Hybrid financial instruments as a strategy to increase risk/return sharing when financing industrial innovation

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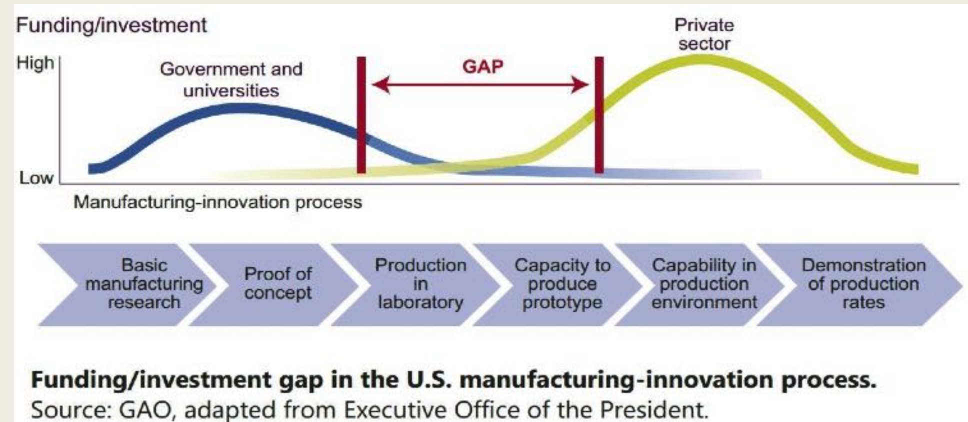
Research problem

■ Inadequate financial instrument portfolio to support corporate R,D&I projects at Finep*, particularly at intermediary maturity stages



Funding/investment gap in the U.S. manufacturing-innovation process.
Source: GAO, adapted from Executive Office of the President.

- Hay and Morris (1979): market imperfections for financing risk ventures leads policy makers to create lending institutions that may address specific categories of borrowers
- More than 90% composed of asset-backed subsidized loans, not the best option for companies with intangible assets (Goodacre & Tonks 1995)
- It does not share the risk, requiring collaterals such as properties or bank guarantees
- As a conclusion, a limited number of companies are granted loans (50-80 annually), mostly for incremental innovation projects, eventually arbitrating interest rates
- **Although a very important instrument (scalable, safe, standard contract and overseeing), it should not comprise such a huge part of the portfolio**

* Finep is a public company related to the Ministry of Science, Technology, Innovations and Communications in Brazil. www.finep.gov.br

Research problem

- Venture Capital could be a solution as it does share risks and rewards, but…
  - Lerner (2011): A government agency is limited on offering what is the key benefit of a VC investment, which is management expertise and networking
  - An alternative, still with limited possibilities, is to perform a role of indirect VC investor, by supporting funds and not companies – limited by short termism and exit strategies (Goodacre & Tonks 1995)
  - Eventually the interest of the funder is limited to a group of projects, where full company exposure is not intended
  - In some areas, especially deep tech, with high capital investment and long maturity terms, the VC model does not work as properly as in other fields where scaling-up requires less investments. (Gaddy et al. 2016).
  - **On top of this issues, it requires limited scale due to the its high management cost (Frodsham and Lichenstein, 2011) – therefore, it may not be the answer for a radical change in overall portfolio**

* Frodsham and Lichenstein (2011) Getting Between the Balance Sheets

Motivations

- Lack of definition for the group of Public Organisations Financing Innovation (POFI), including innovation agencies, development banks, public banks, among others. Current names are: Develpment Finance Institutions (UNIDO 2016), State Investment Banks (Mazzucato & Penna 2015), Public Finance Institutions (OECD 2015b)
- Study alternatives that stands in the middle of ”pure debt or equity”, such as quasi-equity or mezzanine finance (EVCA 2007, OECD 2013)
- Fölster (1990): self financing* mechanisms can be a better option to reduce risk and provide return to the funders
- Prakke (1988): need to balance risk capital and traditional instruments to provide funding for innovations
- It is a mechanism that allows the funder to reap the returns on successful projects (Lazonick & Mazzucato 2013).
- Compare with literature and other similar institutions’ portfolio of financial instruments to investigate eventual directions
- Eventually suggest a new financial instrument that can contribute to new innovations being delivered

*These include equity, participating loans and other instruments where funded projects which are financially successful may provide a partial return to the funder, what contributes to the balance of the initial fund

EVCA 2007. Guide on Private Equity and Venture Capital for Entrepreneurs – European Venture Capital Association

Key literature *(not in formal reference for space purposes)*

Finance

- Goodacre, A. & Tonks, I., 1995. Finance and Technological Change. In Handbook of the Economics of Innovation and Technological Change
- OECD, 2013. Alternative Financing Instruments for SMEs and Entrepreneurs: the Case of Mezzanine Finance
- Prakke, F., 1988. The financing of technical innovation. In A. Heertje, ed. Innovation, Technology and Finance (Commissioned by the European Investment Bank)
- Santarelli, E., 1995. Finance and Technological Change: Theory and Evidence

Institutional Design / PP*

- Howlett, M., 2011. Designing Public Policies: Principles and instruments
- Matland, R., 1995. Synthesising the implementation literature: the ambiguity- conflict model of policy implementation
- Pollitt, C., Talbot, C. & Caulfield, J., 2004. Agencies. How Government do Things through Semi-Autonomous Organizations
- Karo, E. & Kattel, R., 2015. Innovation bureaucracy: does the organisation of government matter when promoting innovation? Papers in Innovation Studies, 2015/38, p.25.

Innovation Policy

- Fölster, S., 1990. The efficiency of innovation subsidies. In E. Deiaco, E. Hörnell, & G. Vickery, eds. Technology and Investment.
- Hay, D.A. & Morris, D.J., 1979. Part IV Issues for Public Policy. In Industrial Economics: Theory and Evidence
- Lerner, J., 2011. The Boulevard of Broken Dreams: Innovation Policy and Entrepreneurship
- Mazzucato, M. & Lazonick, W., 2013. The risk-reward nexus in the innovation-inequality relationship: who takes the risks? Who gets the rewards?
- NESTA, 2016. How Innovation Agencies Work: International lessons to inspire and inform national strategies
- Steinmueller, W.E., 2010. Economics of technology policy. Handbook of the Economics of Innovation

*PP = Policy Process

Why further investigation is needed

- Limited studies on innovation policy with an implementation focus at the level of the public organizations that fund projects (NESTA, 2016)
- An interesting and not very touched field which comprises innovation policy, public management and finance
- the role of finance is commonly not used as means to explain technological change and innovation (Santarelli 1995)
- Limited research on quasi-equity and mezzanine finance, especially for this particular goal
- Searching experiments:
  - ”financial AND instruments AND innovation”: financial innovation, general financial instruments
  - “quasi-equity”: corporate finance, accounting
  - “Mezzanine Financ*”: corporate finance, real estate

Proposed research questions

- *“Are hybrid financial instruments being used by POFIs to finance innovation?”; How different POFI categories use these instruments?*
- *“If so, how representative are they in the portfolio? What is the trend?*
- *Are they increasing the risk/return sharing when comparing to traditional instruments (grants, loans and equity)?”;*
- *“What would be the best strategy to implement them in other POFIs?”.*

Explorative / Descriptive approach…so what?

- May inform the importance of equity quasi-equity and other type of risk sharing instrument
- Can lead to the direction of good examples and its spreading in other organisations
- Policy implications
- Limited information on this topic at this level

Not explanatory: eg. *Is there a relationship between basic interest rates and the use of subsidized loans as an instrument for innovation policy?*

Not evaluative: eg. *Are innovation agencies making profits on their equity investments?*

Research design

- Saunders et al 2016
  - **Methodology**: mixed methods
  - **Time horizon:** cross section
  - **Primary data**: case studies with semi-structured interviews
  - **Secondary data:** academic papers, reports

Expected analysis outcome (quantitative)	Analysis	Sample / sources
- Evidence of the use of hybrids in POFIs	- percentage of POFIs that use at least one hybrid instrument	- Secondary research in academic papers, reports, surveys and websites

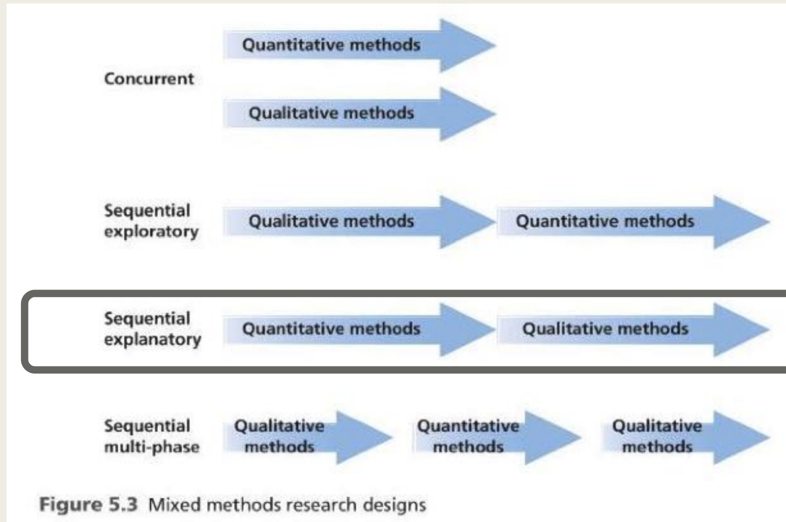


Figure 5.3 Mixed methods research designs

Expected analysis outcome (qualitative)	Analysis	Sample / sources
- indicate most relevant hybrid instruments in place - portray their positive and negative aspects - suggest policy implications	- describe instrument operation - expose types of incumbent firms - indicate financial model	- case study with 5 to 10 instruments/programs highlighted in the previous analysis - secondary data and interviews

Financing innovation

Hybrid financial instruments

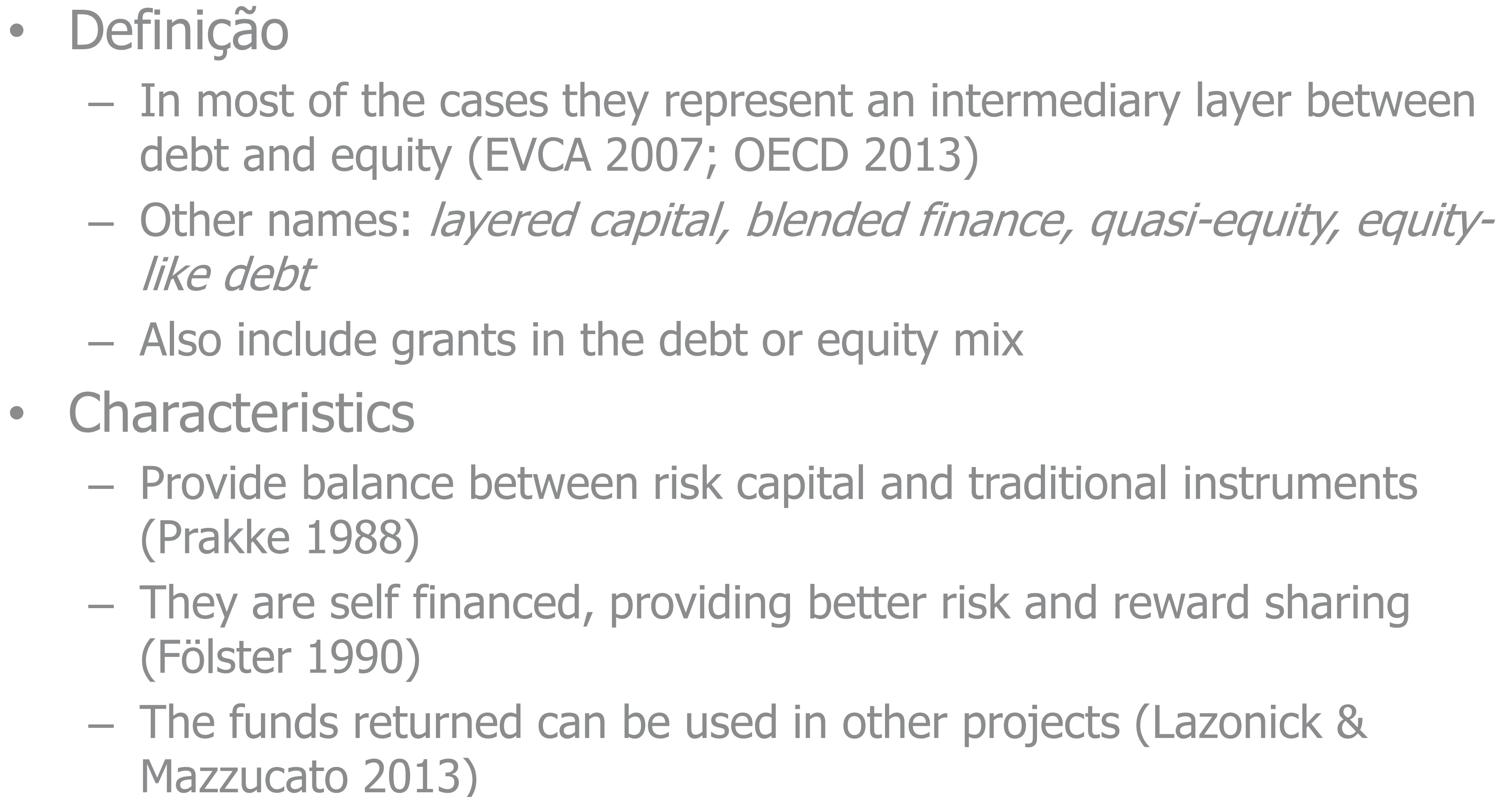


Table 1. Alternative Financing Techniques

Low Risk/ Return	Low Risk/ Return	Medium Risk/ Return	High Low Risk/ Return
Asset-Based Finance	**Alternative Debt**	**"Hybrid" Instruments**	**Equity Instruments**
• Factoring • Leasing • Purchase Order Finance • Warehouse Receipts	• Corporate Bonds • Securitised Debt	• Subordinated Loans/Bonds • Silent Participations • Participating Loans • Profit Participation Rights • Convertible Bonds • Bonds with Warrants • Mezzanine Finance	• Private Equity • Venture Capital • Business Angels • Specialised Platforms for Public Listing of SMEs • Equity Derivatives

Table 2. Comparison of mezzanine finance and other financing techniques

	Senior debt	Mezzanine	Equity
Economic perspective	Debt	Equity	Equity
Legal perspective	Debt	Debt	Equity
Ranking	Senior	Contractually subordinated	Junior
Taxation	Debt interest deductible	Debt interest deductible	Tax on capital
Covenants	Comprehensive restrictions	Tracks senior, but looser	None
Security	Yes -1st ranking	Yes -2nd ranking	No
Investor's involvement in management	No direct involvement	Moderate involvement; board seats	Direct involvement
Purpose	Contractually specified	Not specified	Not specified
Term	4-5 years	5-10 years	Open ended
Interest Costs	Cost of funds + 255-350 basis points	150-300 basis points above senior	None
Repayment	Amortizing from cash flow	Bullet* upon exit or at maturity	None
Warrants	None	Almost always	None
Total Expected Return	5-13%	13-25%	>25%

* The payment for the principal is not made over the life of the loan, but rather as a lump-sum payment at exit or maturity

Source: adapted from Credit Suisse (2006).

Examples of taxonomies

Company balance sheet		Financing instruments
Assets	**Equity and liabilities**	
Current assets	Liabilities	- Bank loans - Bonds - Supplier credits - Customer advances
	Mezzanine	**- Subordinanted loans** **- „Silent" participations** **- Participating loans** **- Profit participation rights** **- Convertible bonds** **- Bonds with warrants**
Fixed assets	Equity	- Retained profits - Stock - Capital contributions from equity holders - Private equity

Position of mezzanine in terms of the company balance sheet (Giurcă 2007)

Examples of taxonomies

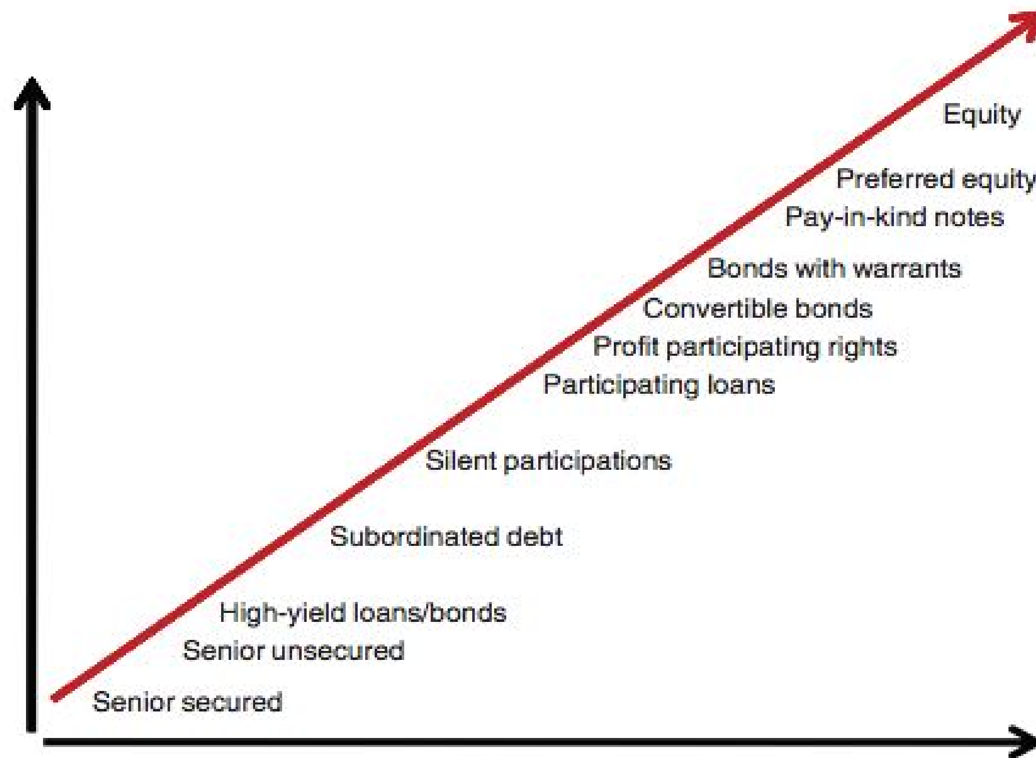


Figure 1.2 The risk–return paradigm
Source: Adjusted from CS economic research

The risk-return paradigm (Nijs 2014, p.11)

Proposed taxonomy for hybrid instruments

Starting as	Becoming	Names	Event	When it is used
Grant	Loan or Equity	Convertible grant	Project resulting in sales	Funder reaping rewards of successful projects
Loan	Grant	Conditional loan	Project not succeeding due to agreed reasons (commercial, technical failure, but well executed)	Support riskier innovations. It can work as an individual grant component or a portfolio tolerance
Loan	Equity	Mezzanine finance	Reach a defined valuation or other milestones	Equity can balance a initial riskier debt (less collateral, for instance)
Equity	Loan		Exit	When a profitable exit is not possible payback can be arranged by loan
Loan/equity	Loan/equity		Specific loan / equity schemes defined initially	When a mix of return payment schemes are necessary to deal with uncertainty

A macro taxonomy of hybrids depending on the combination of grant, debt and equity. Author´s elaboration

Proposed taxonomy for mezzanine finance

Categoria	Mecanismos	Compartilhamento de risco	Observações
Debt	Senior loan	Collateral	Standard secured loan
Higher risk debt	Unsecured / high-yeld loans	Track record, higher interest rates, payment in kind	Higher risk is compensated by higher return
Revenue based finance	Subordinated loans, roylaty-IP based loans, participating loans	Revenue participation (eventually profit or IP shares)	Higher risk and reward sharing
Possibility of equity	Equity kicker, warrants, convertible loans, silent participations, preferred shares	Equity option	Entitles the holder a share of the company's turnover in case of success, to balance the higher risks assumed
Equity	Ordinary shares	Being a shareholder	Higher possibility to direct management, although this is a less liquid asset

A Taxonomy for Mezzanine Finance types of hybrids Sources: Author's work, partially adapted from (Giurcă 2007) and (Nijs 2014), Investopedia

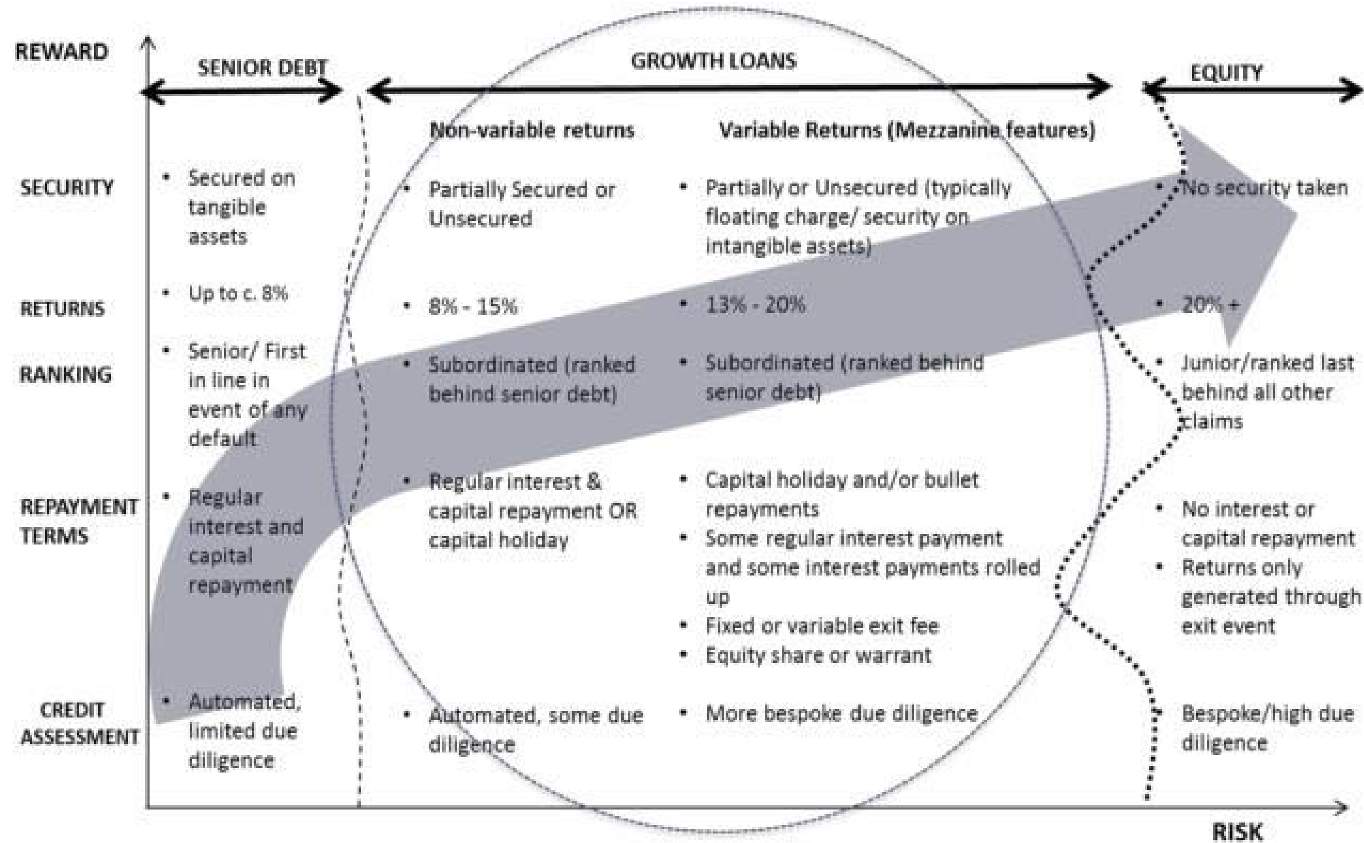
Recommendatons in the literature

- Study on funding high risk biopharmaceutical products issued a clear indication on mezzanine finance as an alternative to bank loans and VC (European Commission 2009)
- A KfW paper (2004) indicates this instrument to fund activities that would not provide collateral for a bank loan, such as research and development investments, while it allows for a healthier debt/capital ratio
- In the UK ICFC was very successful in supporting SMEs with mezzanine finance (British Business Bank 2015)
- Report from UNIDO (2016) acknowledges the fact that development banks use hybrid instruments when supporting SMEs due to their nature
- The MTA report on Advanced Manufacturing (MTA 2012) recommended developing mezzanine finance as one of the key actions to enhance competitiveness in high tech SMEs
- In a sample of 3083 venture finance transactions in Canada, hybrids were used in 30,5% of the cases (Douglas et al. 1998)
- A study on public financial institutions and the low-carbon transition acknowledged junior debt and mezzanine financing as tools to promote risk sharing and contribute to private capital mobilization (OECD 2014)
- Santarelli (1995) recommends royalty R&D partnerships, where equity investors can receive cash returns as soon as the company sells their products, independently from having profits or being sold with a increased value

Examples of hybrid use - EIB

European Investment Bank and the use of hybrids

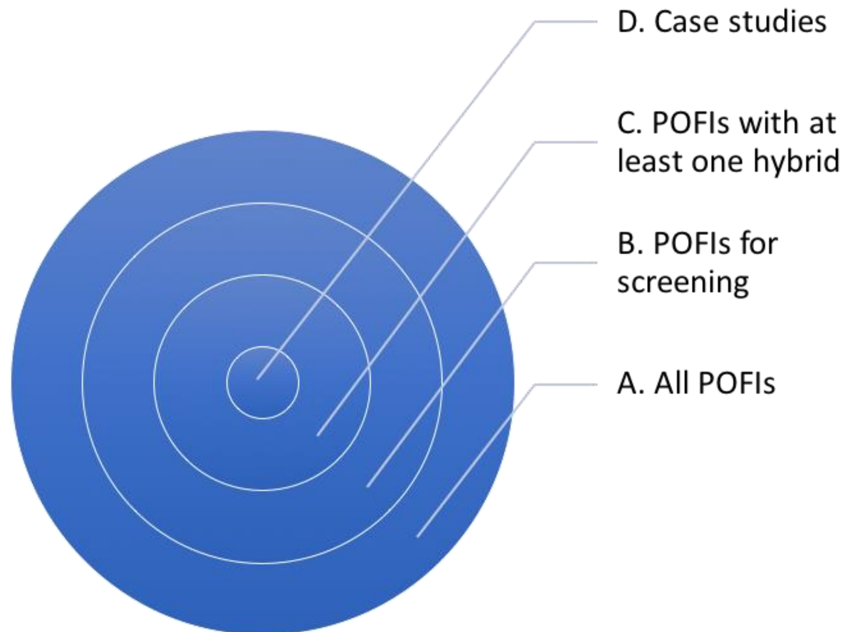
Examples of hybrid use - BBB



Use of hybrids in the British Business Bank. (van der Schans et al. 2012)

Initial screening

An important step in the research design was to define the initial sample for the secondary research and then the number of the case studies



A. Total population (uncertain and unreachable)

B. POFIs that are possible to tackle in the secondary research, according to articles, associations

C. POFIs that have minimum evidence of hybrid use, without further qualification

D. Institutions with hybrid instruments assessed in the case studies

Initial screening – types of institutions and regions

Types of POFIs	Associations	Number in the workable list
Innovation Agencies	TAFTIE (Association of Leading National Innovation Agencies)	25
National Development Banks	ALIDE (The Latin American Association of Development Financing Institutions),	25
Multilateral Development Banks		12
Public Banks, Funds and Agencies	Network of European Financial Institutions for Small and Medium Sized Enterprises (NEFI)	15
International Development Institutions	IDFC (International Development Finance Club), EDFI (European development finance institutions)	13
TOTAL		90

Continent	Number
Africa	8
Asia	14
Latin America	8
North America	10
Oceania	1
Europe	49
Total	**90**

Status	Number
Developing	26
Developed	64
Total	**90**

Results: use of hybrid instruments

Types of POFIs	Total	Category 4+	Category 3+	Category 2+	% Category 2+ / 4	Category 1
Innovation Agencies	25	22	5	6	27%	5
National Development Banks	25	20	18	17	85%	5
Multilateral Development Banks	12	12	10	10	83%	5
Public Banks, Funds and Agencies	15	14	12	12	86%	4
International Development Institutions	13	13	13	13	100%	1
TOTAL	90	81	58	57	70%	18

Categorias

1. Strong evidence of using hybrids - at least one dedicated hybrid instrument
2. Weak evidence of using hybrids - at least one mention of having hybrid instruments or other mechanisms with hybrid characteristics
3. Use of guarantees
4. Usual instruments (loans, grants, equity)
5. Not Applicable (organizations that do not support innovation, only grans for research institutions, etc.)

Development status	Percentage of hybrid use
Developed	69%
Developing	52%

Interview flow and cases

Label	Type	Role of respondent	Date (2017)	Country
POFI 1	Innovation Agency	Head of Studies and Communications	10 August	European
POFI 2	Innovation Agency	Acting Director of Innovation Politics and analysis	8 August	European
POFI 3	Innovation Agency	Acting Director of the Growth Division	8 August	Israel
POFI 4	Innovation Agency	Head of Technology Stations Programme	17 August	South Africa
POFI 5	Development Bank	Manager of the Chemical Sector department	25 August	Brazil
POFI 6	Development Bank	Executive Director	17 August	France
POFI 7	National Public Bank	Director of Communications	17 August	Sweden
POFI 8	National Public Bank	Senior Manager / Economic Advisor	4 August	United Kingdom
POFI 9	Public Fund	Senior Relationship Manager	24 August	Denmark
POFI 10	Multilateral Development Bank	Private Equity Banker	18 August	European
POFI 11	Multilateral Development Bank	Senior Private Sector Specialist	16 August	United States of America

Hybrid instruments found in secondary research

Category	Name	Mention in external research or report	Specific product or fund
Innovation Agencies	CDTI		Partially refundable loan
Innovation Agencies	Innovation Norway	(OECD 2013)	Innovation Loan
Innovation Agencies	Israel Innovation Authority	(NESTA 2016)	Conditional grant
Innovation Agencies	Tekes		Convertible loans (R&D loans)
Innovation Agencies	TIA		Risk Funding Schemes
National Development Banks	BNDES		BNDES THAI
National Development Banks	BPI France	(British Business Bank 2015)	Prêt participatif de développement Innovation
National Development Banks	Business Development Bank of Canada	(OECD 2013; British Business Bank 2015)	Growth & Transition Capital
National Development Banks	KfW Bankengruppe	Mezzanine Product Family	ERP Mezzanine Finance for Innovation
National Development Banks	Small Industries Development Bank of India (SIDBI)	(UNIDO 2016, p.32)	Growth Capital and Equity Assistance
National Public Banks	ALMI	(OECD 2013)	Innovation Loan and Growth Loan
National Public Banks	British Business Bank		Help to Grow Loans
National Public Banks	Finnvera	(OECD 2015a)	Growth Loan
Public fund	Vaekstfonden (Danish Growth Fund)	(OECD 2013; UNECE 2007)	Subordinated loans
Multilateral Development Banks	African Development Bank		Equity and Quasi-Equity
Multilateral Development Banks	Asian Development Bank		Darby Asia Mezzanine Fund II
Multilateral Development Banks	European Investment Bank - EIB	(OECD 2015a)	InnovFin MidCap Growth Finance
Multilateral Development Banks	European Investment Fund - EIF		Mezzanine Facility for Growth
Multilateral Development Banks	Inter-American Development Bank		Investor in the Latin America Mezzanine Finance Fund
International Development Institutions	PROPARCO (AGF subsidiary)		quasi equity

Summary of the case studies (1/2)

Org/Item	Name of instrument	Type of instrument	Motivation	Risk sharing	Range of operations (£thousand)	Funding model and financial targets	Participation in overall budget
Org 1	Partially refundable loan	Convertible loan (to grant)	Covers a higher part of project comparing to grant	Loans converted to grants if projects are not successful	From 462	Funding considers "equivalent grant" (reduced interest and the grant itself)	70%
Org 2	Innovation Loan	Convertible loan (to grant)	Commercial lending market failures (long term, innovation)	Flexible collateral and payback times	From 97 to 1,900	30% limit for overall loss, no individual limit	14%
Org 3	Conditional grant	Royalty based Loan	Develop IP in the country	Company pays royalties if it sells, otherwise it is a grant	No limit, focused on early stage	Repayment reaches 40 to 50%	67%
Org 4	Risk Funding Schemes	Convertible Grant	Provide good incentive and share expectations, risks and rewards	Company pays percentage of turnover or issue shares if it sells, otherwise it is a grant	471 to 884	Receives funding as grant with no target in repayment	Up to 70%
Org 5	Hybrid Bond to Finance Innovation	Participating Debenture	Cover a gap for funding project scale up (radical innovation in basic industries)	No collateral, payment in royalties or shares	2,452 to 49,057	Same funding as equity operations	0%
Org 6	Unsecured Loans	Unsecured Loans	Develop intangible assets	No collateral, higher interest rate	46 to 4,627	Different sources, may request a fee from participants	18%

Summary of the case studies (2/2)

Org/Item	Name of instrument	Type of instrument	Motivation	Risk sharing	Range of operations (£thousand)	Funding model and financial targets	Participation in overall budget
Org 7	Innovation Loan and Growth Loan	Convertible loan (to grant)	Support the growth of early stage companies	Loans can be turned to grant if project does not succeed	Up to 27 (Innovation) or 92 (Growth)	Receives funding as grant with no target in repayment	25%
Org 8	Help to Grow Debt funds	Growth loan (unsecured and participating loans)	Support riskier projects not serviced with debt	Untangible assets Unsecured Equity share or warrant	Up to 2 Open	Freedom for the instrument, 2% overall	Help to Growt (new instrument, very limited). Deb: 19% of funds
Org 9	Subordinated Loan	Subordinated Loan	Provide risk capital for companies that are not able to reach equity investment	No collateral, in exchange for higher interest rate and subscription bonus in liquidity event	247 to 2,466	Keep the same invested capital	5%
Org 10	No specific product	Equity kicker, convertible loan	Support clients with limited collateral, growing revenues, high cash consuming, debt rationed	Equity shares depending on the results of the project	Not defined	Compose portfolio	No estimates
Org 11	No specific product	Convertible debt	Being an alternative to equity investments in emerging markets	Co-investment with private sector, guarantees	Not defined	Compose portfolio	No estimates

Answering the research questions (1/2)

P1: Are hybrid financial instruments being used by POFIs to finance innovation?; How different POFI categories use these instruments?

Yes, 70% of the POFIs assessed in secondary research present evidence of using hybrid instruments

P2. If so (if they are used by POFIs), how representative are they in the portfolio? What is the trend?

The participation in the cases varies from zero (in the case of recent instruments) up to 70% (when grants are involved) or up to 18% in debt/equity mix. There is a clear growth trend evidenced in 9 out of 11 interviews.

P3. Are they increasing the risk/return sharing when comparing to traditional instruments (grants, loans and equity)?;

RESPOSTA: Interviews indicated a clear improvement in risk and return sharing when comparing to grants and loan operations; when comparing to equity, it is not possible to assume a comparison since both share risks and rewards, but hybrids are acknowledged as a better option as they are more selective and better applicable to emerging markets

Answering the research questions (1/2)

P4. What would be the best strategy to implement them in other POFIs?

- Identify a niche
  - Ex-ante evaluation
  - Avoid targeting companies with excessive risk
  - Avoid targeting companies that would not need such a risk/reward balancing scheme

- Institutional design of the POFI should allow risk and reward sharing
  - It is important that these mechanisms provide additionally, not cannibalizing other instruments
  - The funding should be adequate and allow individual loses, targeting a portfolio gain
  - Avoid conflict of interest (as designing the instrument for profit only)
  - There has to be enough stability in the POFI management (a good example is TIA in South Africa, which has a annual plan for the instrument)

- Smart operation
  - Contract design with mechanisms that are easy to understand and apply
  - Internal team trained to operate this instrument, with good methodology and systems
  - In some cases executing these instruments indirectly (with private funds) may be an option

*https://conexaofintech.com.br/brasil/bndes-prepara-fundo-de-r-200-milhoes-para-emprestar-a-start-ups/

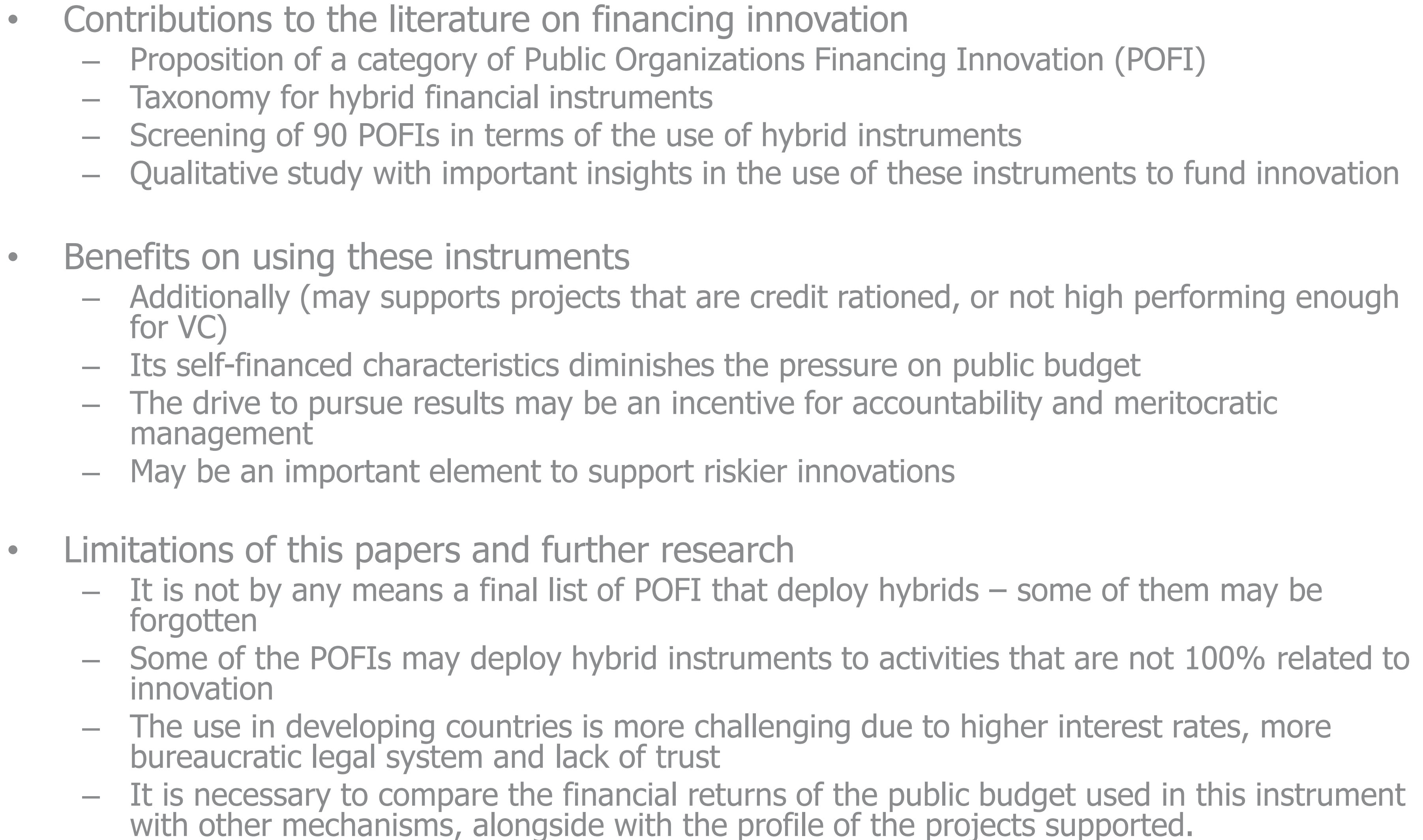
Main findings from the case studies

RQ	Suggested findings	Evidence in cases
2	Loan / grant types of hybrids are more relevant in portfolio than Loan / Equity	The only cases where hybrids accounted for more than 50% of overall budget was with grant and loan / equity mix
2	There is a trend of increasing their use	Growth trends indicated in 9 interviews; in one case (Bpifrance) it is regarded as the fastest growth segment of the organisation
3	Hybrids increase risk sharing comparing to grants	Evidences of biggest funding capacity and better incentives when comparing to grants
3	Hybrids increase risk sharing comparing loans	Evidences of private lending market failure for early stages and/or SMEs. Indication of collateral and track record as limiting points for the growth of these companies on usual debt products
3	More selective risk sharing when comparing to equity	Critics to equity investment, especially in emerging markets, due to lack of profitable and quick exit, complex management of shares for public entities
4	Have a previous research / clear market need	All the organisations indicated a clear need for hybrids as capable of filling financing gaps
4	Institutional design to support risk	Funding allow losses
4	Smart instrument operations	Given the complexity of the instrument, it has to be well designed to avoid being as long as equity without the same benefits; smart contracting and overseeing are important to avoid principal-agent issues

Mitigation for the main potential drawbacks

Issue	Possible solution
Quasi-equity deals are more complicated to set up when comparing to conventional loans	Both recipient and funder need to be compensated by the extra time and complexity (more flexible lending, more revenue opportunities, respectively.
Revenue participation-based models are more difficult to monitor	Create simples mechanisms to attach payback with company’s revenues, as a return cap/multiple.
Recipients may think of it as a grant	Establish clear rules on eventual trigger mechanisms
In successful cases, investees may feel “ripped off” by investors	Setting a limit in the revenue stream; if investee can prove business is viable, charge smaller percentage in change of solid warrant (sales prospects, etc.)
Charging more interest rate to balance the higher risk may be impractible, especially in developing countries	Rely more on the use of convertibles rather than just managing the risk of unsecured financing with higher interest rates

Conclusion



Thank you!

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