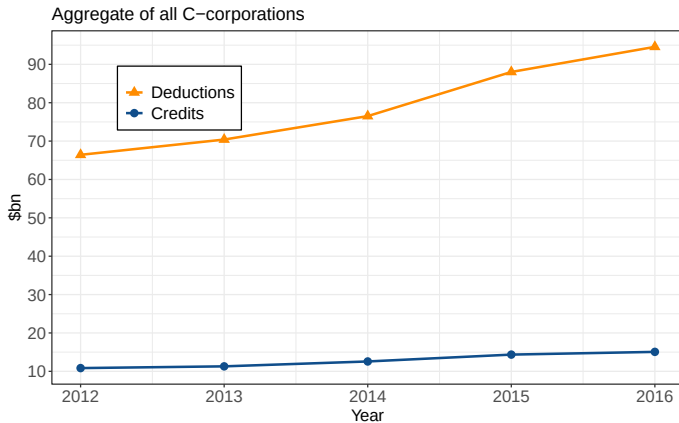
allowable R&D deduction = otherwise allowable R&D deduction – research credit

2. Reduced-credit election: full deduction, reduced credit

$$\text{reduced research credit} = (1 - \tau^{\max}) \times \text{research credit}$$

Why this matters: §280C determines how observed Form 6765 R&D spending is attributed to the deduction side versus the credit side before tracking utilization.

Appendix: tax value of R&D credits and deductions generated



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Note: deduction value is total deductions generated multiplied by 35% tax rate.

Appendix: sample selection

	Age	Assets	Receipts	Loss Share	R&D Exp.	R&D Intensity	Firms
	<i>Sample-weighted mean</i>						<i>Total</i>
	Years	\$, millions		%	\$, millions	%	by weight
Panel C-corps	24.6	4,786	1,359	35	23	15	5,680
C-corps excluded	15.0	507	204	56	5	21	8,489
All SOI C-corps	18.9	2,222	667	47	13	18	14,169
S-corps	23.5	30	42	18	1	17	11,119
All SOI Corps	20.9	1,258	392	34	8	18	25,288

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