

Who Captures the Value of Public Innovation?

Dugoua, Gerarden, Myers and Pless

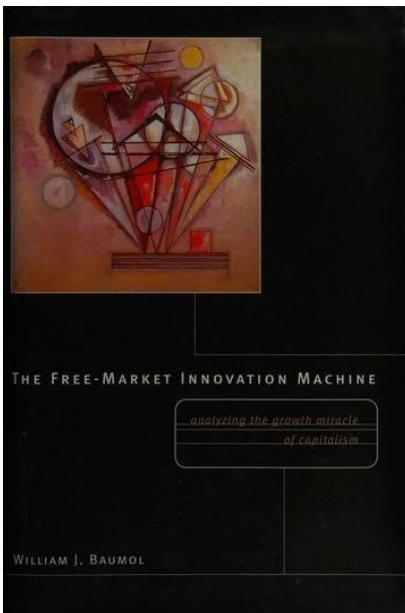
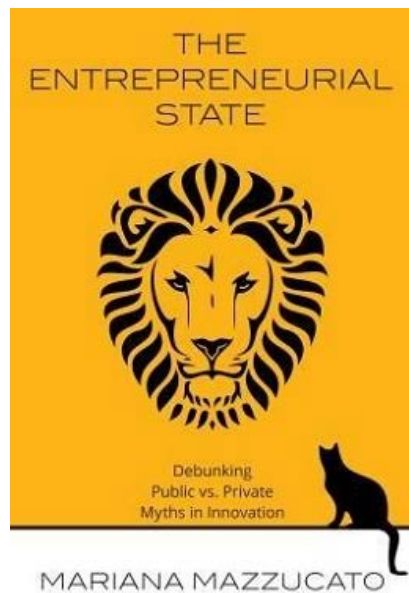
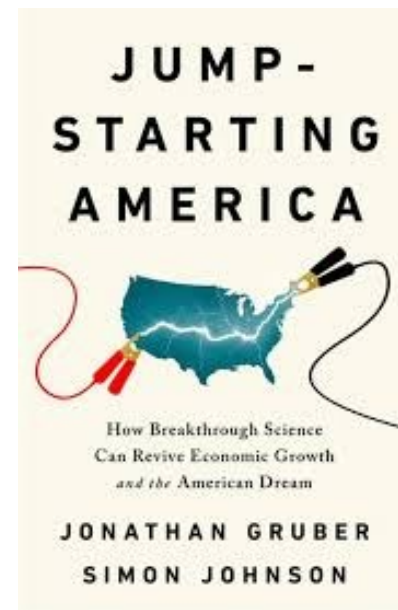
The Private Value of Innovation for the Government

Arora, Belenzo, Cioaca, and Ferracuti

Discussion: Scott Stern, MIT & NBER

NBER Rate of Return to R&D

October 2026



Who Captures the Value of Public Innovation?

Eugenia Dugoua
Todd Gerarden
Kyle Myers
Jacquelyn Pless

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Who benefits from Federal R&D investment (at DOE)?

How does the surplus generated through R&D investment flow to labor, capital, profits, R&D, and consumers?

Key Steps

- Data
 - DOE R&D Expenditure Stock Calculated across 14 Technology Areas
 - Allowing for “Long and Variable Lags”
 - Gap Between Requested and Realized Appropriations Form IV
 - Firm-Specific Stock of DOE R&D “Exposure” for publicly traded Compustat firms, 1989-2016
- Estimation
 - OLS (and IV) regression of sensitivity of firm value-added, input, and mark-up measures on DOE R&D Exposure Metric
- Decompose Value-Added Elements into Fractions by Labor, Capital, Profits, and R&D
- Calibrate incidence of surplus to firms (profits), labor, consumers, and other factors

Higher Firm-Level Exposure → Higher Levels of Firm-Level Activity

TABLE 4. Elasticities with respect to public innovation

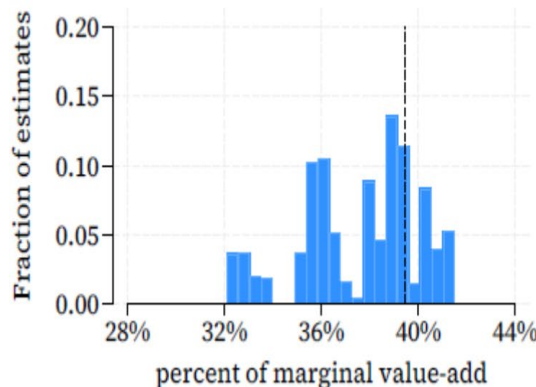
	$p \times q$ (1)	c_l (2)	c_k (3)	c_{rd} (4)	c_m (5)	μ (6)
<i>Panel A: OLS</i>						
Coefficient (β)	0.301	0.295	0.420	0.197	0.304	-0.042
Clustered SE	(0.095)	(0.088)	(0.105)	(0.101)	(0.097)	(0.011)
<i>p</i> -value	0.002	<0.001	<0.001	0.051	0.002	<0.001

$$\log(y_{it}) = \alpha_y + \beta_y \times \log\left(\sum_j \chi_{ijt} \times B_{jt}\right) + \Gamma_y \times z_{it} + u_{yit}$$

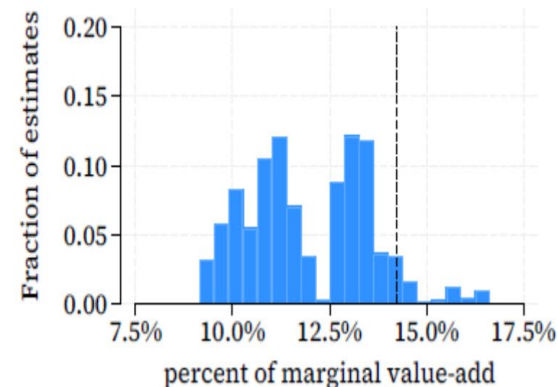
The Allocation of Value-Added

- Conditional on the estimates, a value-added accounting exercise
- Labor accrues 38% of value-added share (consistent with its overall factor share), while capital gets 29%, profits 21% and R&D 12%

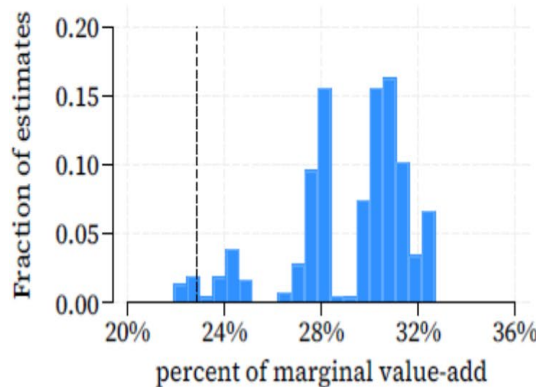
A. Labor



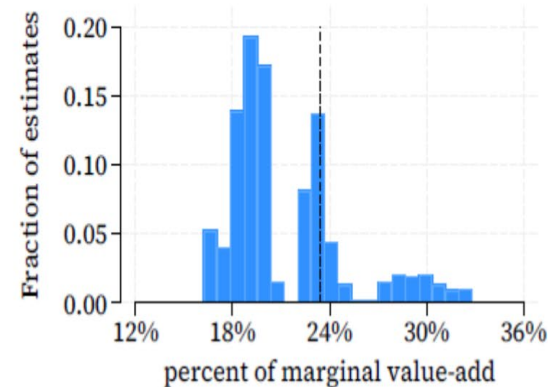
B. R&D



C. Capital



D. Profits



From Value-Added Shares to Marginal Surplus

- An extra dollar of expenditures on workers or suppliers is not an extra dollar of surplus since some presumably reflects increased supply.
 - Isoelastic supply assumption allows for calculation of marginal surplus to labor, capital, and profits

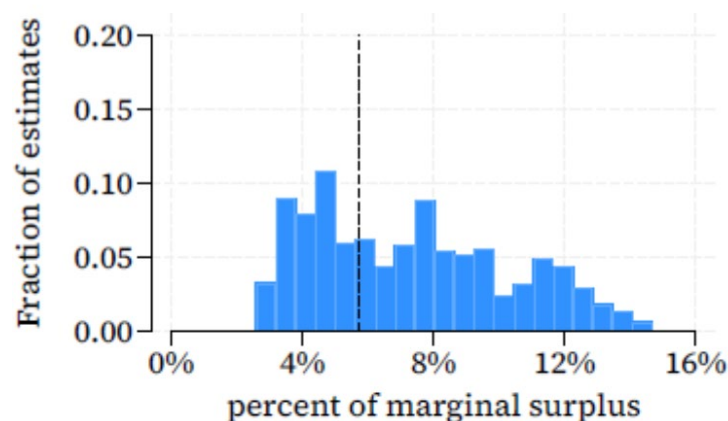
$$\begin{aligned}\mathcal{M}_{x,it}^{\text{TS}} &\equiv \frac{d\text{PS}_{x,it} / d\log(B_{it})}{d\text{TS}_{it} / d\log(B_{it})} \\ &= \frac{c_{x,it} \times \beta_{c_x} / (1 + \varepsilon_x)}{d\text{TS}_{it} / d\log(B_{it})}\end{aligned}$$

- Isoelastic demand assumption allows inferring consumer surplus from mark-ups and revenue (De Loecker, et al, 2025)

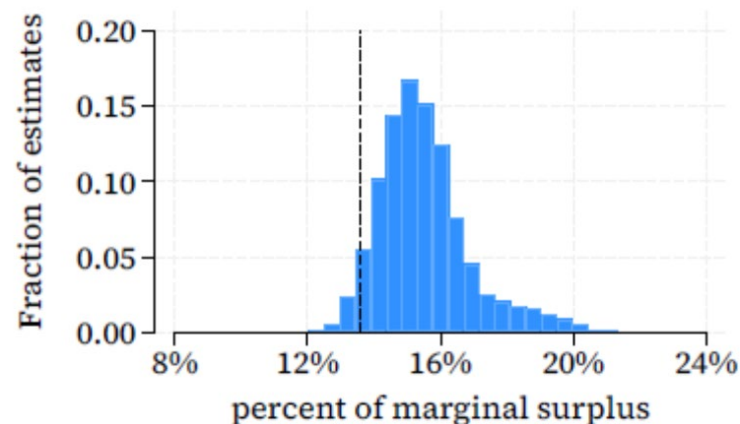
$$\begin{aligned}\mathcal{M}_{CSit}^{\text{TS}} &\equiv \frac{d\text{CS}_{it} / d\log(B_{it})}{d\text{TS}_{it} / d\log(B_{it})} \\ &= \frac{d[\text{Revenue}_{it} \times (\mu_{it} - 1)] / d\log(B_{it})}{d\text{TS}_{it} / d\log(B_{it})}\end{aligned}$$

Surplus incidence: Buyers receive most of the calibrated marginal surplus

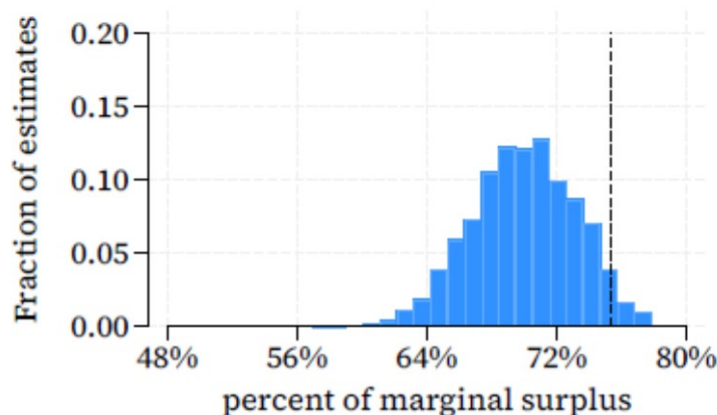
A. Labor



D. Profits



E. Consumers



Consumers 70% • Profits 16% • Labor 7.3%

Comments

- Key Contributions
 - A Novel “Road Map” for Tracing out the Impact of Federal R&D Expenditures on Firms, Factor Inputs, and Consumers
 - Even without the surplus calculation, documenting the empirical sensitivity of DOE R&D exposure on value-added and firm growth
- Some Thoughts
 - IV estimation is helpful (and upward revision to estimates provide evidence against most obvious form of endogeneity)....but OLS (or even better, specific investments) allows for more direct “mapping” of budget events onto subsequent firm and market outcomes
 - Method is “general” -- Would it be possible to extend approach to full Federal R&D budget?
- ***What would it take to merit a semi-decadal CBO “R&D Spillovers Scorecard”?***

The Space Race Example



NASA's space race: more output, capital, and employment

Kantor and Whalley (2025) — baseline manufacturing estimates

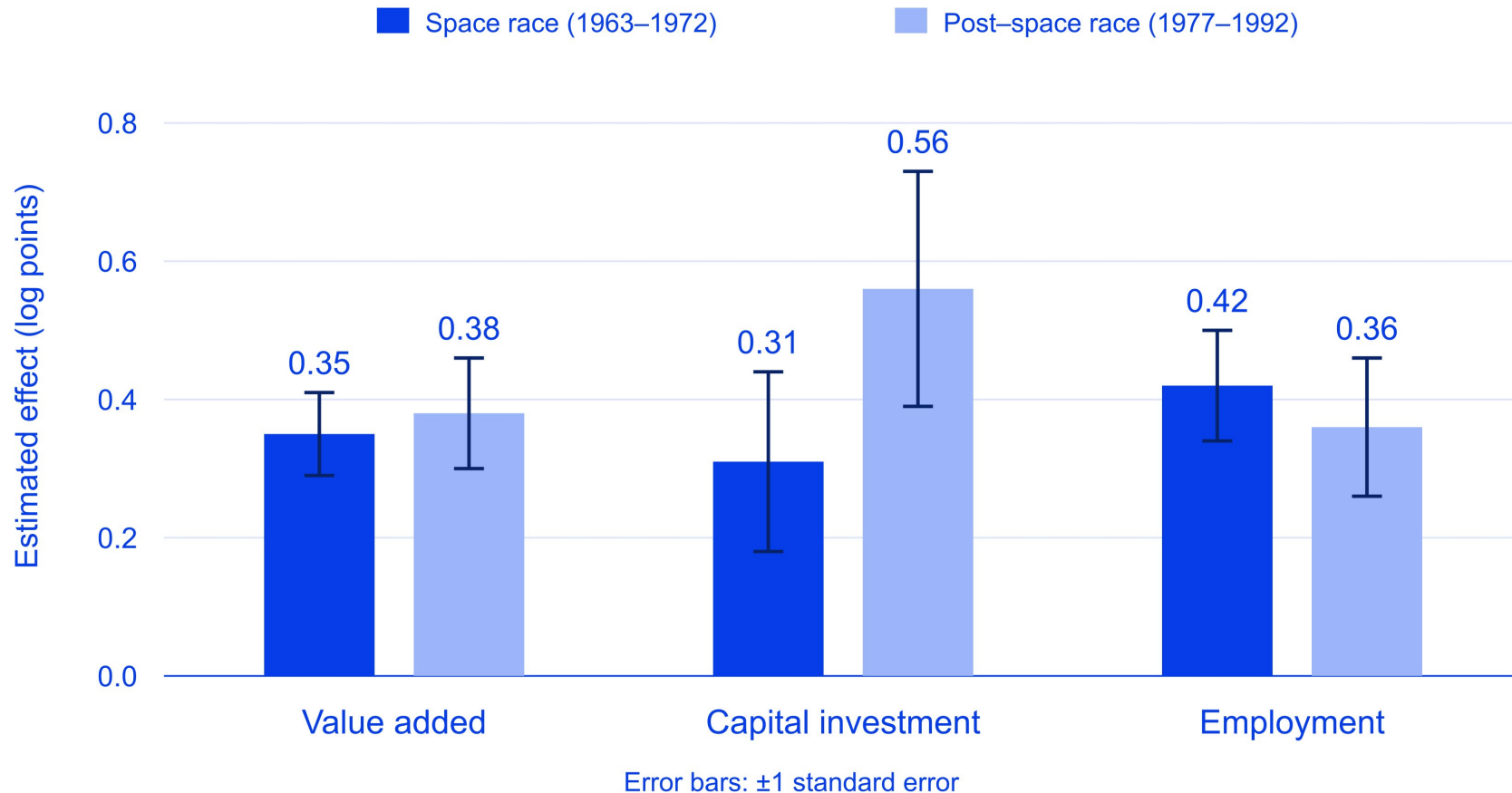


Table 3, cols. (1), (5), (3): high space capability $\times$ space industry $\times$ period.

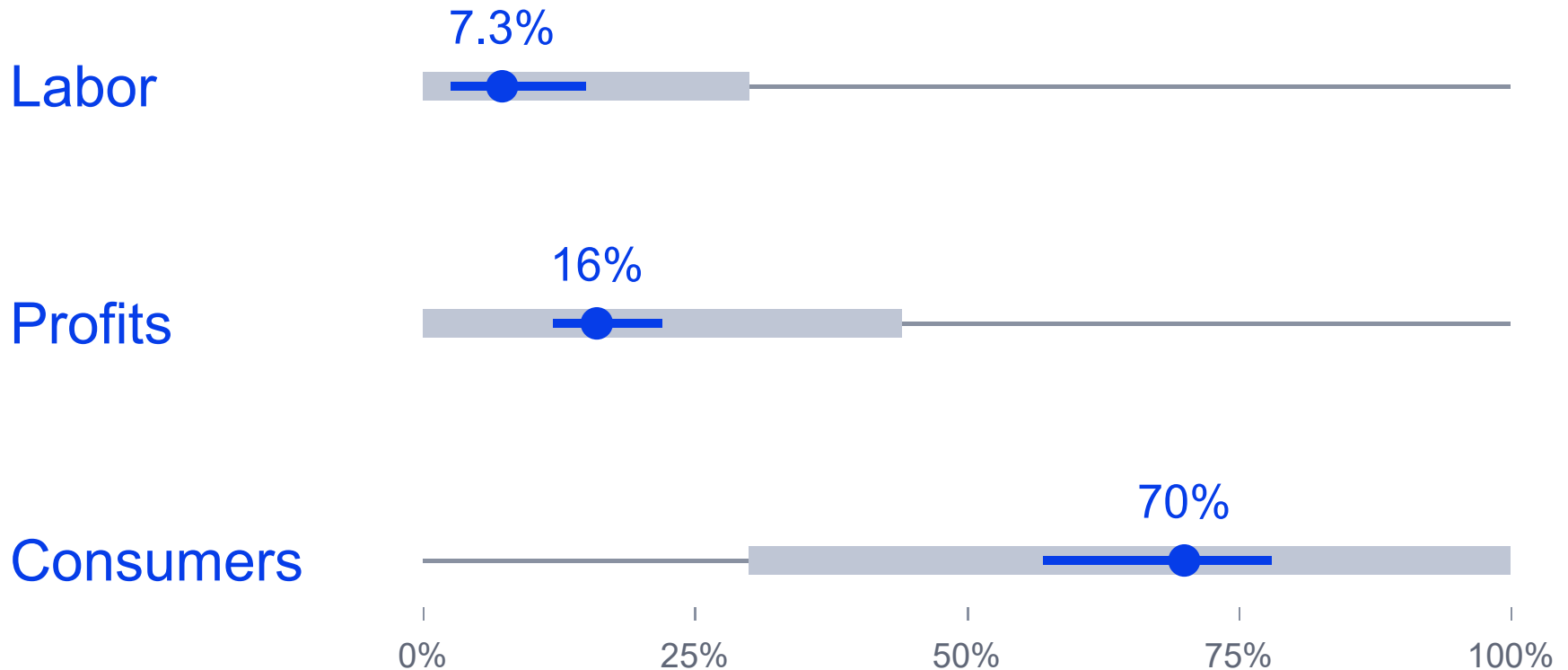
Effects on levels, not annual growth rates. Employment counts workers; it does not measure labor expenditures.

My Slider Score

Shares of marginal total surplus

—●— Paper's estimates

■ My wider uncertainty



Blue ranges: specification sensitivity (approx.). Gray bands: illustrative uncertainty.

The Private Value of Innovation for the Government

Ashish Arora
Sharon Belenzon
Larisa Cioaca
Elia Ferracuti

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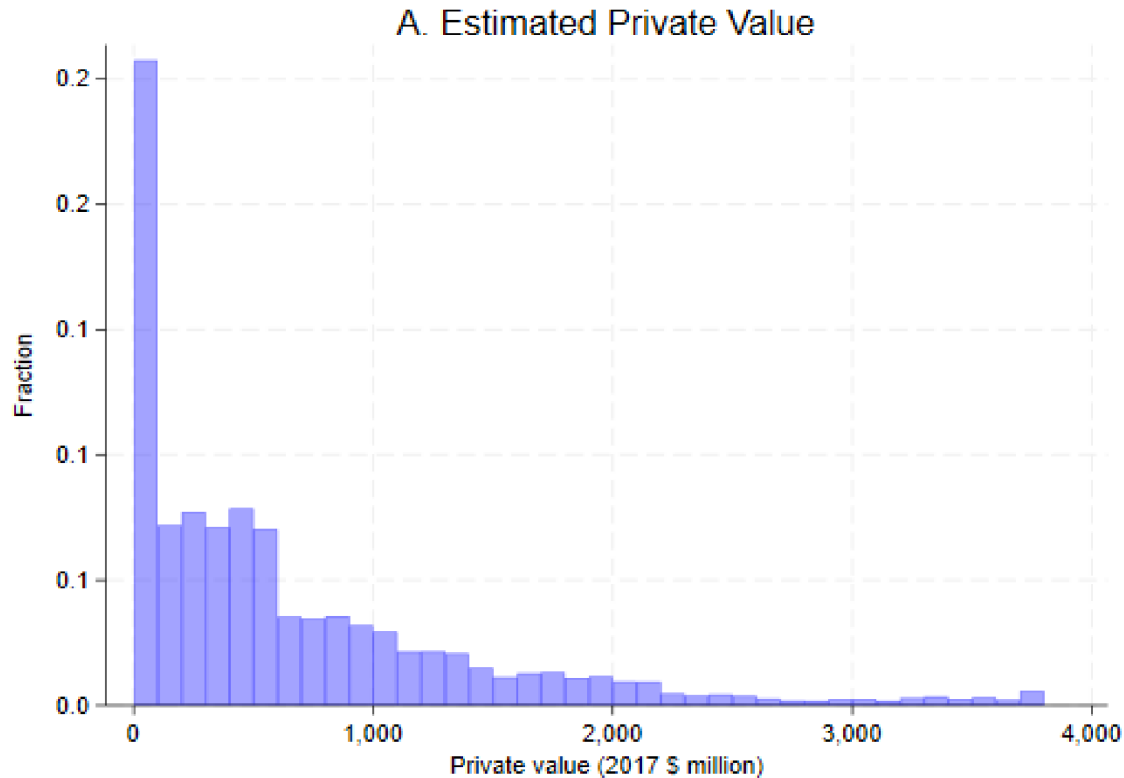
What is the private value (for public firms) of winning a Federal R&D contract?

How does the potential for follow-on procurement impact the inferred value of the “first-stage” R&D contract?

Key Steps

- Taking advantage of ~20K R&D contract announcements to 263 publicly traded firms, use (modified) KPSS “excess returns” approach to estimate the private stock market response to R&D contract announcements
 - *Average stock market return reflects more than 20X the size of the R&D contract itself*
- Motivated by simple model of R&D and procurement, examine how stock market reaction varies with:
 - Future production obligations by granting agency & others
 - Non-competitive production contract guarantee versus not
 - Firms with Production Capacity (Vertical integration) or not
 - By Agency, etc....

Distribution of Private Value from R&D Awards



$$\xi_{fd} = M_{fd} E[v_{fd} | R_{fd}]$$

$$E[v_{fd} | R_{fd}] = \delta_{ft} R_{fd} + \sqrt{\delta_{ft}} \sigma_{\epsilon ft} \frac{\phi\left(-\sqrt{\delta_{ft}} \frac{R_{fd}}{\sigma_{\epsilon ft}}\right)}{1 - \Phi\left(-\sqrt{\delta_{ft}} \frac{R_{fd}}{\sigma_{\epsilon ft}}\right)}$$

Private Value Increases in Agency-Specific Future Production Obligations

Private Value and Future Production

Dependent variable: $\ln(\$1 + \text{Private value})$

	(1) Baseline	(4) Firm fixed effects
$\ln(\$1 + \text{Future production obligations, same agencies, 5 years})$	0.013 (0.004)	0.006 (0.002)
$\ln(\$1 + \text{Future production obligations, other agencies, 5 years})$	0.001 (0.004)	0.000 (0.003)
$\ln(\$1 + \text{Options value of focal contract})$		0.000 (0.000)
$\ln(\$1 + \text{Obligated value of focal contract})$		-0.002 (0.002)
$\ln(\$1 + \text{Market value})$	1.055 (0.010)	0.908 (0.018)
Industry FE	Yes	No
Firm FE	No	Yes
Year FE	Yes	Yes
Mean DV	674.58	675.87
Firms	263	195
Observations	19,417	19,374
Adjusted R-squared	0.969	0.985

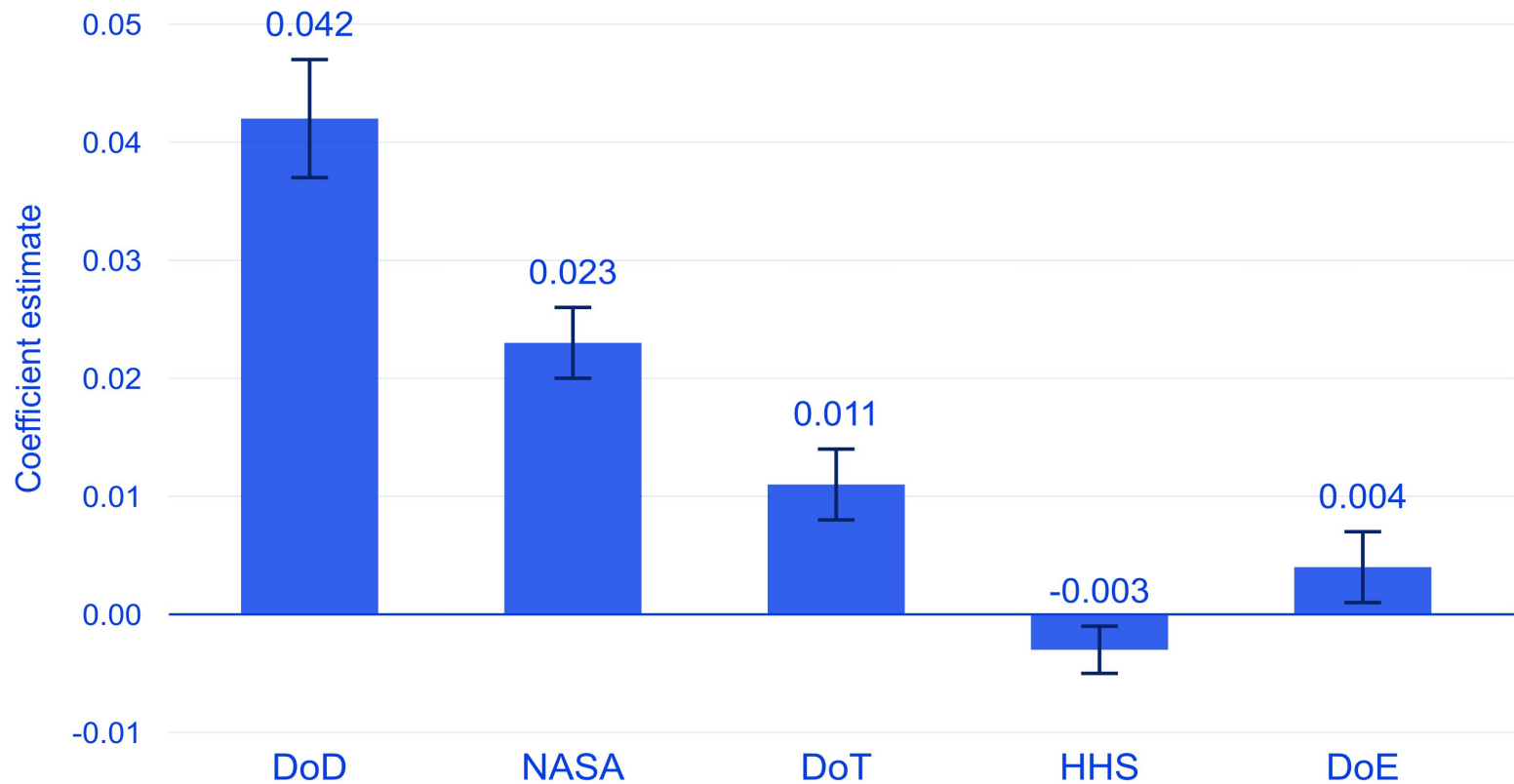
OLS estimates. Standard errors in parentheses, clustered by year.

- Particularly for Agencies whose Obligations with Non-Competitive Procurement
- For Firms Vertically Integrated with Production Capacity

Effect is Particularly Large for DOD & NASA Contracts

Private Value and Future Production, by Agency

Dependent variable: $\ln(\$1 + \text{Private value})$



Error bars: ± 1 standard error • Table OA9, columns (1)–(5)

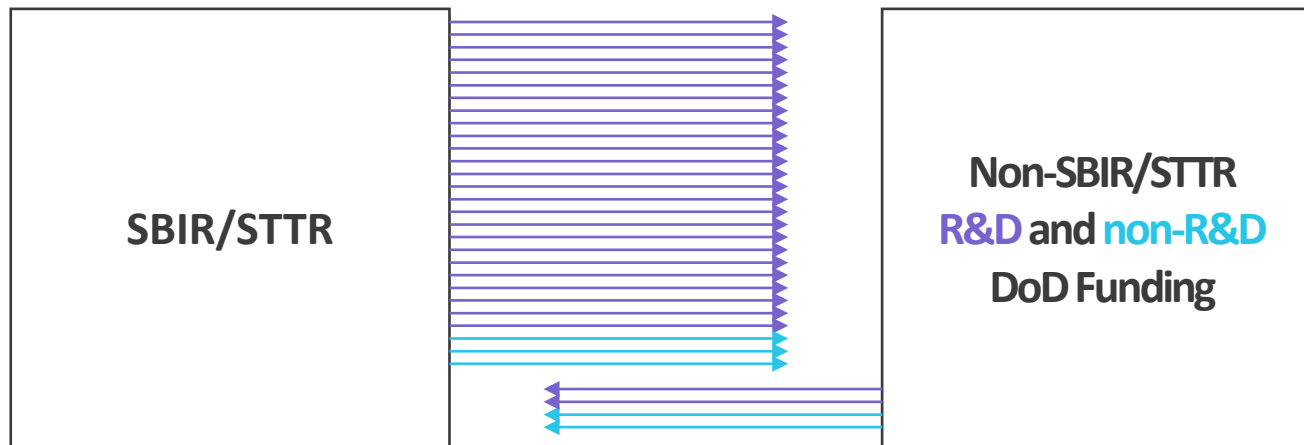
Comments

- Key Contributions
 - Documenting Significant Private Capital Market Response to R&D Grant Awards
 - Linking the Size of these Effects to Variation in Economic, Strategic and Institutional Environment
- Some Thoughts
 - Perhaps better to *Contrast* Procurement-Oriented Agencies (DoD, NASA) and Non-Procurement-Oriented Agencies (NSF, HHS, DOE)
 - Potential to Contrast Concrete Variation Over Time in Institutional or Strategic Environment
 - SAM (and other DoD data) might enable more direct measures of follow-on procurement
- *What would it take to merit a DOD R&D Contract and Procurement Tool Dashboard?*



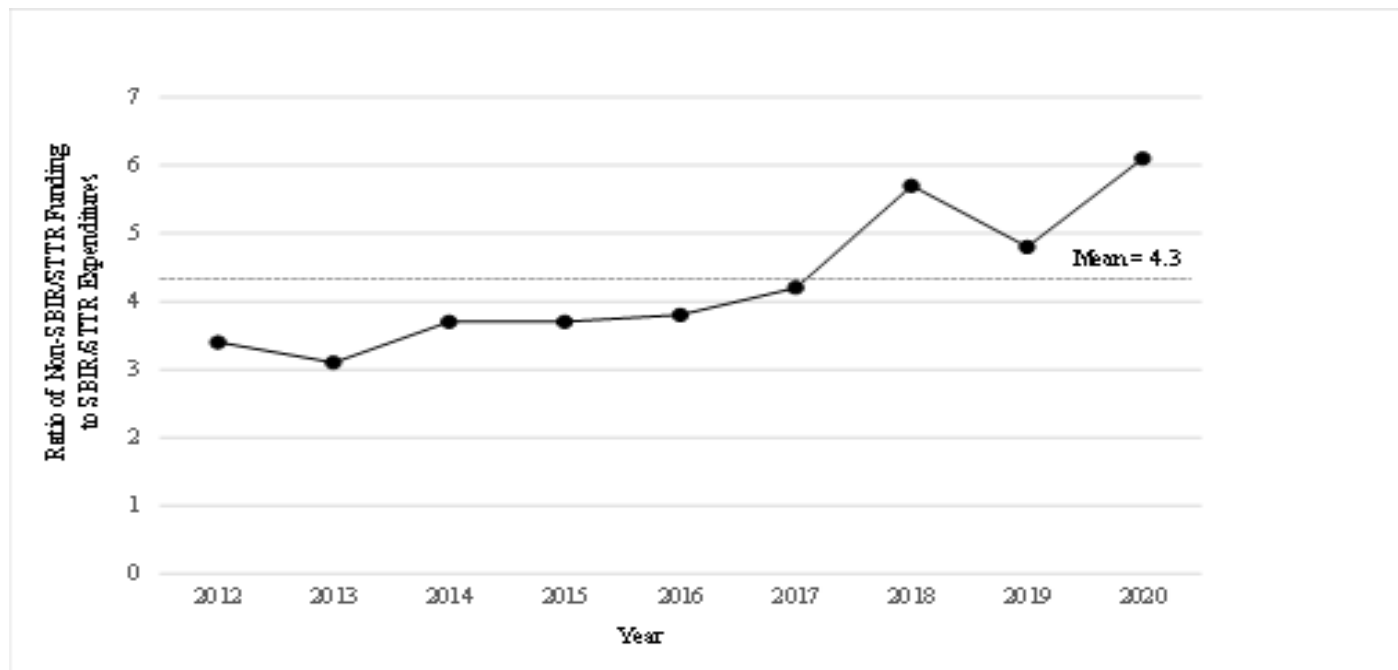
SBIR/STTR is a critical doorway to DOD R&D funding

Among small firms that receive DOD RDT&E funding, **90% get first funding from SBIR/STTR**
Firms come to SBIR/STTR first to access DOD



Each arrow represents 100 firms that transacted with both SBIR/STTR and USASpending, 2012–2020.

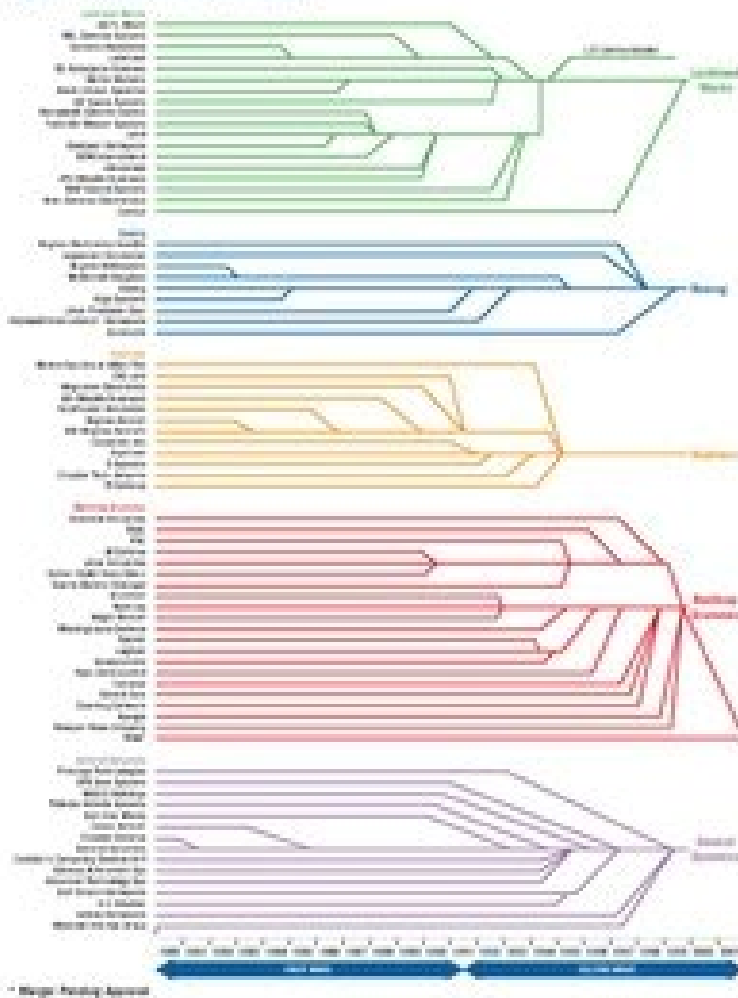
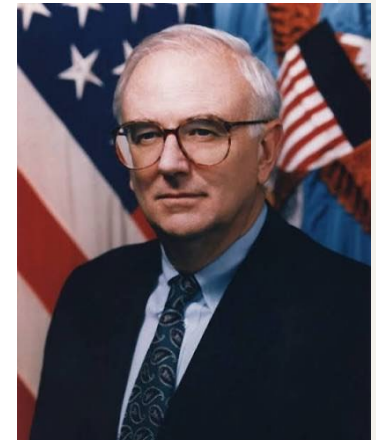
DOD SBIR/STTR firms receive about \$4 in non-SBIR/STTR funding for every DOD SBIR/STTR \$, and this ratio increased over the 2010s



The 1993 DOD “Last Supper”

Defense Commissions

Figure 7-4. 30-Year of Industry Consolidation



My Slider Score

I buy the results. How much precision do I buy?

— Reported uncertainty

■ My uncertainty: $2\frac{1}{2} \times$ reported SE

Both ranges: estimate ± 2 SE; wider range reflects my judgment.

Future production

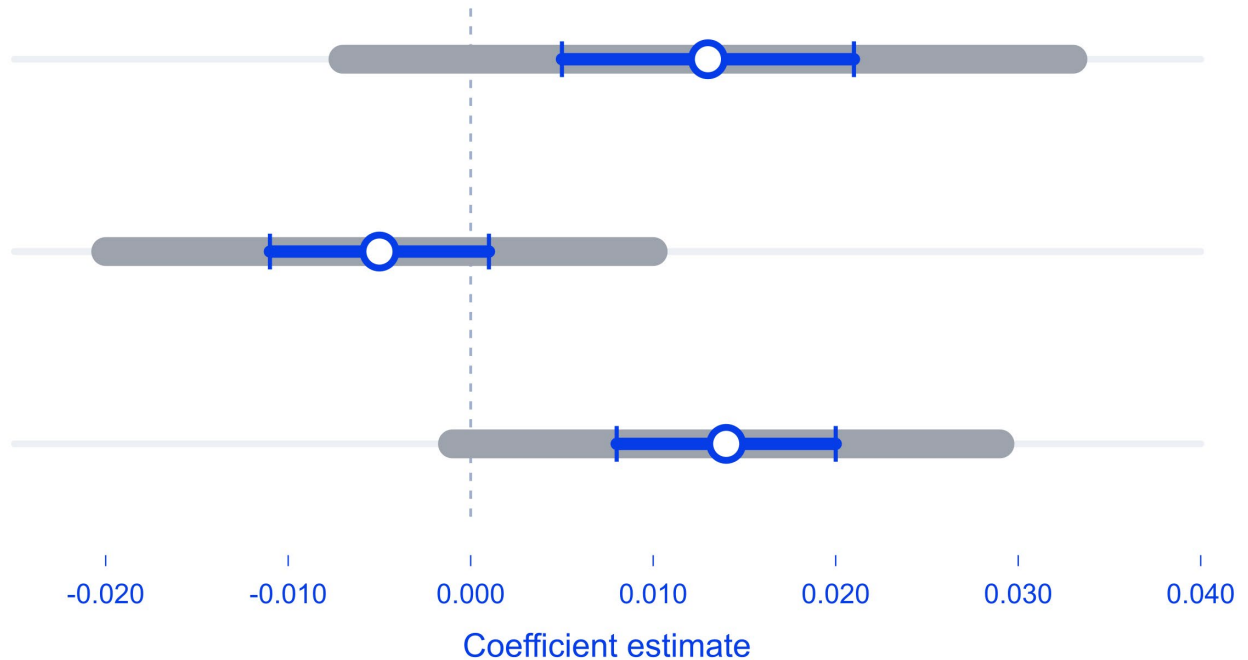
0.013 (reported SE 0.004)

Competitive production

-0.005 (reported SE 0.003)

Noncompetitive production

0.014 (reported SE 0.003)



★ DoD and NASA: I'm much more persuaded.

Baseline estimates: Table 3, col. (1); Table 4, col. (1). ★ Discussant judgment on agency results.

Putting It Together...

- While still involving noise and requiring important assumptions, potential for integrated analytical tool for assessing both
 - the impact of Federal R&D Expenditures on private sector and market outcomes
 - The Impact of Federal R&D Contracts on Private Value
 - And How this Varies by Procurement Rules
- Both of these measures are inputs into establishing the overall returns to R&D
 - While still subject to the “missing intercept” problem, tracing out the flow of impact of Federal R&D expenditures on private firms (and markets) is key microeconomic evidence for the conditions shaping overall high rate of return
 - Linkage between R&D and follow-on procurement is particularly important driver of growth in sectors and technologies where government is not only R&D funder but largest (and in many cases only) buyer!

Thanks!

