

# Public Venture Capital Funds and New Technology Based Firms

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## 1. Purpose and Background –Why Public Venture Capital Research?-

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★PUVC scheme have been a key policy issue for governments to promote not only new technology based firms(NTBFs) but also economic development since 2000.

*\*Governments throughout the world, Australia, U.S., European, China, Japan have established PUVC programs since the beginning of 2000’.*

*\*In Japan, The Innovation Network Corporation of Japan, the biggest PUVC was launched in 2009. It was capitalized at 300 billion yen or 3 billion US dollars. The Japanese government injecting 286 billion yen and 26 private corporations providing a further 14 billion yen.*

*\*In Europe, Numerous attempts by European governments, the European Union to foster the creation of US- or Silicon Valley style venture capital industries as a necessary preliminary step to support the generation of high-growth entrepreneurial firms.*

*\*PUVCs intend to develop dynamic private venture capital (PRVC) industry and alleviate the equity capital gap for young and innovative startups, new technology based firms (NTBFs).*

## 2. How Justify Public Interventions?

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### ▼ Positive spillover hypothesis

*\*It assumes that NTBFs generate positive externalities by commercializing their ideas and inventions, creating jobs and boosting economic development (Florida and Kenney, 1988; Audretsch 1995; Pfirrmann, Wupperfeld and Lerner, 1997; Lerner, 1997).*

*\*PUVCs are supposed to identify investments which will ultimately yield high private and/or social returns and provide value adding supports to the management of their portfolio firms.*

## 2. How Justify Public Interventions?

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### ▼ Market failure hypothesis

*\*It is presumed that NTBFs often cannot gain enough capital to start and expand their businesses.*

*\*And also assumed that public intervention can be helpful for filling the NTBFs' equity capital gap.*

*\*It highlights the risk of R&D externalities and agency problems surrounding NTBFs. Moreover, their human resource constraints, insufficient collaterals and lack of management experience appear to be reasons for their difficulties in raising capital. Thus, in this underdeveloped PRVC market,*

*\*Theoretically, VC is expected to be a financial intermediary that provides social and economic welfare to help alleviate the problems of adverse selection by intensively scrutinizing firms before providing capital and monitoring them afterwards.*

*\*PRVCs often do not get incentives to invest in NTBFs which have higher risks. Furthermore, the 2008-2009 financial crisis has deteriorated the situation, because PRVCs have become more risk adverse and have focused on later stage investments.*

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## Criticisms of the Two Hypotheses

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★ The effectiveness or appropriateness of PUVC programs is still controversial.

### ▼ Positive spillover hypothesis

*\*It has been argued PUVCs could identify successful investments either financially or socially and give appropriate value added supports as coaches.*

*\*Government officials might lack proper incentives, knowledge and experience to invest in NTBFs (Lerner, 2002; Leleux and Surlemont, 2003).*

*\*Due to the broader objectives not only financially but also socially than PRVCs, they might be less accountable for their activities.*

### ▼ Market failure hypothesis

*\*PUVCs might have reduced PRVCs' chances to invest in NTBFs (Armour and Cumming 2006).*

*\*This might weaken the functions of PRVCs.*

### 3. Research Questions

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▼RQ1: How has the positive spillover hypothesis been discussed in the prior researches?

\*This micro level researches have focused on PUVCs' portfolio selections, value adding activities and investment performance.

▼RQ2: How has the market failure hypothesis been discussed in the prior researches?

\*This macro level researches have focused on crowding-in or crowding-out effects and the effectiveness of entries in the capital market.



## 4. Review Methodology

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### ▼ Major databases

ABI/INFORM, Business Source Premier and Science Direct, Web of Science and Google Scholar

### ▼ Keywords

“public venture capital,” “publicly backed venture capital,” “publicly supported venture capital,” “public sector venture capital,” “government venture capital,” “government backed venture capital,” “government-supported venture capital,” “university seed fund” and “seed funds.”

### ▼ More than 180 peer reviewed papers

### ▼ Extracting the relevant 72 papers from initial pool of 180

### ▼ Dividing them into two groups

Micro level and Macro level researches



# The relevant 72 papers

Paper	Year	Journal
Chen, J., Liao, W. M., & Lu, C. (2012). The effects of public venture capital investments on corporate governance: evidence from IPO firms in emerging markets. <i>Abacus</i> , 48(1), 86-103.	2012	Abacus
Avots, K., Strenga, R., & Paalzow, A. (2013). Public venture capital in Latvia. <i>Baltic Journal of Economics</i> , 13(1), 3-30.	2013	Baltic Journal of Economics
Cumming, D., & MacIntosh, J. (2007). Mutual funds that invest in private equity? An analysis of labour-sponsored investment funds. <i>Cambridge Journal of Economics</i> , 31(3), 445-487.	2007	Cambridge Journal of Economics
Lerner, J., & Tåg, J. (2013). Institutions and venture capital. <i>Industrial and Corporate Change</i> , 22(1), 153-182.	2013	Corporate Change
Johan, S., Schweizer, D., & Zhan, F. (2014). The Changing Latitude: Labor-Sponsored Venture Capital Corporations in Canada. <i>Corporate Governance: An International Review</i> , 22(2), 145-161.	2014	Corporate Governance: An International Review
Vanacker, T., Heughebaert, A., & Manigart, S. (2014). Institutional Frameworks, Venture Capital and the Financing of European New Technology-based Firms. <i>Corporate Governance: An International Review</i> , 22(3), 199-215.	2014	Corporate Governance: An International Review
Grilli, L., & Murtinu, S. (2014B). New technology-based firms in Europe: market penetration, public venture capital, and timing of investment. <i>Industrial and Corporate Change</i> .	2014	Industrial and Corporate Change
Knockaert, M., Lockett, A., Clarysse, B., & Wright, M. (2006). Do human capital and fund characteristics drive follow-up behaviour of early stage high-tech VCs?. <i>International Journal of Technology Management</i> , 34(1-2), 7-27.	2006	International Journal of Technology Management
Le Bas, C., & Picard, F. (2006). Models for allocating public venture capital to innovation projects: lessons from a French public agency. <i>International Journal of Technology Management</i> , 34(1-2), 185-198.	2006	International Journal of Technology Management
Colombo, M. G., Grilli, L., & Verga, C. (2007). High-tech Start-up Access to Public Funds and Venture Capital: Evidence from Italy. <i>International Review of Applied Economics</i> , 21(3), 381-402.	2006	International Review of Applied Economics
Cumming, D. (2014). Public economics gone wild: Lessons from venture capital. <i>International Review of Financial Analysis</i> , 36, 251-260.	2014	International Review of Financial Analysis
Keuschnigg, C., & Nielsen, S. B. (2001). Public policy for venture capital. <i>International Tax and Public Finance</i> , 8(4), 557-572.	2001	International Tax and Public Finance
Buzzacchi, L., Scellato, G., & Ughetto, E. (2013). The investment strategies of publicly sponsored venture capital funds. <i>Journal of Banking &amp; Finance</i> , 37(3), 707-716.	2013	Journal of Banking & Finance
Lerner, J. (1999). The government as venture capitalist: the long-run impact of the SBIR program. <i>Journal of Business</i> , 72(3), 285-318.	2000	Journal of Business
Alperovych, Y., Hübner, G., & Lobet, F. (2015). How does governmental versus private venture capital backing affect a firm's efficiency? Evidence from Belgium. <i>Journal of Business Venturing</i> , 30(4), 508-525.	2015	Journal of Business Venturing
Guerini, M., & Quas, A. (2015). Governmental venture capital in Europe: Screening and certification. <i>Journal of Business Venturing</i> .	2015	Journal of Business Venturing
Munari, F., & Toschi, L. (2015). Assessing the impact of public venture capital programmes in the United Kingdom: Do regional characteristics matter?. <i>Journal of Business Venturing</i> , 30(2), 205-226.	2015	Journal of Business Venturing
Croce, A., Martí, J., & Murtinu, S. (2013). The impact of venture capital on the productivity growth of European entrepreneurial firms: 'Screening' or 'value added' effect?. <i>Journal of Business Venturing</i> , 28(4), 489-510.	2013	Journal of Business Venturing
Carpentier, C., L'her, J. F., & Suret, J. M. (2010). Stock exchange markets for new ventures. <i>Journal of Business Venturing</i> , 25(4), 403-422.	2010	Journal of Business Venturing
Cumming, D. (2007). Government policy towards entrepreneurial finance: Innovation investment funds. <i>Journal of Business Venturing</i> , 22(2), 193-235.	2007	Journal of Business Venturing
Cumming, D., & MacIntosh, J. (2006). Crowding out private equity: Canadian evidence. <i>Journal of Business venturing</i> , 21(5), 569-609.	2006	Journal of Business Venturing
Venkataraman, S. (2004). Regional transformation through technological entrepreneurship. <i>Journal of Business venturing</i> , 19(1), 153-167.	2004	Journal of Business Venturing
Leleux, B., & Surlémont, B. (2003). Public versus private venture capital: seeding or crowding out? A pan-European analysis. <i>Journal of Business Venturing</i> , 18(1), 81-104.	2003	Journal of Business Venturing
Cumming, D., Grilli, L., & Murtinu, S. (2014). Governmental and independent venture capital investments in Europe: A firm-level performance analysis. <i>Journal of Corporate Finance</i> .	2014	Journal of Corporate Finance
Jeng, L. A., & Wells, P. C. (2000). The determinants of venture capital funding: evidence across countries. <i>Journal of corporate Finance</i> , 6(3), 241-289.	2000	Journal of Corporate Finance
Toole, A. A., & Czarnitzki, D. (2007). Biomedical academic entrepreneurship through the SBIR program. <i>Journal of Economic Behavior &amp; Organization</i> , 63(4), 716-738.	2007	Journal of Economic Behavior & Organization
Bottazzi, L., Da Rin, M., & Hellmann, T. (2008). Who are the active investors?: Evidence from venture capital. <i>Journal of Financial Economics</i> , 89(3), 488-512.	2008	Journal of Financial Economics
Cumming, D., & Johan, S. (2009). Pre-seed government venture capital funds. <i>Journal of International Entrepreneurship</i> , 7(1), 26-56.	2009	Journal of International Entrepreneurship



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Koppel, J. G. (1999). The challenge of administration by regulation: preliminary findings regarding the US government's venture capital funds. <i>Journal of Public Administration Research and Theory</i> , 9(4), 641-666.	1999	Journal of Public Administration Research and Theory
Da Rin, M., Nicodano, G., & Sembenelli, A. (2006). Public policy and the creation of active venture capital markets. <i>Journal of Public Economics</i> , 90(8), 1699-1723.	2006	Journal of Public Economics
Keuschnigg, C., & Nielsen, S. B. (2002). Tax policy, venture capital, and entrepreneurship. <i>Journal of Public Economics</i> , 87(1), 175-203.	2002	Journal of Public Economics
Heinonen, J., & Hytti, U. (2016). Entrepreneurship mission and content in Finnish policy programmes. <i>Journal of Small Business and Enterprise Development</i> , 23(1).	2016	Journal of Small Business and Enterprise Development
Lim, S., & Kim, Y. (2015). How to Design Public Venture Capital Funds: Empirical Evidence from South Korea. <i>Journal of Small Business Management</i> , 53(4), 843-867.	2015	Journal of Small Business Management
Pintado, T. R., Lema, D., Pérez, D. G., & Van Auken, H. (2007). Venture capital in Spain by stage of development. <i>Journal of Small Business Management</i> , 45(1), 68-88.	2007	Journal of Small Business Management
Cumming, D., & Johan, S. (2010). Venture capital investment duration. <i>Journal of Small Business Management</i> , 48, 228-257.	2010	Journal of Small Business Management
Armour, J., & Cumming, D. (2006). The legislative road to Silicon Valley. <i>Oxford Economic Papers</i> .	2006	Oxford Economic Papers
Florida, R., & Kenney, M. (1988). Venture capital, high technology and regional development. <i>Regional Studies</i> , 22(1), 33-48.	1988	Regional Studies
Colombo, M. G., D'Adda, D., & Pirelli, L. H. (2016). The participation of new technology-based firms in EU-funded R&D partnerships: The role of venture capital. <i>Research Policy</i> , 45(2), 361-375.	2016	Research Policy
Bertoni, F., & Tykvová, T. (2015). Does governmental venture capital spur invention and innovation? Evidence from young European biotech companies. <i>Research Policy</i> , 44(4), 925-935.	2015	Research Policy
Grilli, L., & Murtinu, S. (2014A). Government, venture capital and the growth of European high-tech entrepreneurial firms. <i>Research Policy</i> , 43(9), 1523-1543.	2014	Research Policy
Meuleman, M., & De Maeseneire, W. (2012). Do R&D subsidies affect SMEs' access to external financing?. <i>Research Policy</i> , 41(3), 580-591.	2012	Research Policy
Link, A. N., & Scott, J. T. (2010). Government as entrepreneur: Evaluating the commercialization success of SBIR projects. <i>Research Policy</i> , 39(5), 589-601.	2010	Research Policy
Jääskeläinen, M., Maula, M., & Murray, G. (2007). Profit distribution & compensation structures in publicly & privately funded hybrid venture capital funds. <i>Research Policy</i> , 36(7), 913-929.	2007	Research Policy
Wright, M., Lockett, A., Clarysse, B., & Binks, M. (2006). University spin-out companies and venture capital. <i>Research policy</i> , 35(4), 481-501.	2006	Research Policy
Wright, M., Lockett, A., Clarysse, B., & Binks, M. (2006). University spin-out companies and venture capital. <i>Research policy</i> , 35(4), 481-501.	2006	Research Policy
Murray, G. (1998). A Policy Response to Regional Disparities in the Supply of Risk Capital to New Technology-based Firms in the European Union: The European Seed Capital Fund Scheme. <i>Regional Studies</i> , 32(5), 405-419.	1998	Research Policy
Brander, J. A., Du, Q., & Hellmann, T. (2014). The effects of government-sponsored venture capital: International evidence. <i>Review of Finance</i> .	2014	Review of Finance
Chemmanur, T. J., Krishnan, K., & Nandy, D. K. (2011). How does venture capital financing improve efficiency in private firms? A look beneath the surface. <i>Review of financial studies</i> , 24(12), 4037-4090.	2011	Review of financial studies
Bertoni, F., Colombo, M. G., & Quas, A. (2015). The patterns of venture capital investment in Europe. <i>Small Business Economics</i> , 45(3), 543-560.	2015	Small Business Economics
Knockaert, M., & Vanacker, T. (2013). The association between venture capitalists' selection and value adding behavior: Evidence from early stage high tech venture capitalists. <i>Small Business Economics</i> , 40, 493-509.	2013	Small Business Economics
del-Palacio, I., Zhang, X., & Sole, F. (2012). The capital gap for small technology companies: public venture capital to the rescue?. <i>Small Business Economics</i> , 38(3), 283-301.	2012	Small Business Economics
Link, A. N., & Scott, J. T. (2012). Employment growth from the small business innovation research program. <i>Small Business Economics</i> , 39(2), 265-287.	2012	Small Business Economics
Revest, V., & Sapio, A. (2012). Financing technology-based small firms in Europe: what do we know?. <i>Small Business Economics</i> , 39(1), 179-205.	2012	Small Business Economics
Leicht, K. T., & Jenkins, J. C. (1998). Political resources and direct state intervention: the adoption of public venture capital programs in the American States, 1974-1990. <i>Social Forces</i> , 76(4), 1323-1345.	1998	Social Forces
Wang, J., Wang, J., Ni, H., & He, S. (2013). How Government Venture Capital Guiding Funds Work in Financing High-Tech Start-Ups in China: A 'Strategic Exchange' Perspective. <i>Strategic Change</i> , 22(7-8), 417-429.	2013	Strategic Change
Carpentier, C., & Suret, J. M. (2010). The Canadian public venture capital market. <i>Strategic Change</i> , 19(7-8), 303-323.	2010	Strategic Change
Luukkonen, T., Deschryvere, M., & Bertoni, F. (2013). The value added by government venture capital funds compared with independent venture capital funds. <i>Technovation</i> , 33(4), 154-162.	2013	Technovation



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Lerner, J. (2002). When bureaucrats meet entrepreneurs: the design of effective public venture capital programmes. <i>The Economic Journal</i> , 112(477), F73-F84.	2002	The Economic Journal
Kochenkova, A., Grimaldi, R., & Munari, F. (2015). Public policy measures in support of knowledge transfer activities: a review of academic literature. <i>The Journal of Technology Transfer</i> , 1-23.	2015	The Journal of Technology Transfer
Munari, F., Pasquini, M., & Toschi, L. (2015). From the lab to the stock market? The characteristics and impact of university-oriented seed funds in Europe. <i>The Journal of Technology Transfer</i> , 40(6), 948-975.	2015	The Journal of Technology Transfer
Cumming, D., & Johan, S. (2014). Venture's economic impact in Australia. <i>The Journal of Technology Transfer</i> , 1-35.	2014	The Journal of Technology Transfer
Colombo, M. G., Cumming, D. J., & Vismara, S. (2014). Governmental venture capital for innovative young firms. <i>The Journal of Technology Transfer</i> , 1-15.	2014	The Journal of Technology Transfer
Knockaert, M., Wright, M., Clarysse, B., & Lockett, A. (2010). Agency and similarity effects and the VC's attitude towards academic spin-out investing. <i>The Journal of Technology Transfer</i> , 35(6), 567-584.	2010	The Journal of Technology Transfer
Secrieru, O., & Vigneault, M. (2004). Public venture capital, occupational choice, and entrepreneurship. <i>Topics in economic analysis &amp; policy</i> , 4(1).	2004	Topics in economic analysis & policy
Cumming, D. (2011). Misinforming the public about public policy towards venture capital. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 13(1), 99-102.	2011	Venture Capital: An International Journal of Entrepreneurial Finance
Colombo, M. G., Luukkonen, T., Mustar, P., & Wright, M. (2010). Venture capital and high-tech start-ups. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 12(4), 261-266.	2010	Venture Capital: An International Journal of Entrepreneurial Finance
Block, J., & Sandner, P. (2009). What is the effect of the financial crisis on venture capital financing? Empirical evidence from US Internet start-ups. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 11(4), 295-309.	2009	Venture Capital: An International Journal of Entrepreneurial Finance
Rubin, J. S. (2009). Developmental venture capital: conceptualizing the field. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 11(4), 335-360.	2009	Venture Capital: An International Journal of Entrepreneurial Finance
Cumming, D., & Johan, S. (2008). Information asymmetries, agency costs and venture capital exit outcomes. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 10(3), 197-231.	2008	Venture Capital: An International Journal of Entrepreneurial Finance
Lerner, J., & Watson, B. (2008). The public venture capital challenge: the Australian case. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 10(1), 1-20.	2008	Venture Capital: An International Journal of Entrepreneurial Finance
Hood, N. (2000). Public venture capital and economic development: the Scottish experience. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 2(4), 313-341.	2000	Venture Capital: An International Journal of Entrepreneurial Finance
Dahlstrand, A., & Cetindamar, D. (2000). The dynamics of innovation financing in Sweden. <i>Venture Capital: An International Journal of Entrepreneurial Finance</i> , 2(3), 203-221.	2000	Venture Capital: An International Journal of Entrepreneurial Finance

## 5. Micro Level Researches

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▼ RQ1. How has the positive spillover hypothesis been discussed in the prior researches?

◇ The distinctive propensities of PUVCs ‘

pre- and post-investment activities

- Portfolio selections
- Value adding activities.

◇ The investment performance

- Exit performance
- Growth of sales / Employment

★PUVCs seem to invest in seed or early stage firms and in relatively high tech firms such as biotechnology. In addition, they also chose local targets in accordance with their political objectives.

*\*Cumming (2007) reveals that the Innovation Investment Funds in Australian are 46% more likely to finance seed stage firms than other types of private funds, and 27% more likely to finance early stage firms than other types of private funds. Besides, the IIFs are more likely to finance the following: 34% in biotech/medical, 14% in computer and 17% in Internet, than other types of PRVCs.*

*\*PUVCs specialize in investments that do not attract other types of VCs in industries such as biotechnology and also more frequently select local investment targets(Bertoni, Colombo and Quas, 2015).*

*\*In South Korea, PUVCs invest more in the bio-sector than PRVCs (Lim and Kim, 2015).*

### ★ Longer investment duration, Less sensitive to IPOs

*\*Buzzacchi, Scellato and Ughetto (2013) imply that PUVCs tend to postpone the exit of their portfolio firms if they might contribute social returns in addition to the private ones.*

*\*Jeng and Wells (2000) find PUVC has different sensitivities to the determinants of VC than non-PUVC. In detail, PUVC is less sensitive to IPOs across countries.*

### ★ Ineffective substitute but effective complement -Innovation-

*\*Bertoni and Tykvová (2015) imply that PUVCs are an ineffective substitute, but an effective complement of PRVC.*

*\*Le Bas and Picard (2006) insists three crucial issues for PUVCs to support innovative projects: management of intellectual property assets, management of external relationships of the firms and management of knowledge or human capital based on the case study of French PUVC organizations.*

### ★ Commercialization, R&D partnership channel -Network-

*\*Colombo, D'Adda and Pirelli (2016) reveal that VC backing has a strong positive impact on NTBF's participation in EU-funded R&D partnerships and PUVCs and bank-affiliated VCs exhibit the strongest positive effects with regard to the magnitude of the impact of VC backing.*



## These Support Activities Effective?

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★Effective: Monitoring intensively, Creating better corporate governance structures

*\*Cumming (2007) finds Australian IIFs finance on average 0.3 fewer firms per manager than other types of private funds. Thus, IIFs and funds affiliated with the IIFs seem to monitor more intensively and to add more value to their investee firms relative to other types of PRVCs.*

*\*In Taiwan, PUVC investments add value to new initial public offering (IPO) firms not only in financing but also in creating better corporate governance structures, according to Chen, Liao and Lu (2012).*

## These Support Activities Effective?

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### ★ Ineffective -Less value-adding activities and Less productivity

*\*Bottazzi, Da Rin and Hellmann (2008) find that PRVCs are more active than 'captive' (bank-, corporate-, or government-owned) VCs. VCs with partners that have prior business experience are more active in recruiting managers and directors, helping with fundraising, and interacting more frequently with their portfolio firms.*

*\*Knockaert, Lockett, Clarysse and Wright (2006) and Knockaert and Vanacker (2013) find that investment managers of captive funds were less involved in value-adding activities.*

*\*Alperovych, Hübner and Lobet (2015) find that the PUVC-backed firms display significant reductions in productivity and in exist.*

*\*Cumming and Johan (2009) imply that the LSVCFs provide less value adding activities and also less effectiveness.*

*\*Luukkonen, Deschryvere and Bertoni (2013) find the importance of the value-adding contributions of PUVCs was less than those of PRVCs.*



### ★ Positive results

*\*Lerner (1999) examines the long-run performance of high-technology firms receiving funds from the SBIR. It finds that the SBIR program awardees enjoy substantially greater employment and sales growth and are more likely to receive VC financing.*

*\*Link and Scott (2012) mention that the public funding of research by the SBIR program is more likely to stimulate employment when the government created a market for the products, processes, or services developed by the research projects even although the direct impact of the SBIR funded projects on employment is small, especially when compared to the average number of employees in the firms.*

*\*In Australia, the IIFs are relatively successful in terms of facilitating R&D, innovation, and economic growth compared to PUVC programs in other countries, according to Cumming and Johan (2014).*

### ★ Negative results

*\*Grilli and Murtinu (2014b) reveal that PUVC-backed NTBFs underperform with respect to PRVC-backed ones and do not grow more than non-venture capital-backed firms.*

*\*Cumming, Grilli and Murtinu (2014a) specify that PRVC backed firms have better exit performance than PUVC backed firms.*

*\*In Canada, Cumming and Johan (2008) reveal that Canadian VCs have had less success in achieving initial public offerings (IPOs) than VCs in Australasia, Europe and the US. They suggest that these are consistent with the view that the dominant presence of Labor Sponsored Venture Capital Funds (LSVCFs), a Canada PUVCs, have given rise to a high proportion of less successful exits and more write-offs.*

*\*Cumming and MacIntosh (2007) find Canadian Labor Sponsored Venture Capital Funds (LSVCFs) have significantly underperformed industry benchmarks and have charged higher management expense ratios.*

★ VC managers or Market conditions are more significant.

*\*Cumming and Johan (2008) find that among four PSFs in Canada, one PSF has outperformed the other PSFs with regards to the portfolio firms' patents and financial statement performance, even though this fund has invested less money and charged lower management fees than its counterparts. They imply that the impact of PUVCs depends not only on the design of the program but also on the selection of the VC managers carrying out the investments.*

*\*Cumming (2007) mentions that there are not statistically significant differences with regard to the exit performance of the IIFs in Australia. It suggests that market conditions are the most significant determinant of exit outcomes.*

### ★ Effectiveness of co-financing with PRVC

*\*Cumming, Grilli and Murtinu (2014) find that mixed-syndicates of PRVC and PUVC give rise to a higher likelihood of positive exits than that of PRVC-backing.*

*\*Brander, Du and Hellmann (2014) find that there is a positive association between mixed funding of PUVCs and PRVCs and successful exits, as measured by initial public offerings (IPOs) and acquisitions, attributable largely to the additional investment.*

*\*Grilli and Murtinu (2014b) also mention that when PUVCs co-finance young innovative NTBFs with PRVCs, the portfolio firm's sales growth has been observed to be positive and statistically significant.*

*\*Grilli and Murtinu (2014a) only when led by PRVCs, a positive and statistically significant impact of syndicated investments by both types of investors on firm sales growth.*

## 6. Macro Level Researches

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▼RQ2. How has the market failure hypothesis been discussed in the prior researches?

◇Crowding-in or crowding-out effects

◇Effectiveness of PUVCs' entries in the market

## Crowding-in Effects

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*\*Brander, Du and Hellmann (2014) find that markets with more PUVC funding have more VC funding per enterprise and more VC-funded enterprises.*

*\*Guerini and Quas (2015) find that PUVC funding increases the likelihood that firms will receive PRVC.*

*\*Cumming (2014) points out that PUVCs have not crowded-out PRVCs with the study spanning 13 countries in Europe.*

*\*In Scotland, Hoo (2000) mentions that the activities of the Scottish Development Finance has become well understood and followed by the formation of new PRVC market.*

*\*In Spain, Zhang and Sole (2012) learns public intervention may be positively contributing to fostering PRVC market.*

*\*In Australia, Cumming (2007) finds that IIFs funded firms are more likely to have one extra staged financing round and one extra syndicated partner than other types of funds.*

*\*In South Korea, Lim and Kim (2015) find that, in the growth stage of the VC market, the PUVCs seem to significantly induce VCs to invest more in NTBFs.*

## Crowding-out Effects

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*\*As PUVCs have broader objectives than PRVCs, they are less accountable for generating high returns.*

*Therefore, the provision for cheap equity capital discourages private investors, leading to replacement rather than engagement of PRVCs (Colombo, Cumming and Vismara, 2014).*

*\*Armour and Cumming (2006) find that PUVC programs more often hinder than help the development of private equity.*

*\*In the case of the UK, Munari and Toschi (2015) confirm that the VC market in the UK has undergone a significant reduction in investments by PRVCs*

*\*In Canada, Cumming and MacIntosh (2006) point out that the Labor Sponsored Venture Capital Corporations (LSVCCs) have displaced other types of VC funds, implying that it has resulted in crowding-out.*

### **★ Crowding-out previous PUVCs**

*\*In Australia, a PSF program diminished the incentives for a previously existing PUVCs program, IIFs (Cumming and Johan, 2009). It implies that competing government initiatives appeared to be crowding-out one another.*

## No correlation between PUVC and crowding-in or out

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### ★ No evidence

*\*Leleux and Surlemont (2003) find that their analyses do not support the view that public venture capitalists are acting to seed the industry or that are they crowd-out private funds.*

*\*Da Rin, Nicodano, and Sembenelli (2006) indicate that no evidence of the effectiveness to increase the NTBFs investments by channeling more PUVCs into VC markets.*

### ★ Different investment pattern

*\*Bertoni, Colombo and Quas (2015) point out that PUVCs have not been able to attract PRVCs to the NTBFs because the different investment patterns of PRVCs and PUVCs have proven to be stable over time.*

*\*Buzzacchi, Scellato and Ughetto (2013) imply that PUVCs tend to postpone the exit of their portfolio firms if they might contribute social returns in addition to the private ones so that the problem of potential crowding out effects seems to be mitigated.*



### ★ Effectiveness of co-investment with PRVCs

*\*Brander, Du and Hellmann (2014) find that enterprises funded by both PUVC and PRVC obtain more investment than firms funded purely by PRVCs, and much more than those funded purely by PUVCs.*



## ★Effective

*\*In Sweden, PUVCs fill the 'capital gap' in the R&D and startup phase firms and support a wide variety of technologies and industries not only today's growth industries (Dahlstrand and Cetindamar, 2000).*

*\*In China, the local governments usually play dominant roles in VC market owing to their strategic resources (Wang, Wang, Ni and He, 2013).*

## ★Partially effective

*\*Lerner and Watson (2008) indicates that the Australian government has acted decisively to stimulate the country's VC sector not only by the PUVC programs or initiatives but also by the complimentary policies and regulatory reforms such as tax incentives. It implies that the complimentary policies and regulatory reforms are also necessary to alleviate the gap.*

*\*In Latvia, Avots, Strenga and Paalzow (2013) mention that the financial gap for pre-seed and early-stage funding still remains (Avots, Strenga and Paalzow, 2013).*



## Effectiveness of PUVCs' Entries in the market

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### ★ Not effective

*\*Colombo, Grilli, and Verga (2007) investigate the determinants of NTBF's access to PUVCs and PRVCs based on a sample composed of 550 Italian NTBFs and find that the presence of inefficiencies in VC markets that are not alleviated by the existing Italian technology policy measures towards high-tech start-ups.*

*\*In South Korea, the injected public capital in government-managed and sponsored VCs do not considerably contribute to filling the gap (Lim and Kim, 2015).*



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Others

★ *Signaling effects are argued among researchers behind the crowd-in effects*

*\*The selective provision of PUVCs to NTBFs can signal their high potential to PRVCs and thus, foster the additional funding of these firms.*

*\*Owing to these signaling effects, PUVCs could have a positive crowding-in effect on the development of VC markets (Leleux and Colombo, Grilli, and Verga, 2007; Colombo, Cumming and Vismara, 2014).*

*\*del-Palacio, Meuleman and Maeseneire (2012) find that obtaining a R&D subsidy provides a positive signal about the NTBF's quality and results in better access to long-term debt.*

## Classification of VC

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In the prior researches, VC has been classified by scholars in accordance with mainly their ownership and governance structures.

\*Grilli and Murtinu (2014b) classify VC largely into two types: public venture capital (PUVC) and private venture capital (PRVC) in their research which focuses on the effect of PUVC and PRVC on the sales growth of NTBFs.

\*Colombo, Cumming and Vismara (2014) classify VCs differently: independent VC and captive VC. Independent VC is a limited partnership in which a management company raises capital from limited partners, often institutional investors. Captive VC includes corporate VC, bank-controlled VC, and governmental VCs (Colombo, Cumming and Vismara, 2014).

→In this presentation, I hired the concise classification of the former one: PUVC and PRVC because my research focus is PUVCs as economic policies.

## Definition of PUVC

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\*Lerner (2002) outlines that PUVC initiatives are programs that make equity or equity-like investments in SMEs, or encourage other intermediaries to make such investments.

\*In the literature, there are different definitions of PUVC ranging from a narrower focus on VCs which consist of public financing, to broader classifications that include taxation policies to encourage the investment of PRVCs.

\*Regarding the public financing, it can be classified into three categories: direct public funds consisting of 100 % government fund, hybrid private-public funds, and funds-of-funds which invest in other investment funds rather than investing directly in firms (Colombo, Cumming and Vismara, 2014).

→In this presentation, I adopt the broader definition including taxation policies and different types of public financing.

## Taxes affect PUVC's portfolio selections

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\*Johan, Schweizer and Zhan (2014) investigate the role corporate governance and government policy plays in the portfolio choices of the Labor-Sponsored Venture Capital Corporations (LSVCCs) and find LSVCCs in Ontario are more likely to include public firms in their portfolios after the announcement of the change in tax policy. They imply that LSVCCs' style drift may be a result of their preparing for potential wealth transfer or liquidation by retail investors.

\*Keuschnigg and Nielsen (2003) investigate the effects of taxes on the equilibrium level of managerial advice, entrepreneurship and welfare, considering differential wage and capital income taxes, a comprehensive income tax, progressive taxation as well as investment and output subsidies to the entrepreneurial sector. They imply that taxes towards VC and entrepreneurship positively or negatively affect improvements in social welfare.