Venture Capital Response to Government-Funded Basic Science

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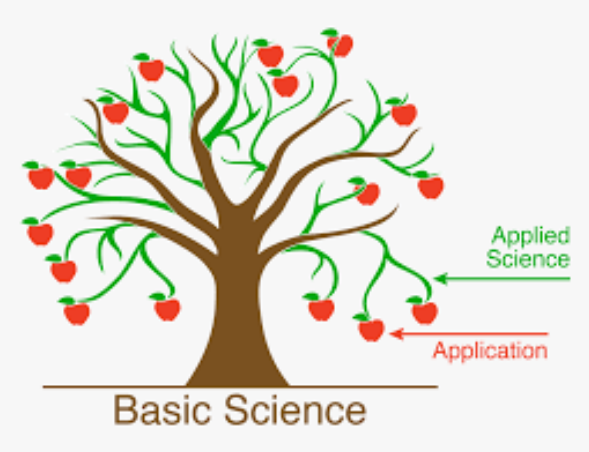
Motivation

- Technical innovation necessitates investment in the underlying basic science
- Basic science mostly funded by public funding
  - Long timelines
  - No straightforward application
  - Externality



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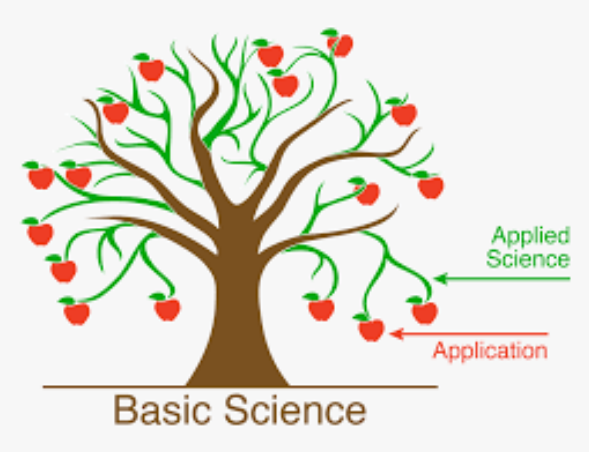

Research Question

- Whether public funding of basic science fosters VC investment?
- It may not help
  - Funded projects may be far from commercial viability (fusion energy)
  - Crowding out VC (subsidizing entrepreneurial and top talent competing)
- Use BRAIN Initiative as a natural experiment
  - Mapping the human brain to overcome the longstanding stagnation of neuroscience

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Main Findings

- As the initiative begins:
  - Extensive margin: Neuro startups more likely to receive venture financing
  - Intensive margin: $21 - 50\%$ larger investment, $23 - 41\%$ higher valuation
  - Produced more patents, hired more academic inventors, and integrated AI at twice the rate of peers
  - \$1 investment in BI results in \$1.1 VC investment and \$2.5 exit value
- Authors argue the BI expected to reduce uncertainty
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- My comments focus on interpretations

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Comments I: Magnitude of Impact

- $1.1 investment for $2.5 return (10 years) also seems low
  - Average VC IRR 2014-2014: EU 20.77%, US 18.18%
- BI increase neuro investments by $5.3 B
  - Only a small part of $ 67.6 B total investment in neuro
- The multiplier seems to be low
  - BI expenditure $4.8 B 1.1 investment multiplier
- Not efficient investment? or not fair comparison?

Model	Public investment multiplier	
	$t = 1$	$t = 5$
Baseline specification	0.4***	1.1***
IV (2SLS) estimation using public investment shocks to instrument public investment	0.4***	1.0***
GMM estimation	0.5**	0.8**
Dropping country fixed effects	0.4***	1.5***
Dropping lagged real GDP growth variable	0.3**	1.1***
Pre-global financial crisis period only (1980-2007)	0.3*	0.9***
Additional control variables: two lags of inflation and trade-to-GDP ratio	0.4**	1.1***
Alternative fiscal space specification		
Large increase in debt-to-GDP ratio (upper quartile = above 3.7)	0.3	0.7
Large decrease in debt-to-GDP ratio (lower quartile = below -3.2)	0.5*	1.4***
Alternative public investment efficiency measures		
Low efficiency: Dabla-Norris et al. (2012) PIMI below the sample mean	0.1	0.9
High efficiency: Dabla-Norris et al. (2012) PIMI above the sample mean	0.4***	1.2***
Low efficiency: Bottom quartile of Devadas and Pennings (2018) Infrastructure Efficiency index	0.2	0.3
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Low efficiency: Bottom quartile of CPIA Public Sector Management and Institutions index	0.3	0.6
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Source: Authors' estimates.
Note: 2SLS = two-stage least squares; CPIA = Country Policy and Institutional Assessment; GMM = generalized method of moments; IV = instrumental variables approach; PIMI = Public Investment Management Index. The table shows responses of real GDP (cumulative change in year t relative to year $t = -1$, in percent) to a public investment shock equivalent to 1 percent of GDP; $t = 0$ is the year of the shock. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

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- BI may attract resources and talents from other healthcare sectors
  - Startups in other healthcare sectors may not be a good control group
  - Social welfare is unclear
- Inconsistent data suggests some other structure changes in the healthcare sector
  - Less than 10% additional total VC investment in neuro
  - $21-50\%$ larger investment and higher chance to receive funds
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Comments III: External Validity

- A friend in top medical school: "BI generates patents, so it is not basic science..."
- It reveals that basic sciences are different
- I try to categorize and position BI
  - Differ in how uncertain to generate some outcomes
  - Differ in how uncertain the applications are

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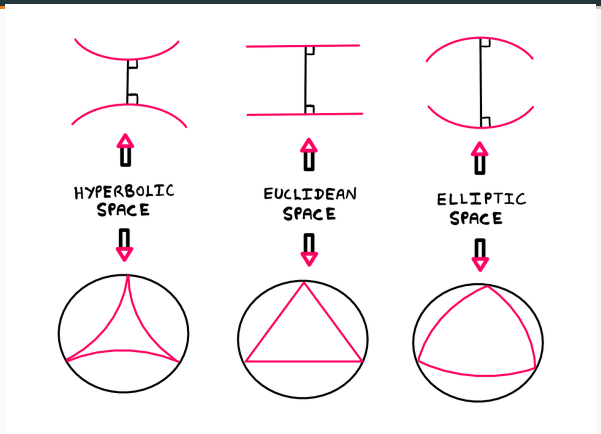

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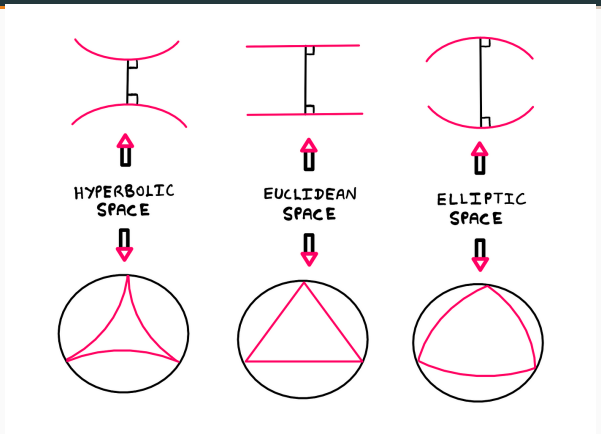

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Comments IV: Economic Mechanism

- The current story is BI reducing uncertainty
- That might not be the main concern given the low uncertainty feature
- Alternative story: research cost saving
  - Basic part done by public funding
  - Research cost reduced
- VC and Entrepreneur are more eager, even ex ante
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Conclusion

1. Interesting topic and an unanswered question!
2. Careful and comprehensive executions
3. More discussions on magnitude of impact
4. More clear about the nature of BI
5. Good luck!