

Financing R&D Commercialization: Typologies

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R&D from Macro and Micro Perspectives

Government Perspective

- R&D enables innovation
- R&D drives economic growth
- R&D creates new industries
- R&D allows new employment
- R&D fosters entrepreneurship
- R&D expands the tax base
- R&D heightens national competitiveness

Business Perspective

- Startups: R&D is our future
- Startups: R&D will pay great returns
- Startups: R&D is essential
- Existing: R&D is an expense
- Existing: R&D lowers profits
- Existing: R&D returns are hard to judge
- Existing: **But, R&D is needed to stay competitive in the market**



R&D's Goal is BUSINESS and ECONOMIC GROWTH through Continuous INNOVATION

- New Materials (for existing/new industries)
- New Inventions (for existing/new industries)
- New Products (to increase revenues)
- New Services (to increase revenues)
- New Processes (to lower costs)
- New Networks (to lower costs)
- New Technologies (to lower costs)

New Business Assets and Value

- New Patents
- New Copyrights
- New Formulas
- New Franchises/Licenses
- New Trademarks
- Higher Stock Valuations



How Much Do Countries and Companies Spend on R&D?

Countries (% of GDP)

- **Israel** – 4.9% (USD 6.9 billion)
- Japan – 3.2% (USD 156 billion)
- **United States** – 2.6% (**USD 342 billion**)
- European Union – 1.8% (USD 247 billion)
- **Thailand** – 0.3% (USD 0.6 billion)
- Malaysia – 0.6% (USD 0.8 billion)
- Singapore – 2.2% (USD 2.7 billion)
- Taiwan – 2.4% (USD 8.3 billion)
- Korea – 2.6% (USD 23.3 billion)

Companies (% of Revenues)

- Industrial – 3.5%
- High Technology – 7% (average)
- High Technology – 15% (remarkable)

**Ratio of private versus
public-funded R&D is
2/3 and 1/3**



**In Thailand, it is the
reverse.**



**If Thailand
increased to 2.5%
R&D spending, it
would be USD 5
billion – almost
10x greater than at
present.**



What are R&D Costs?

- Personnel
- Materials, Equipment, and Facilities
- Purchased Intangibles Assets (Patents, Copyrights, etc)
- Contracted Services
- Other Costs



Financing R&D – Financial Institution Concerns

Is your business a start-up or an established business?

Where is the cash flow going to come from to repay the R&D loan?
What is the collateral asset providing security?

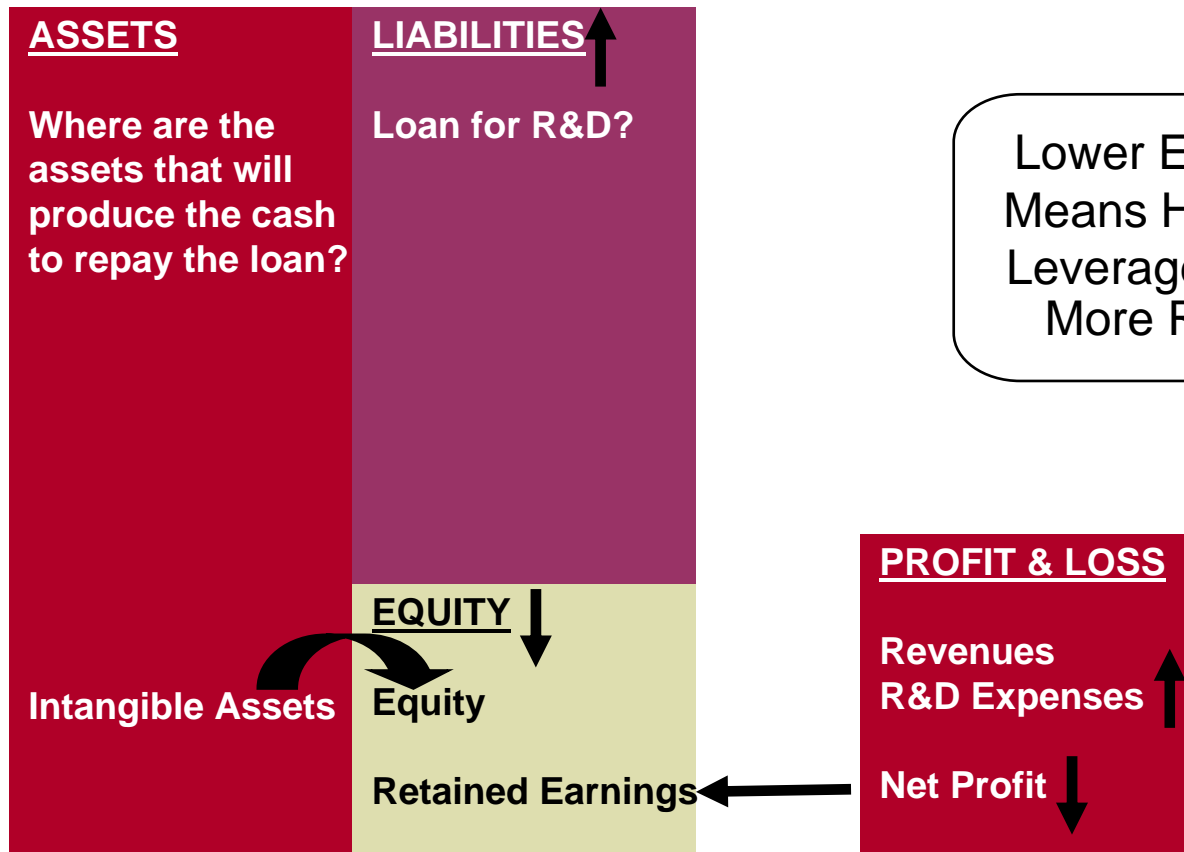
Banks regard R&D as a **cost** to the enterprise and not a source of future cash flow to repay loans.



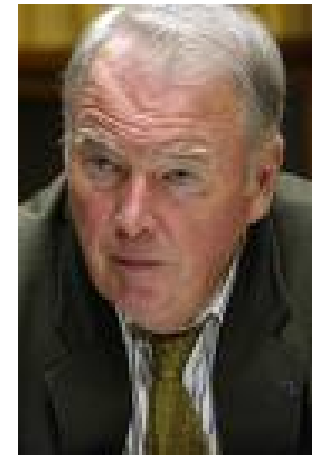
R&D financing should come from the equity contributions (shareholders, retained earnings and other internal fund sources) as these are the longest-term funds able to absorb high-risk R&D activities.



Financing R&D – A Banker’s View Is An Accounting View



Lower Equity Means Higher Leverage and More Risk



Financial institutions are willing to finance R&D for **established businesses** with multiple asset classes providing consistent cash flows. Low-risk, low-return debt financiers are cautious toward **start-up and small** R&D-based businesses.



Fundamental Problem: Not Enough R&D Investment in Economy

The Argument ...

*“The primary output of a R&D investment is the knowledge of how to make new goods and services. The use of the knowledge by one enterprise does not preclude its use by another. To the extent that knowledge cannot be kept secret, the returns to the investment in it cannot be appropriated by the enterprise undertaking the investment, and therefore such enterprises will be reluctant to invest, leading to the **under-provision of R&D investment** in the economy.”*



Reasons for Limited R&D Investment Financing

It is a widely held view that R&D activities are difficult to finance in a freely competitive market place.

BECAUSE

1. **Asymmetric Information** between inventor and investors
2. **Moral Hazard** from the separation of management & ownership
3. **Tax Considerations** that favor use of internal funds as a less expensive cost of capital



Reasons for Limited R&D Investment – Ramifications

- Large enterprises tend to fund R&D from internal funding sources such as revenues and retained earnings but are cautious in their R&D goals.
- Start-up and small enterprises do not have sufficient internal financing sources to fund R&D, but have ambitious R&D goals. Financial institutions are reluctant to provide debt financing as there is limited collateral and insufficient cash flows. Start-ups and small enterprises need to rely on the highest cost of capital – equity – to fund their R&D investments.



Reasons for Limited R&D Investment – Ramifications

- Venture capital provides finance to promising start-up and small enterprises' R&D investments but only in a few sectors – avoiding others. Relatively large-sized minimum VC investment amounts exclude many viable R&D investments.
- A **Funding Gap** exists between larger and smaller enterprises looking for funding to finance R&D investments. This funding gap is the primary rationale for government intervention to promote R&D investments through various mechanisms. In addition, governments want the the **Economic Growth Benefits** that are driven from the innovations arising out of R&D investments.



Financing R&D Commercialization – Government Role

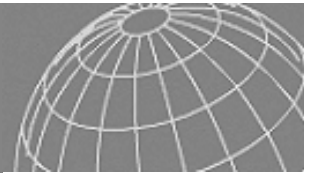
Government has a key role to play in **funding** fundamental research and **lowering** the cost of capital for innovative SMEs to finance their R&D investments and to help **attract** other equity capital (grants & co-funding).

Immediate Tools Available

BUT MORE IMPORTANT

- Tax Incentives
 - Deductions
 - Credits/Refunds
 - Lower or Zero Tax
- Grants
- Expansion Venture Capital
- Start-Up & Seed Capital
- Gov't-Cost Loans & Funds
- Building R&D Network Alliances between the Government, Universities, Research Institutes, Enterprises, and Individuals
- Openness to Globalized R&D market

To lower the cost of capital



Financing R&D Commercialization – Government Role

Fundamental Tools

- **Competitive Business Environment** – low barriers to entry, anti-monopolistic, openness to domestic and foreign investment, etc.
- **Developed Financial Infrastructure** – competitive financial services market, venture capital firms, capital markets, risk-mitigation markets, etc.
- **Quality Physical Infrastructure** – industrial and residential areas, roads, universities, research institutes, advanced ICT, laboratories, etc.
- **Fair and Enforced Legal Infrastructure** – intellectual property rights, contract rights, property rights, etc.
- **Attractive Human Capital Infrastructure** – high-quality education, open immigration policies (attract global best and brightest), etc.



Financing R&D Commercialization – Government Role

Government Interests

- Military Security
- Energy Security
- Environmental Security
- Economic Security



Financing R&D Commercialization – Gov't – Examples

USA – 2.6% GDP

- Defense Advanced Research Projects Agency (DARPA) – \$3.1 billion
- Small Business Technology Transfer Program (STTR) and Small Business Innovation Research Program (SBIR) Combined – \$2.3 billion

Sweden – 4% GDP

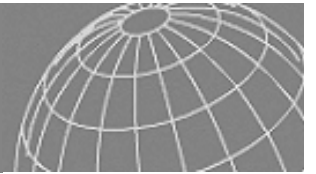
- VINNOVA and others – \$1.4 billion integrated programs across all sectors

Finland – 3.5% GDP

- TEKES – \$0.7 billion

Europe – 1.8% GDP

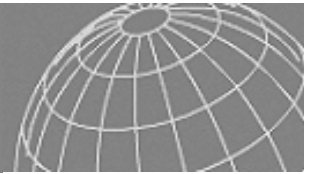
- EUROSTARS – \$1.2 billion PPP for EU R&D-oriented SMEs
- EIB – \$70+ billion over decade



Financing R&D Commercialization – Private Role

Private Enterprise Interests

- Start New Businesses – Seeking Wealth
- Rise Above Competition – Competitive Advantage
- Increased Shareholder Value-Added
- Potential New Earnings
- Lower Cost of Capital
- **But,** R&D Spending Subject to Business Cycles



Financing R&D Commercialization – Private – Examples

Existing Enterprises

Internal Funding – focus is more on development of research and speeding innovations to product/services and to market.

Internalizing Externals:

Corporate VC – fund promising R&D

M&A – “Big fish eating little fish”

Externalizing Internals:

Securitized R&D Funding – SWORDS and R&D LPs

Start-Up Enterprises

No Internal Funding – requires equity

Inventor/Friends/Family/Fools’ Equity

Charity/NGO/Donors Grants/Equity

Venture Capital – Early Stage (debt-like with close monitoring/control) and Expansion Stages (equity like) – US most developed VC market

AND

Government Equity, Debt, and Tax Assistance – Already Mentioned



Thank You for Your Time and Attention