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Your Emerging Technology Partner

Finance and Investor Models in Nanotechnology

International Symposium on Assessing the Economic Impact of Nanotechnology

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Agenda

- The Structure of Private Investment in Nanotechnology
- The Challenges of Investing in Nanotechnology
- Conclusions & Recommendations

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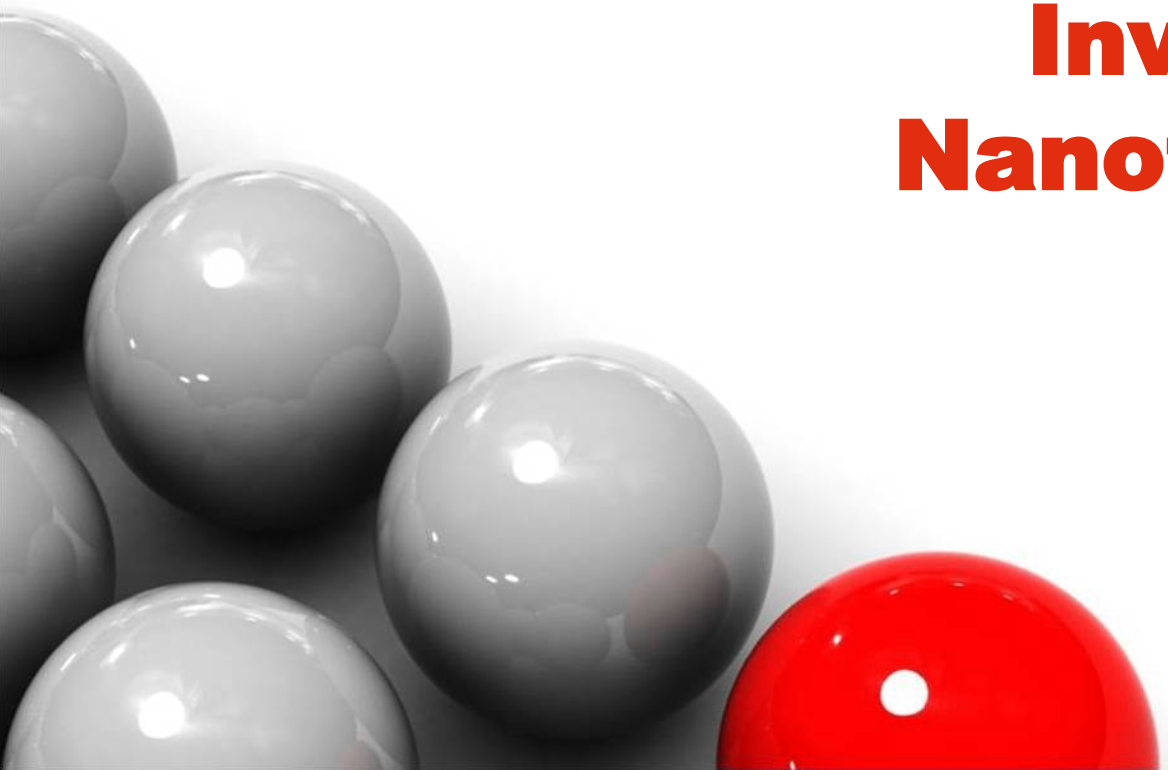
The Structure of Private Investment in Nanotechnology



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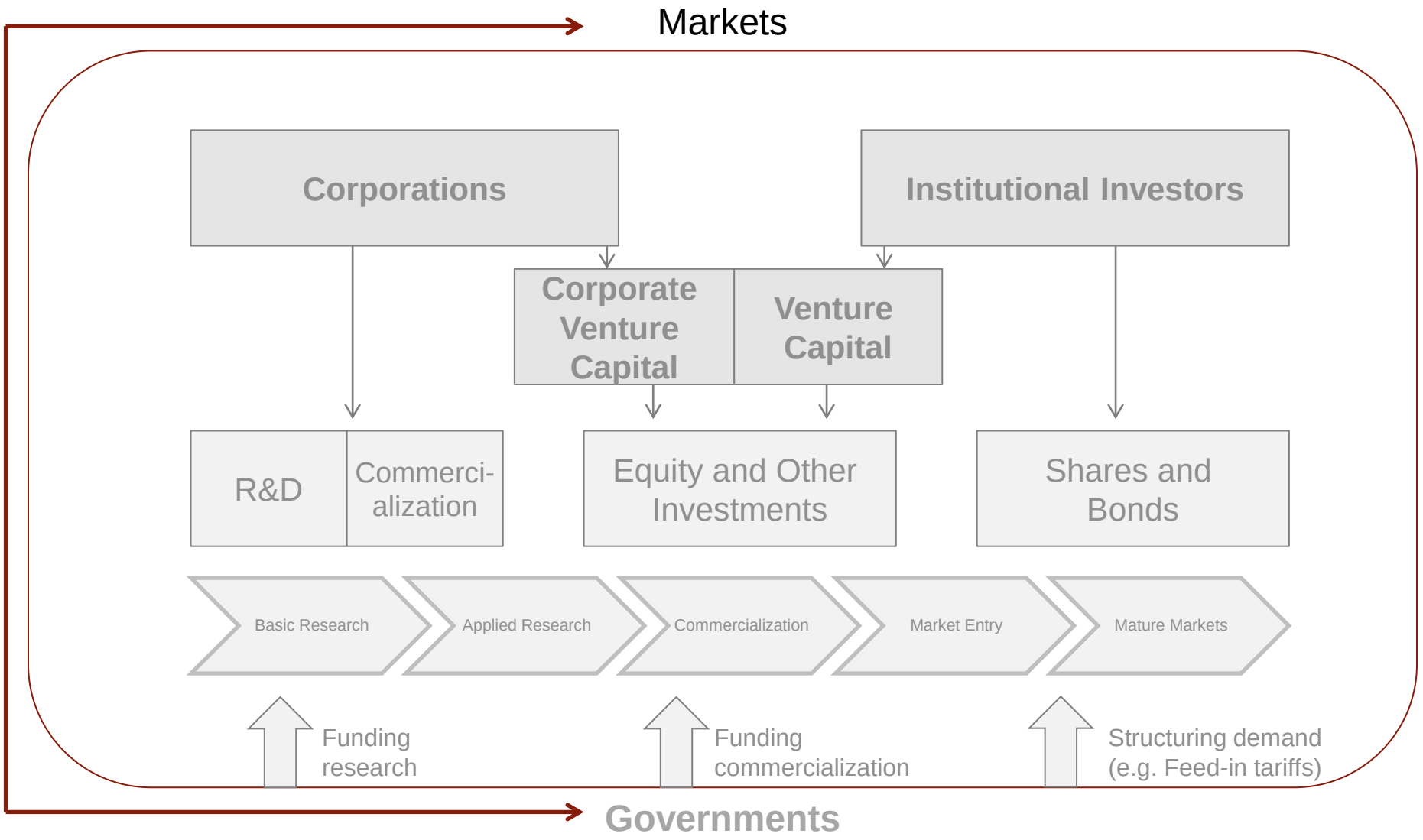
Nanotechnology is funded by various players with different success measures



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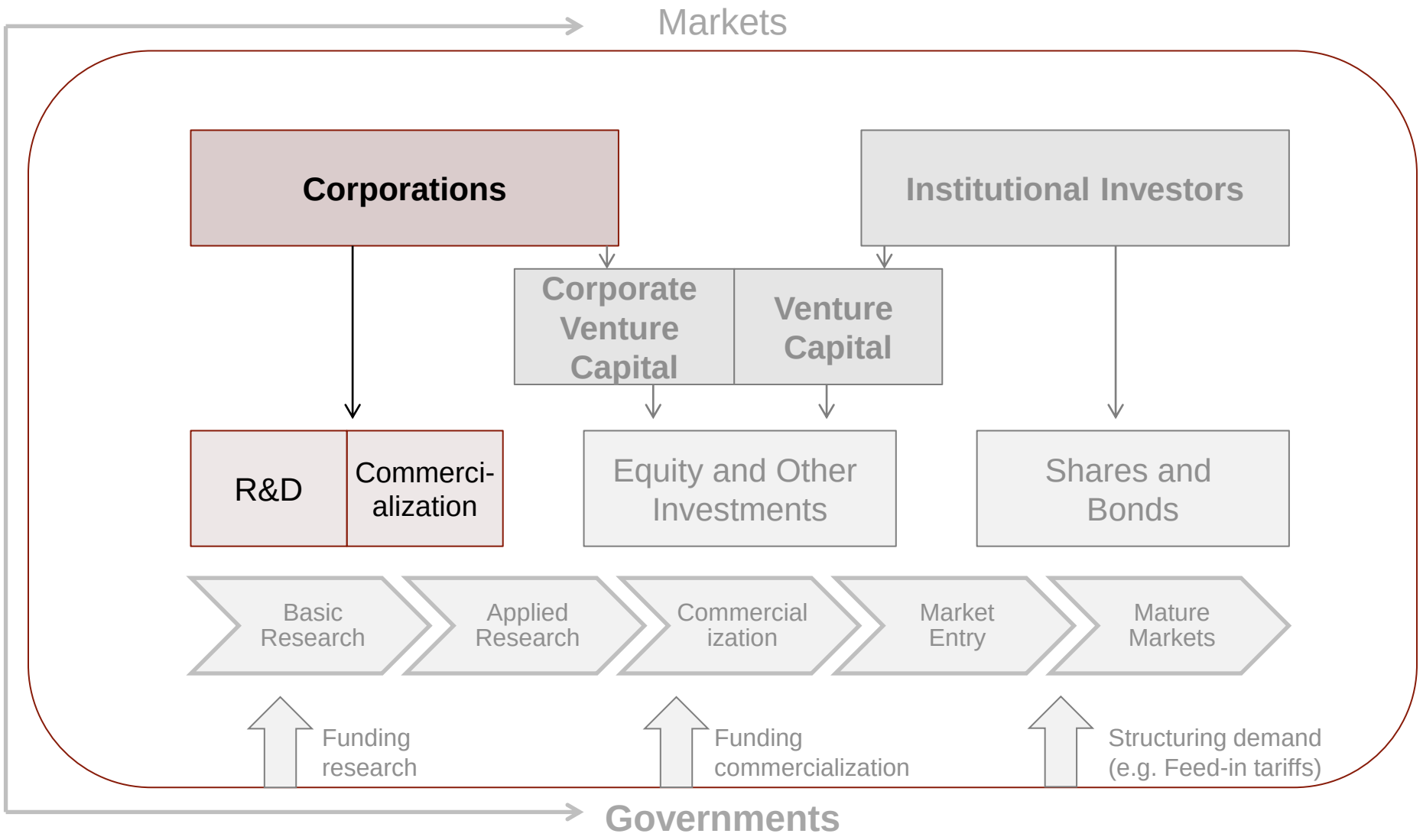
Corporate investment is directed to research and commercialisation



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Corporations invest to grow, renew or increase profitability

R&D

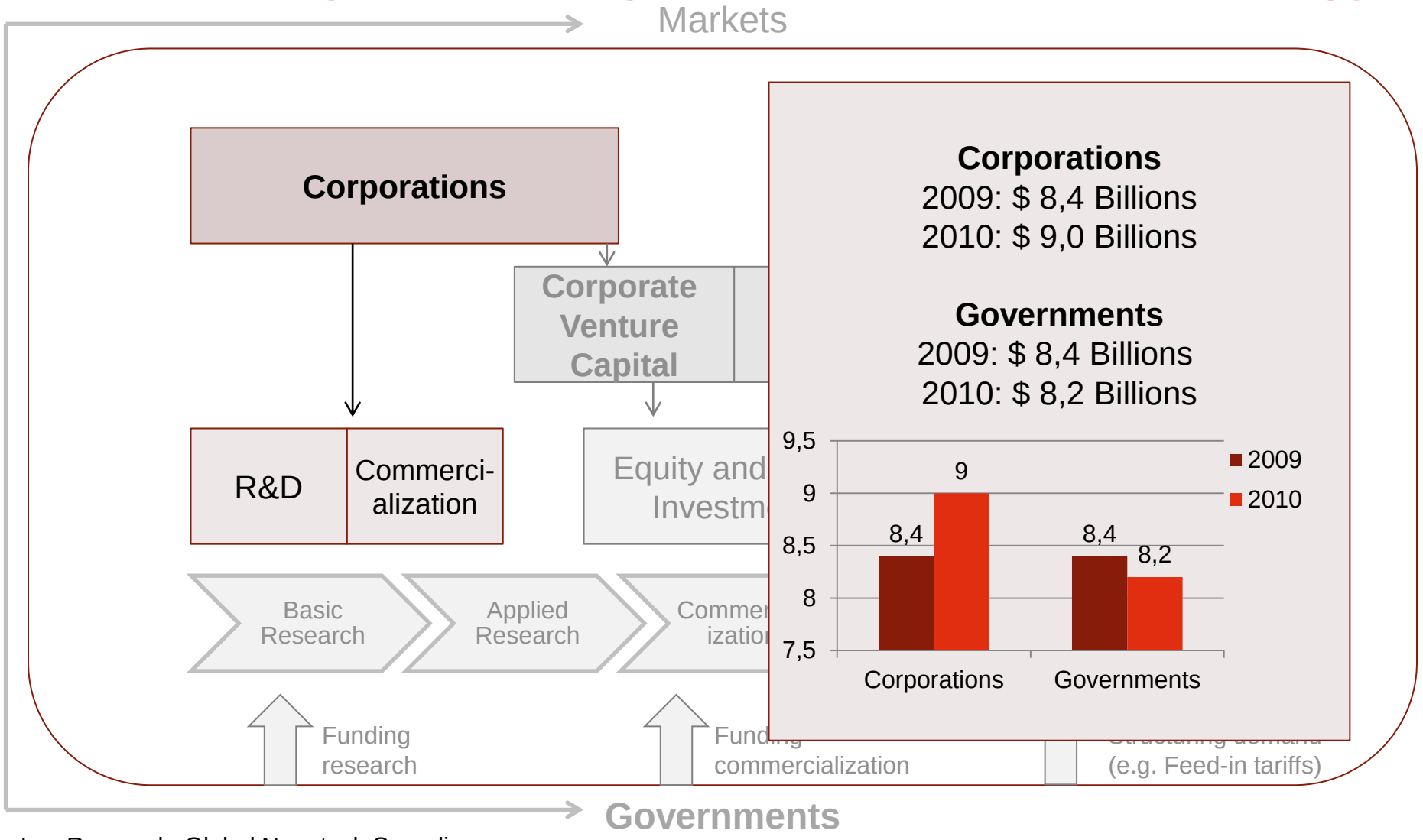
- Research and experimental development
- Metrics
  - Number of patents
  - Research intensity (R&D expenditure as a percentage of turnover)
  - Return on Investment (ROI) of R&D activities
  - Strategic considerations such as defensive patenting

Commercialization

- Activities necessary to take an innovation to market
  - Production facilities; hiring and training workers; sales and marketing
- Metrics
  - More explicit focus on ROI
  - Expected returns: increased sales
  - Costs: building production facilities, marketing
  - Expected payback time, cost of capital

Increased revenue from new or improved products in new or current markets
Improved profitability from reduced costs

From 2010 corporations overtook governments as the largest funding source for nanotechnology



Lux Research, Global Nanotech Spending, presented at EuroNanoForum 2011 conference, 30 May 2011

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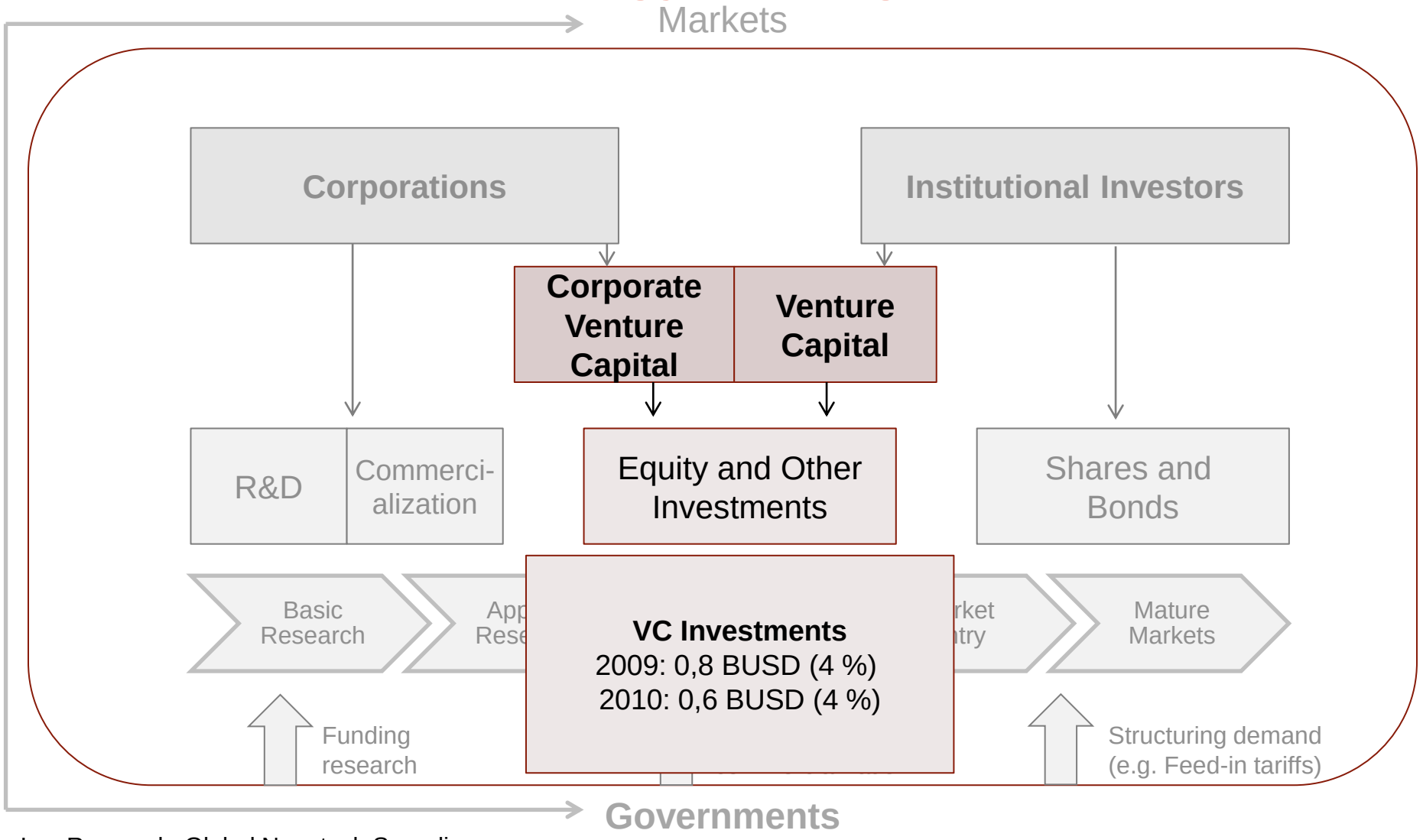
Venture capital accounts for a less than 5% of overall nanotechnology funding



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Venture Capitalist (VC) seeks to finance rapid growth with high returns

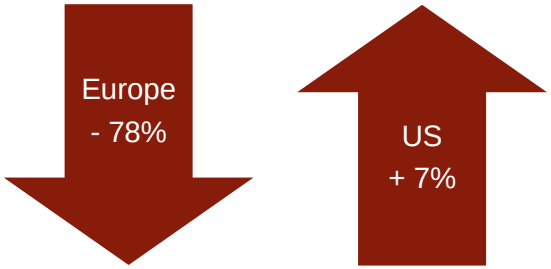
Investment mode		
Direct equity investments	Convertible loans	Senior debt

Investment criteria		
Profile of the company's management	Market potential	Business model
Development stage of the company and its technology	Exit plan	Valuation of the company

- Venture capitalists invest in portfolio of companies that return money back in 3-5 years.
- Best cases are expected to return 10 to 100 times the original investment, typically by listing to stock market or sale to large corporation
- Over half of investment are expected fail, thus high returns expectations

The number of nanotechnology-specific VCs remains low, whole sector has troubles in EU

- VCs more important in US than Europe
  - Systematic effect: EVCA figures show investments in Europe down 78% from their 2006 level
- Few nanotech-specific venture funds



Nanostart	• Nine firms in the portfolio • Medical implants, cancer therapies, optical sensors, and coatings for sports equipment • Three firms in Singapore, two in the US, four in Germany
Nanodimension	• Has invested in seven companies • Construction materials, electronics and targeted vaccines • All but one based in US

European Venture Capital Association, http://www.evca.eu/

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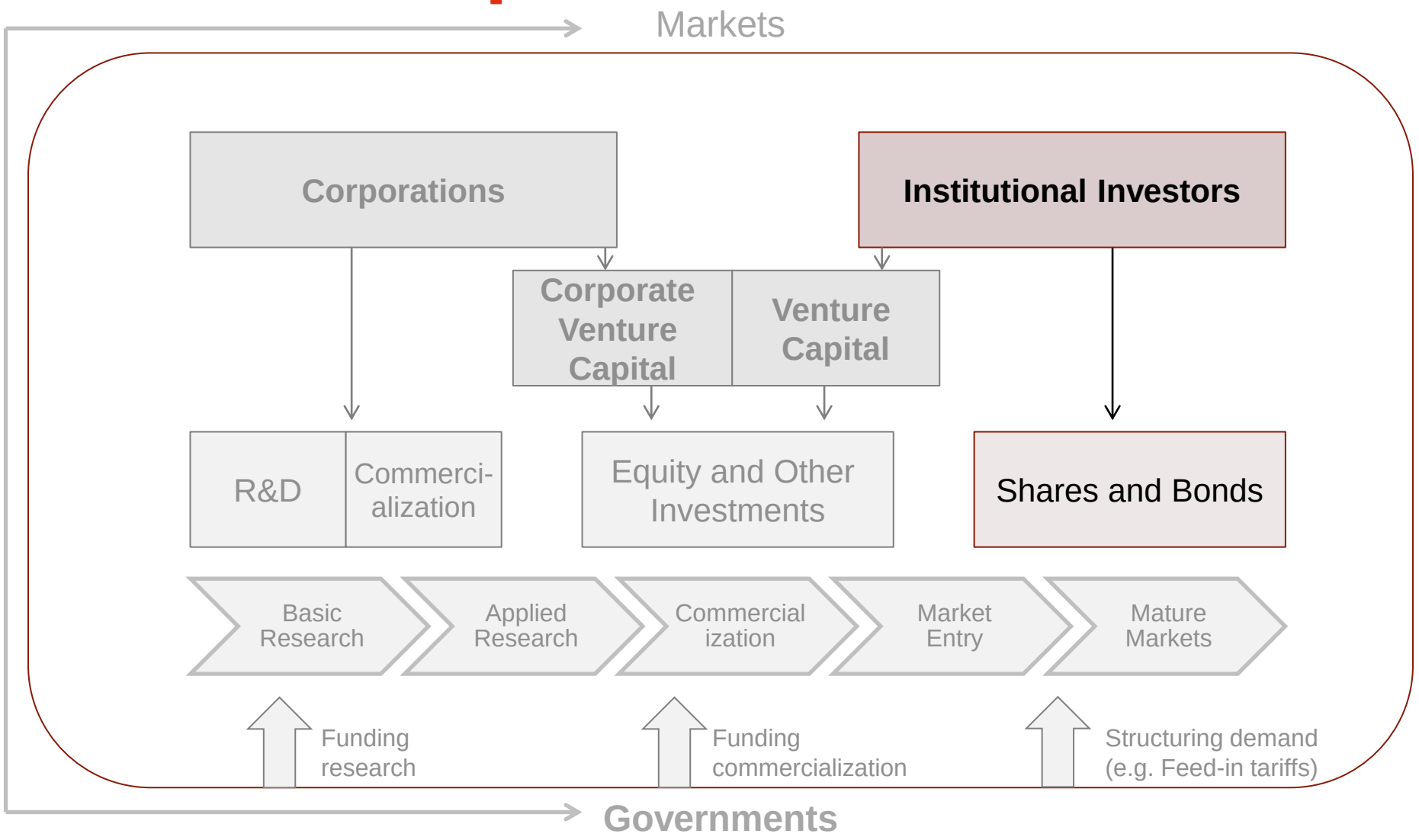
Institutional investors channel funding through share and bond purchases



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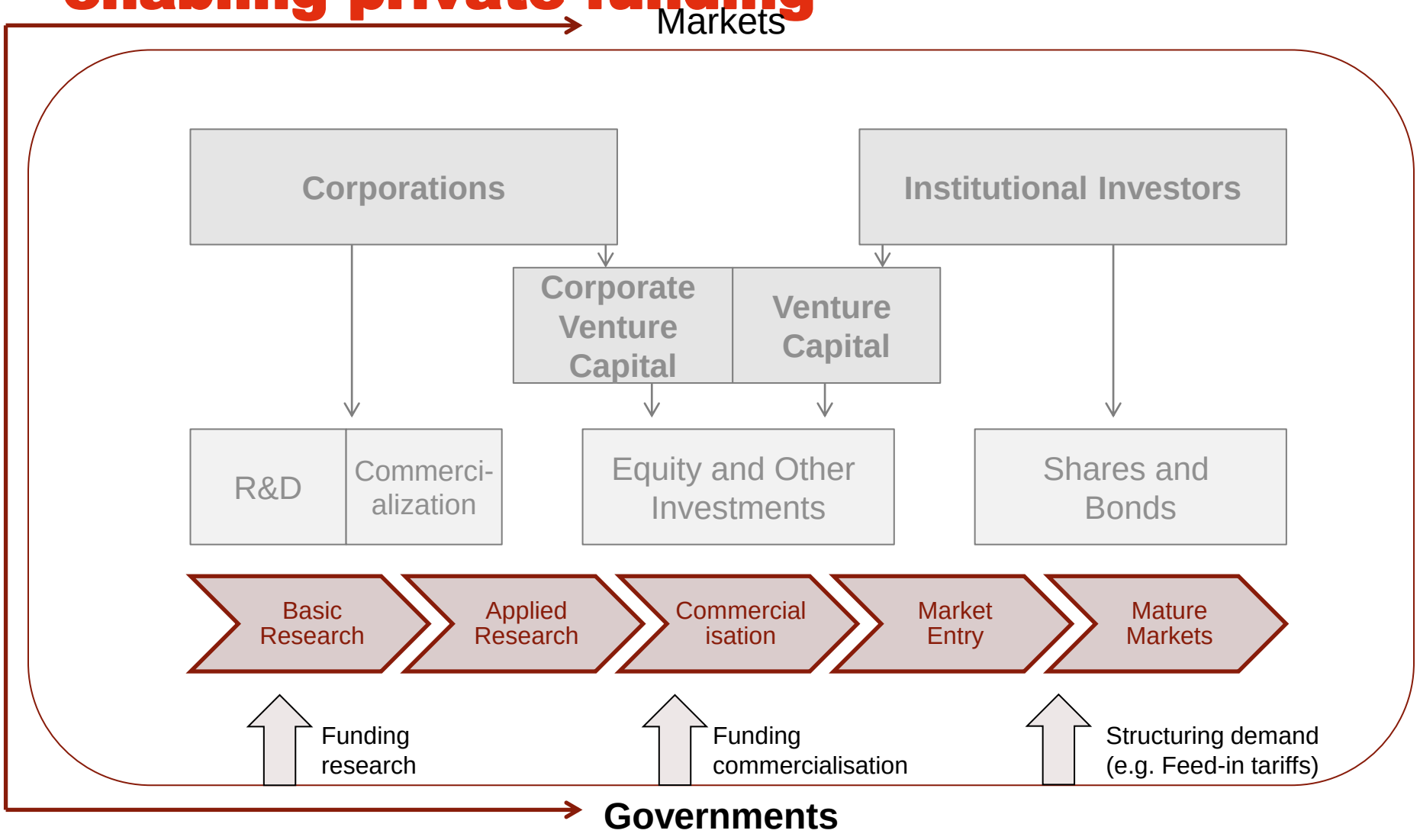
Nanotech firm stock market performance has been very poor – too early listings?

- PowerShares Lux Nanotech Portfolio (Exchange Traded Fund):

%	Company	Ticker Symbol	Sector	5 Year Share Price Change
6,75	Headwaters Inc	NYSE:HW	Energy	-86,6 %
6,66	Flamel Technologies	NASDAQ:FLML	Nanomedicine	-79,9 %
6,36	Valence Technology, Inc	NASDAQ:VLNC	Energy/Transportation	-39,05 %
6,31	Veeco Instruments Inc	NASDAQ:VECO	Tools & Instruments	+41,36 %
5,78	A123 Systems, Inc	NASDAQ:AONE	Energy/Transportation	-89,11 %*

- 5Y performance on 15.2.2012. NASDAQ performance +19.19% over the period
- Source: http://www.invescopowershares.com/products/overview.aspx?ticker=PXN
- *Since floating at $19.6/share on Sept 25th 2009

Public funding plays a critical role in enabling private funding



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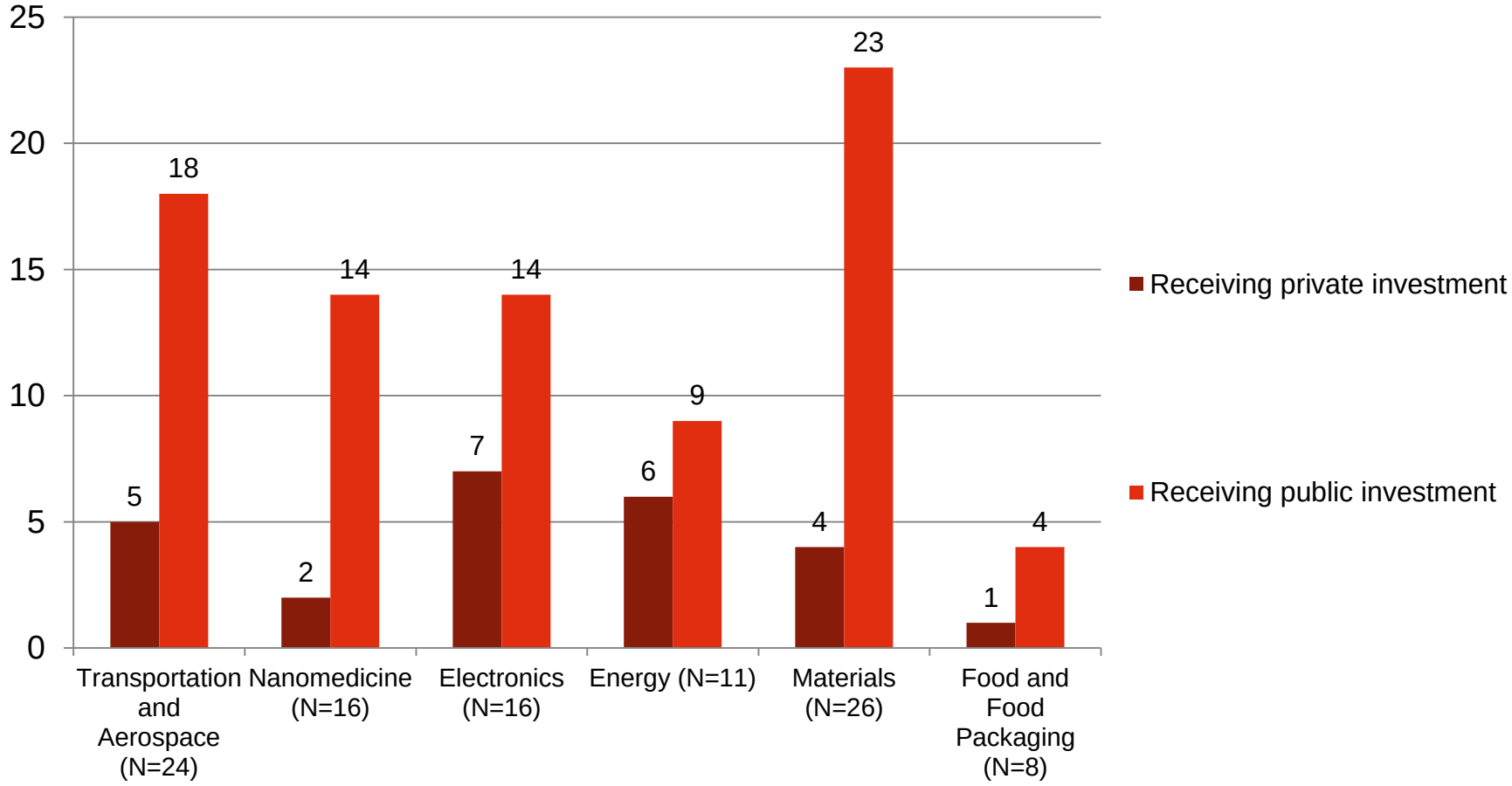
Public funding partly compensates lack of VC money in Europe



Sources of Funding for Companies Using Nanotechnology in Europe.
Source: Spinverse analysis of ObservatoryNano company survey data

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Largest nanotech R&D investments in Europe have had a matching government component…

Inno.CNT, Germany

- 90 million € in total
- Government funding 45 million €
  - Federal Ministry of Education and Research: "Materials Innovations for Industry and Society" program
- A research network of more than 90 partners from research and industry
  - BASF, Bayer, EADS, Siemens, Varta...
  - Fraunhofer, Max-Planck, Leibniz-Institut, several universities...
- Carbon nanotubes (CNT)
- Started in 2008

Genesis, France

- 107 million € in total
- Government funding 46 million €
  - OSEO-ANVAR: funding and assistance for industrial innovation
- A network led by Arkema
  - 16 partners from France and abroad
  - Industrial groups, SMEs, and several university laboratories
- Nanostructured materials, carbon nanotubes in particular: design and applications in a number of markets
- Started in 2008

- Public funding partially mitigates the risk of corporations investing alone and enables creation of value-adding open innovation networks

… not forgetting globally single most significant nanotech investor - Rusnano

RUSNANO
Russian Corporation of Nanotechnologies

RUSNANO, Russia

- 8 BUSD nanotech investment fund by Russian government
- Invests globally in companies and venture capital funds
- Investment targets expected to establish operations in Russia
- Drives Russian industry modernization and commercializing scientific innovation
- Attracts over 50% private investment in each case

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The Challenges of Investing in Nanotechnology

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Nanotechnology presents distinct technology and market acceptance risks

Technology risks	• Scalability from laboratory to industrial scale • Integration of nanomaterials or components with larger systems • Intellectual property risks
Market acceptance risks	• Existing solutions may be ”good enough” • Adoption needed throughout value chain • Regulatory, safety and societal factors

Sector specific factors have a greater impact on investment success than nanotechnology per se

Transportation & Aerospace	Nanomedicine	Electronics
+ Improved batteries for electric vehicles; New materials - Strong competition; Adaptation needed from users	+ Many opportunities to contribute to innovative products - Regulatory approval process	+ Downscaled sizes; 'More than Moore' - Well optimised existing solutions
Energy	**Materials**	**Food & Food Packaging**
+ Energy storages; Photo-voltaics; Catalysts; 'Clean Tech' - Cost competitiveness of existing solutions	+ Potential to transform other sectors - Difficult to evaluate as an investment class	+ More degrees of freedom within packaging; Strong incumbent players - Public image of "nano"

Conclusions

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Conclusions

- The value of nanotechnology will be realized when it is embedded in mass-produced products
- Much of the complexity and investment risk occurs in the commercialisation stage
- Commercialization often needs many players to co-operate over value chain
- Corporations still cannot bear all the risks of required development and value-chain integration alone
- Venture capitalists require fast growth and high returns. Nanotechnology companies cannot often meet the timeline
- There is a clear need for government interventions to support activities which take nanotechnology closer to market

Recommendations

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Industrial investment can be encouraged with public-private partnerships and risk sharing

Pooling knowledge between the corporate, SMEs and research worlds

- Integration and information sharing along a value chain
- Forming new combinations, beyond traditional industries

- As the benefits of an enabling process technology are shared by a number of companies, so should the costs
- Public funding is often required to catalyse these combinations, and reduce risk to individual firms
- Research funding should be more application-oriented

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Venture capital will still play a role, but it has to work in partnership with public funding

- Venture capital investors compare nanotechnology-enabled businesses unfavorably to e.g. software business
- Nanotechnology will always have high capital requirements and long payback times, but there are ways to mitigate this

→ An optimal combination?
  - → opportunity identification skills and commercial rigor of best venture capitalists to accelerate commercialization
  - → deep pockets and patience of government-backed funds
  - → joint use facilities and financing for proof-of-concept and pilot production
  - → networks to complementary expertise and customers
  - → leveraged upside ROI for private investment

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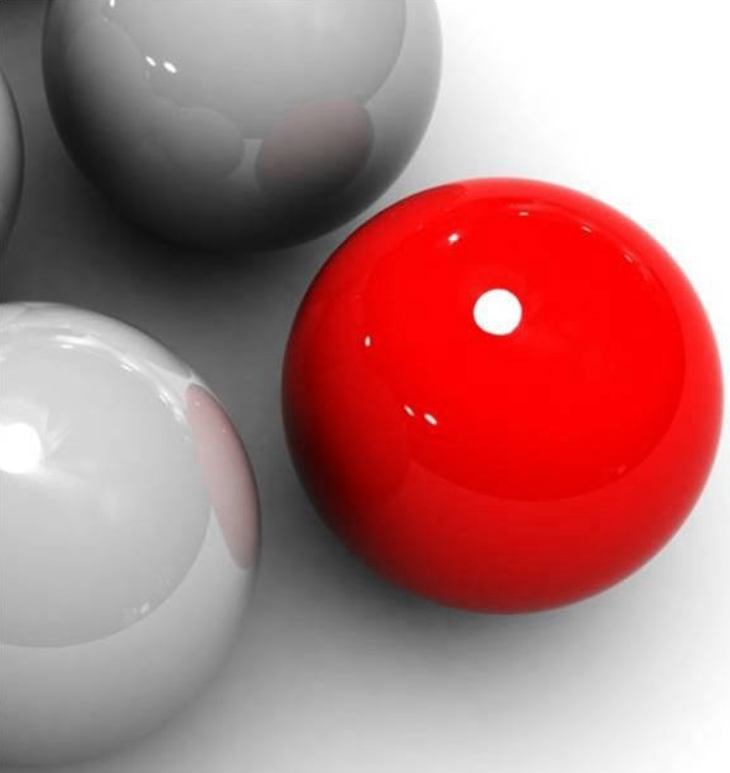

Thank you.

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