

VILNIUS UNIVERSITY

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**IMPACT OF PUBLIC VENTURE CAPITAL
ON ECONOMIC DEVELOPMENT**

Summary of doctoral dissertation

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The dissertation will be defended at the public meeting of the scientific council in the field of economics on 16 May 2014 at 2 pm in auditorium 403 at the Faculty of Economics, Vilnius University.

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VILNIAUS UNIVERSITETAS

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**VALSTYBINIO RIZIKOS KAPITALO POVEIKIS
EKONOMIKOS PLĖTRAI**

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SUMMARY OF DOCTORAL DISSERTATION

Relevance of the topic. Upon a still hardly developing Lithuania's economy based on innovation and high-tech, it is required to pay an exceptional attention to high-tech financing; solely by joint efforts, businesses, governmental bodies, and higher education institutions are capable to ensure a continuous and irreversible progress in innovation and high technology and sustainable economic development in pursuance of a new society development quality.

Meanwhile, the recent economic progress has had almost no influence on the country's innovativeness or the production efficiency: according to the Summary Innovation Index, calculated by the European Commission, Lithuania took the 4th place from the end among all the EU countries in 2006 and, by 2012, managed to improve its ranking only by one place (European Commission, 2013); in 2011, high and medium-high-tech products in Lithuania amounted only to 17.4% of the total industrial output; since 2002, this rate has increased only by 1.7 percentage point. National business sector investments in research and development (hereinafter – R&D) are five times lower than the EU average; it results in a small proportion of high-tech and innovations in a national industry composition, that, in turn, contributes to a low production efficiency and a low labour productivity – in Lithuania, it barely amounts to 62% of the EU average.

On the other hand, in terms of R&D staff, Lithuania is little behind the EU's average. According to Eurostat, in 2009, there were 7.4 of R&D employee in Lithuania and 10.7 – in the EU per 1,000 labour force. However, the majority of Lithuanian R&D personnel work in higher education and governmental bodies; in 2009, business sector contained only 13% of R&D personnel, while the EU average was 44%. This means that Lithuania has a sufficient knowledge potential, the problem is commercialization of the knowledge. This fact is also proved by incredibly low rates of industrial and intellectual property rights protection: Lithuania, in terms of a number of patents, is behind the EU average by 15-20 times (depending on a type of patents).

An irreversible breakthrough in innovation and high technology area requires an adequate financing infrastructure, to be ensured by relevant financing instruments. Both experience of other countries, systematically presented in the 2nd part of the dissertation, and practical examples in Lithuania demonstrate that banks alone cannot assume responsibility for financing or, even more so, for formation of innovative industries.

Suitable financial solutions for innovative business start-up financing are various venture capital instruments such as venture capital funds, business angels, private equity investment firms, etc. Yet, this activity is equally successful not in all countries: venture capital funds, which started operating in Lithuania a few years after Independence, has not played any significant role in a development of innovative economy or in a formation of new business industries. Of course, it was mostly influenced by a small volume of such funds and by their tendency to finance buyout transactions.

Venture capital market recovery is felt from the end of 2010, after establishment of first hybrid¹ venture capital funds financed under European JEREMIE initiative; however, even they alone, due to their small size (in 2007-2013, 80 million Euros of the EU support was granted under JEREMIE initiative), are not capable to finance innovative business breakthrough and development. This requires a systematic approach

¹ I.e., co-financed by the EU support and private resources.

of the Government toward a problem of innovative business financing, first and foremost, by acknowledging the existence of the problem and, then, by developing guidelines for its potential solutions.

Therefore, it can be stated that the problem of selecting appropriate financing instruments for innovative business start-ups also brings up a question of who should be responsible for a selection of such instruments. It means that not only an arsenal of ready-made financing instruments should be prepared but also that the Government should have guidelines or, even, a strategy of the formation of economic development.

In the absence of a properly formulated strategy at the state level, any existing funds, especially given their small size, will further finance separate projects in a random manner, without contributing to creation of new industries or to the formation of community development. Meanwhile, a public venture capital fund, as a state policy tool designed for creating new business sectors, might induce the development of venture capital market in the country and, thus, contribute to the formation of an innovative, high-technology-based national economy.

Of course, a mere public venture capital fund is not enough to achieve the above mentioned objectives ó it is rather necessary to coordinate efforts of all institutions. However, a smoother financing of young innovative companies and defining guidelines for new business sectors would enable public VC fund to contribute to the development of a national venture capital market, and also to the awareness-raising and forming a positive public opinion on the venture capital. Currently, as studies show, society has neither opinion nor knowledge about the functioning of venture capital in the country.

Relevant issues of innovation and high-tech promotion in Lithuania, current financing infrastructure which poorly addresses the above issues, and a highly promising performance of public venture capital funds in foreign countries are the factors which have determined research topic selection, formulation of goals and objectives.

The research problem and awareness in Lithuania and the world. Venture capital in Lithuania is a new and little-analyzed topic. Studies made in the field can be conditionally divided into two periods: before 2009-2010, upon establishment of Lithuanian Private Equity and Venture Capital Association and first hybrid venture capital funds, and the period after that.

Early studies mainly analyze the process of innovation and do not focus enough on venture capital (Ge as et al., 2003; Valentinavi ius, 2006; Jakubavi ius et al., 2008). Studies in the field of venture capital became more active since 2009, after the establishment of Lithuanian Private Equity and Venture Capital Association. This was the beginning of analysis of the venture capital's impact on business development (Laurinavi ius & Jasien , 2008; Laurinavi ius & Laurinavi ius Alg., 2011; Laurinavi ius, 2012a, 2012b, 2013; Snie-ka & Venckuvien , 2010a, 2010b, 2011a, 2011b, 2012; Venckuvien , 2013) and on the national competitiveness (Laurinavi ius & Smilga, 2011, 2012), as well as of various variables' impact on national venture capital system (Jankauskien & Kaupelyt , 2009; Jankauskien , 2009).

Foreign authors have analyzed venture capital topic in detail. Relation of venture capital to innovation was revealed in works of Audretsch et al. (2006) (Germany's example), Sorensen (2006), Cumming (2007), Da Rin & Penas (2007), Gompers et al. (2007), Wonglimpiyarat (2007), Caselli et al. (2009) (Italy's example), Klepper (2009), Fritsch (2010) (Germany's example), Fritsch & Schroeter (2010), Baptista & Preto

(2011), Dutta (2011), and Kelly (2011); relation of venture capital to cultural dimensions was analyzed in studies of Da Rin et al. (2006), Gompers et al. (2006), McMullen et al. (2007), and Li & Zahra (2012).

Venture capital, as an alternative to banking financing, was studied in works of Edwards & Fischer (1994), Holmstrom & Tirole (1997), and Berger & Udell (1998), while venture capital, as a factor of economic development is in works of Shane (2008), Ferrary & Granovetter (2009), and Colombo et al. (2012).

Advantages of public venture capital were revealed in works of Jaaskelainen et al. (2007), Bagby et al. (2008), Ahlstrom et al. (2010), Grundling et al. (2010) (China's example), Lerner (2002, 2010), Fritsch (2010) Fritsch & Schilder (2011), and many other authors, many of which are systematized in the 1st part of the dissertation.

Shortcomings of public venture capital are revealed and solutions offered by Gompers & Lerner (1999), Lerner (2002), Leleux & Surlemont (2003), Armour & Cumming (2006), Cumming & MacIntosh (2006), Plage (2006), Cumming & Johan (2009) (Australia's example); considerations when choosing between private and public venture capital are generalised by Lerner et al. (2005) (New Zealand's example), Avnimelech & Teubal (2006) (Israel's example), Da Rin et al. (2006), Meyer (2006), Cumming (2007) (Australia's example), Jaaskelainen et al. (2004, 2007), Aernoudt et al. (2008) (the Netherlands' example), Suchard (2009), Brander et al. (2010), Grundling et al. (2010), Samila & Sorenson (2010), Del-Palacio et al. (2012) (Spain's example), and Ibrahim (2012).

Object of the research is public venture capital as a tool of venture capital market incentive, innovative business start-up financing, and state policy, which helps addressing imperfect/inefficient market situations where private venture capital does not access all market participants.

Object of the research is presented in Fig. 1:

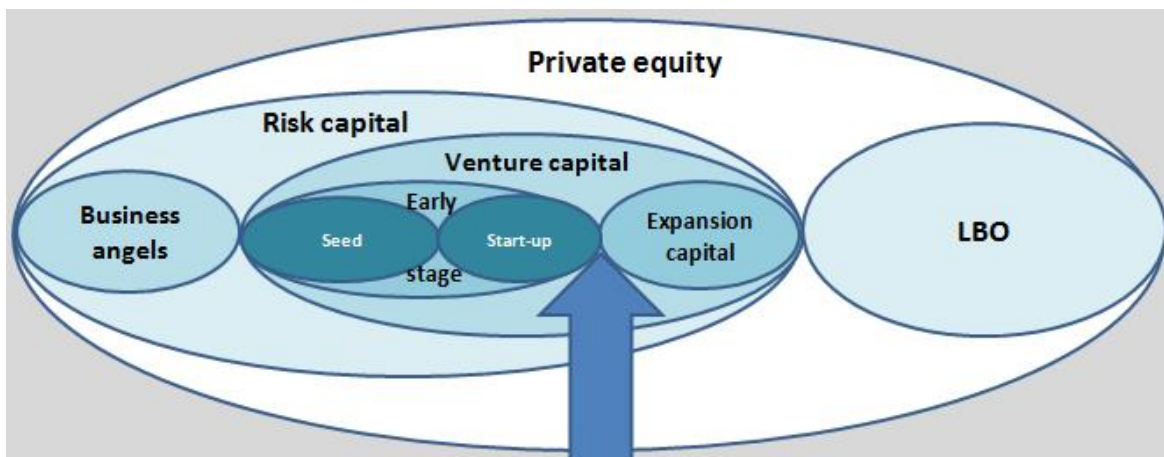


Fig. 1. Object of the research

Source: compiled by the author based on the data of the EC (European Commission, 2006)

Figure 1, providing a mutual relationship of different parts of private equity, demonstrates that the object of the dissertation research is venture capital, or a formal part of a risk capital.

Purpose of the research is to reveal the importance of public venture capital to national venture capital sector, its impact on the economy and, based on the experience of European countries, to create a hypothetical model of public venture capital development in Lithuania.

Tasks of the research:

1. To overview theoretical aspects of public venture capital in foreign authors' scientific works and to compare the tools proposed by the authors in order to develop public venture capital.
2. To analyze public venture capital tools, which have been implemented in foreign countries, to assess their advantages and shortcomings.
3. To evaluate the level of study of public venture capital topic in Lithuanian authors' scientific works.
4. To analyze the state of Lithuanian innovation development and financing and venture capital systems, to evaluate their efficiency and potential impact of public venture capital on the above systems.
5. To create a hypothetical model of public venture capital development which could be implemented in Lithuania; to evaluate model's parameters and operating principles, the factors influencing it, sources of its financing, divestment techniques, and expected results.
6. To interpret the results and, based on the study limitations, to present conclusions and recommendations.

Research methods. In order to achieve the purpose and to solve the tasks, foreign and Lithuanian scientific literature's primary and secondary sources collection, grouping and systematization, generalization, comparison, and logical analysis methods have been used.

Analysis and evaluation of foreign countries' practical experience has included the calculation of absolute and relative indicators; analysis of Lithuanian innovation development and financing and venture capital systems has applied a graphical data representation. Calculation of absolute and relative indicators and graphical data representation were performed using the *Microsoft Office* applications.

The author's study consists of:

1. Correlation analysis. Correlation coefficients between public venture capital and various variables in the European countries were calculated. At a high correlation, regression coefficients were calculated.
2. Based on the correlation and regression analysis, the multiple correlation between public venture capital and various variables was formulated.
3. Factor analysis was performed in order to reveal and group factors influencing public venture capital.

Research resources. The dissertation analyzes scientific works of Lithuanian and foreign authors. Comparative analysis of public venture capital programmes, ongoing in foreign countries, is based on empirical studies of foreign authors.

Lithuanian innovation and venture capital system is evaluated by analyzing the data from Lithuanian Department of Statistics, Eurostat databases, Lithuanian Private Equity and Venture Capital Association's publications.

Data, necessary for the author's study, was collected from European Private Equity & Venture Capital Association, European Organisation for Economic Co-operation and Development (hereinafter – OECD), Eurostat and the European Commission.

The dissertation has referred to a number of Lithuania's and EU legislation:

- analysis of venture capital regulation in the EU was based on the Community guidelines on State aid to promote venture capital investments in small and medium-sized enterprises (2006/C 194/02); Communication from the Commission amending the Community guidelines on State aid to promote venture capital investments in small and medium-sized enterprises (2010/C 329/05); and Regulation (EU) No. 345/2013 of the European Parliament and of the Council on European venture capital funds;
- analysis of legal regulation on collective investment undertakings in Lithuania was based on the Law on Collective Investment Undertakings of the Rep. of Lithuania; Directive 2004/39/EC of the European Parliament and of the Council on markets in financial instruments; Directive 2009/65/EC of the European Parliament and of the Council on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS); Law on Collective Investment Undertakings for informed investors of the Rep. of Lithuania; and Amendment to the Law on Economic Partnerships of the Rep. of Lithuania.

Defended propositions:

1. Commercialization of R&D results is complicated due to the lack of young innovative companies financing. By contributing to commercialization of R&D results, venture capital not only has a positive impact on innovation and high-tech development, but also on the overall economic development.
2. When a country lacks private venture capital, VC market development itself runs slowly – it needs a direct state aid; regulation alone is not enough. Public venture capital fund may act as an accelerator of venture capital market development: a properly developed and implemented public venture capital model would induce the development of a local venture capital market.
3. Public venture capital programmes and tools are most effective when they lay the foundation for sustainable functioning of a private venture capital market in the long term. Therefore, a public venture capital fund should act as a catalyst and, by attracting a foreign venture capital, make syndicated investments in high-tech firms, founded in the country, and, thus, stimulate the development of both private venture capital market and high-tech industry.
4. Public venture capital is as well preferred in imperfect market situations, in order to close financing gaps and solve the problems of information asymmetry. In addition, public venture capital is characterized by a positive external effect of R&D.
5. Due to different legal and financial systems and a stricter labour market regulation, continental European countries have more advantages in applying public venture capital programmes, while the Anglo-Saxon countries have poorer results – therewith, it is a good news for Lithuania.

Scientific novelty and theoretical significance of the research. Scientific novelty of the work is supported by the fact that public venture capital is a little-analyzed topic in Lithuanian authors' works, while public venture capital fund as a public policy tool promoting private venture capital market, has not been ever analyzed at all.

The author's study is significant for the development of economic science under the following aspects:

- the systematic comparative analysis of public venture capital programmes, implemented in foreign countries, has allowed to highlight main advantages and disadvantages of such programmes;
- evaluation of the state of national innovation and venture capital systems has revealed a potential new tool to solve financing problems - public venture capital;
- the importance of public venture capital to the national venture capital sector, innovations, and the overall economy has been revealed and evaluated;
- a hypothetical model of public venture capital development has been created, which might be implemented in Lithuania, its parameters, functioning principles, legal framework, divestment techniques, and expected results have been discussed, potential sources of the policy financing have been analysed;
- using the created model, a potential positive impact of public venture capital on Lithuania's economy has been estimated;
- a factor analysis allowed to reveal and to group factors influencing public venture capital;
- as well, completely new observations and conclusions of the author regarding an impact of institutional complements (legal and financial systems and the labour market) on the success of public venture capital programmes have been established.

Practical significance of the research:

- dissertation material might be helpful to academics, and experts who study innovation and venture capital promotion issues;
- created hypothetical model of public venture capital development might be used to implement a national pilot experiment; later, upon its validation, it can be a basis for a full-fledged public venture capital policy in Lithuania;
- after implementation of the public venture capital model, formulated by the author, one might hope for the progress in national venture capital market development;
- after implementation of the public venture capital model, at least a partial alternative to banking financing would be created, which might become particularly important in times of crisis;
- the implemented model would enable to fill financing gaps in industry sectors where venture capital is currently inaccessible;
- the implemented model can have a positive impact on R&D commercialization, development of high-tech and, even, of the overall economy.

Structure and scope of the study. The doctoral thesis consists of the introduction, three chapters, conclusions and recommendations, a list of references, and annexes. The doctoral dissertation contains 217 pages, 29 tables and 25 figures; 200 references were used for the purposes of the thesis.

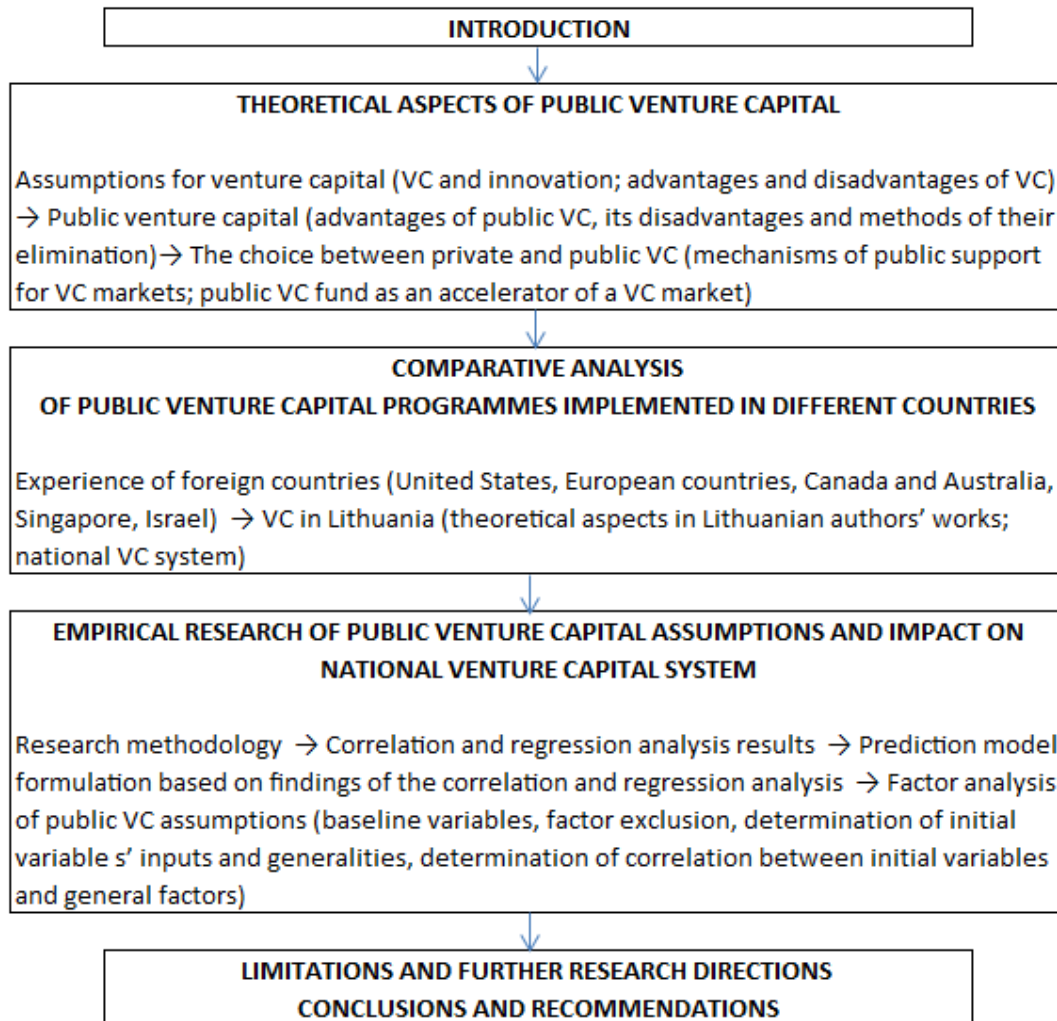


Fig. 2. Logical structure of the dissertation

Source: compiled by the author

The logical structure of the dissertation is presented in Fig. 2. It shows the consecutive realization of the study objectives.

Theoretical aspects of public venture capital

Venture capital became an object of research in the late 80s (Landström, 2009); an impact of venture capital on national innovative capacity is analysed in subsequent works. The dissertation covers many authors who have analyzed venture capital, and the table below summarizes their key ideas (Table 1):

Table 1. Impact of venture capital on economic development

The effects of the impact of venture capital on economic development	Authors
Venture capital and innovations	
Venture capital ensures growth and recovery of the national economy	Bygrave & Timmons (1992)
Venture capital catalyzes the process of entrepreneurship	Wonglimpiyarat (2007)
Volume of venture capital in an industry significantly increases its number of patents	Kortum & Lerner (2000)
There is a positive correlation between venture capital and technological innovation	Da Rin & Penas (2007), McKnight & Parker (2001), Hellmann & Puri (2000), Kaplan & Stromberg (2000), Kortum & Lerner (1998), McCann (1991), Bygrave & Timmons (1986)
There is a positive moderate correlation between private equity investment in the national economy and the level of national innovativeness	Laurinavi ius & Smilga (2012)
Venture capital as an alternative to bank financing	
Absence or insufficiency of collaterals: financing with low collateral (or without it at all) requires regular control which, along with financing, may be ensured solely by venture capital funds	Berger & Udell (1998), Holmstrom & Tirole (1997)
Newly established companies, especially innovative ones, are unwillingly financed by banks due to low banks involvement in governance of such companies	Edwards & Fischer (1994)
Venture capital as a factor of economic development	
Venture capital stimulates not only innovation and entrepreneurship, but also creation of new jobs and economic development	NVCA (2007), Botazzi et al. (2002), Kortum & Lerner (2000)
Sales of companies, where venture capitalists invest, grow faster	Jeng & Wells (2000)
Signalling effect	Ferrary & Granovetter (2009)
Venture capital has a positive impact on the formation of industrial clusters, thus, ensuring a positive external effects on technological innovation	Colombo et al. (2012)

Source: compiled by the author

The dissertation also contains a detailed analysis of advantages and shortcomings of public venture capital and methods of elimination of the latter. The following two

tables summarize the author's study of theoretical aspects of public venture capital (Tables 2 and 3):

Table 2. Benefits of public venture capital

No.	Benefits of public venture capital	Authors
1.	Fixing market failures:	
1.1.	Because of asymmetric information, newly established, small and/or high-tech companies do not have access to capital markets, bank financing, and have difficulties raising funds from private venture capital investors. Public VC eliminates such information asymmetry problems.	Grundling et al. (2010), Da Rin et al. (2006), Lerner (2002)
1.2.	Positive external R&D effect	Chang et al. (2002), Jaffe (1996), Griliches (1992)
1.3.	Financing deficits or gaps:	
1.3.1.	Public venture capital finances early-stage high-risk activities (related to information asymmetry)	Hyytinen & Pajarinen (2003)
1.3.2.	Venture capital investments themselves (without state intervention) tend to be geographically concentrated	Fritsch & Schilder (2011), Zook (2002), Manigart et al. (1996), Florida & Kenney (1988)
1.3.3.	Venture capital investments themselves (without state intervention) tend to be concentrated in certain sectors	Lerner (2002), Devenow & Welch (1996)
2.	Public VC plays a catalyst role in attracting foreign venture capital and promotes syndication of venture capital funds, thus, contributing to the development of private venture capital market	Cumming (2007), Armour & Cumming (2006), Sorensen & Stuart (2001), Lockett & Wright (1999), Gompers & Lerner (1998), OECD (1997)
3.	Public VC stimulates investment during economic downturn or recession, since the private venture capital market is sensitive to cyclical fluctuations	Lerner (2010)
4.	"Signalling" effect is "a guarantee of reliability" or a "quality signal", which is sent to prospective investors and customers, therefore, the chances of public VC-financed companies to attract private venture capital in later stages of growth is higher; in addition, sales of such companies grow faster, they create more jobs, and have higher labour productivity	Aernoudt et al. (2008), Bates et al. (2008), Lerner (1999)

Source: compiled by the author

Table 3. Disadvantages of public venture capital and the ways to fix them

Disadvantages of public venture capital	Suggested measures how to fix the disadvantages
Public VC does not always invest in the best companies, besides, it does not stop investing in "hopeless projects" in pursuing better "survival" statistics. As a result, inefficient firms or, even, sectors, that would otherwise withdraw, continue to exist (Leleux & Surlemont, 2003; Lerner, 2002; Wallsten, 2000; OECD, 1997; Florida & Smith, 1993; Cohen & Noll, 1991)	To expand relationships with private investors, to focus on technologies which are less popular or associated with a higher risk, to invest more during downturns ó i.e., to fill financing gaps (Gompers & Lerner, 1999)
Officials of state agencies may lack the necessary knowledge or experience required to select (and later ó to support) innovative companies. In addition, they lack a motivation: while receiving a fixed salary, they are not concerned about success of businesses, as compared to private fund owners participating in capital of such companies (Leleux & Surlemont, 2003; Lerner, 2002; Gompers & Lerner, 1999; OECD, 1997)	Public funds could be allocated to private venture capital firms
Moral hazard or agency dilemma	Decentralization of decisions and distribution of decision making officials among various state agencies. In this way, it is harder to identify the decision-makers and to try to influence them (Lerner, 2002). In addition, public venture capital funds should contain independent investment committees (European Commission, 2006).
An increased supply of venture capital may reduce the average rate of return below a level acceptable to private investors, or, state-funded investors may invest in projects with a negative pre-tax return (OECD, 1997)	To avoid tax incentives
Inefficient firms may be artificially overestimated, thus, becoming less attractive in the eyes of informed investors; uninformed investors, when purchasing such firms, might also pay a too high price due to information	Such risk is not typical exceptionally to public venture capital; private venture capital comes across it as well

asymmetry	
Private investments “crowding out” effect (Armour & Cumming, 2006; Cumming & MacIntosh, 2006)	This risk does not occur in poorly developed markets, it is therefore suggested to use public venture capital as an accelerator of private venture capital markets and, upon their successful start to withdraw it
The investment “crowding out” effect also exists among separate state programmes (Cumming & Johan, 2009)	For such a risk occurrence, it is, first and foremost, necessary to run at least <u>two</u> public venture capital programmes

Source: compiled by the author

Based on the above said, it can be stated that a public venture capital fund should act as a catalyst and, by attracting foreign venture capital, make syndicated investments in high-tech firms, founded in the country, and, thus, stimulate the development of both private venture capital market and the high-tech industry.

There are various forms of public venture capital, and their choice should be defined not as a search for the best one, but as a search for the best possible option under certain conditions (country’s development level, a certain type of national financial system, capital market size and liquidity, etc.). In summary, methods of state support for venture capital markets are shown in Fig. 3:

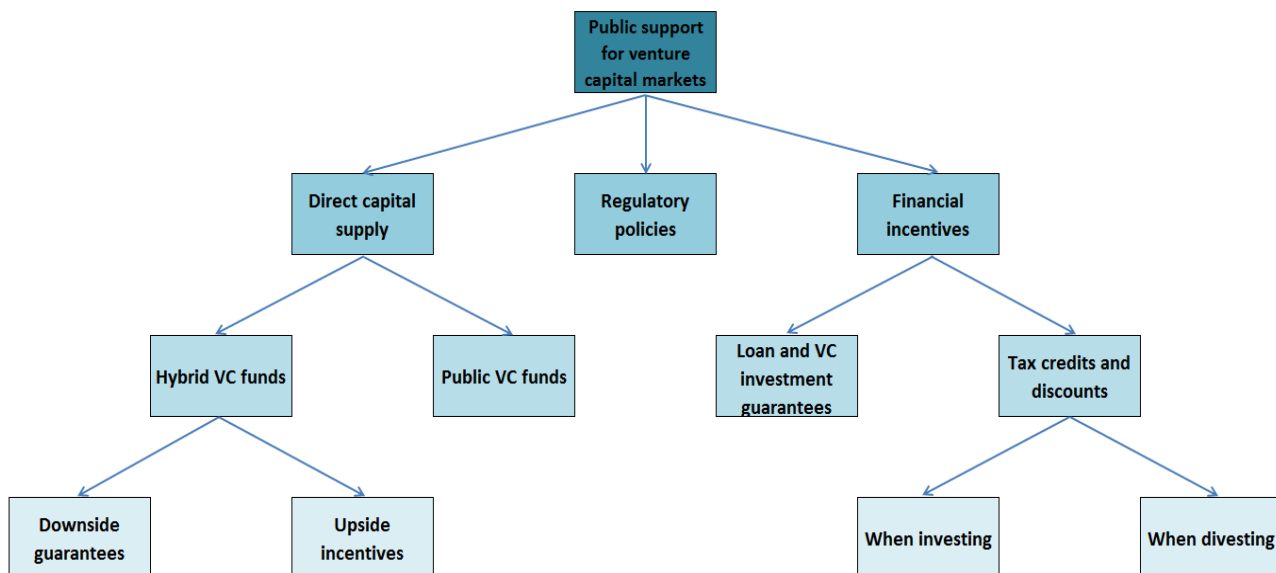


Fig. 3. The means of public support for venture capital markets

Source: compiled by the author

Based on analysis of the methods of state support for venture capital markets, also public venture capital financing sources, and divestment opportunities, a principal public venture capital use scheme is made, summarising a hypothetical public venture capital model (Fig. 4):

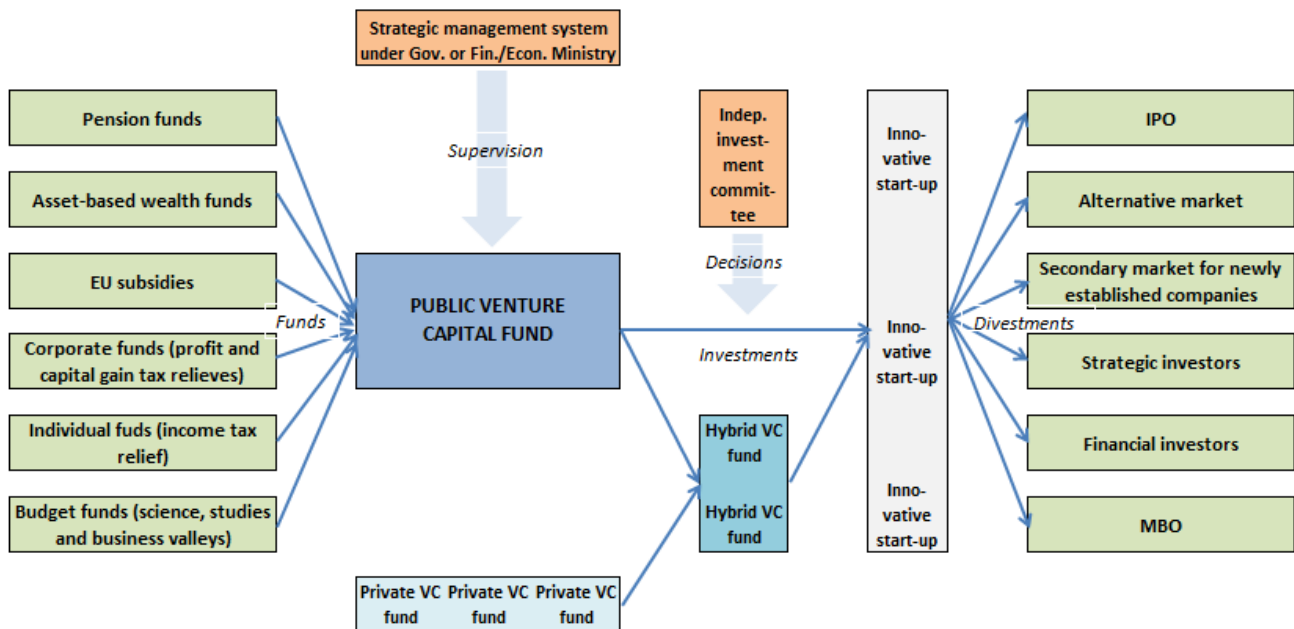


Fig. 4. Hypothetical model of public venture capital
 Source: compiled by the author

The public venture capital diagram, provided in the model, illustrates funds' turnover cycle, where, first and foremost, those funds are attracted from various sources (pension, welfare funds, etc.). Then, they are invested into innovative start-ups (either directly or in cooperation with private venture capital funds), and finally, they are divested, i.e., companies (or a share of companies owned by a public VC fund) are sold, while the funds can be re-used for new venture capital investments.

Comparative analysis of public venture capital programmes implemented in different countries

In recent years, many European, Asian, and American governments launched public programmes to stimulate development of venture capital markets. Though the programmes were structured differently (as shown in the previous part of the thesis), state regulation in practice, like in theory, is justified by market failure arguments, and venture capital initiatives are aimed at early-stage technology companies which face higher business and financial risks and have more challenges in attracting private capital. Governments' efforts in venture capital markets are fluctuating from the creation of a favourable business development environment and improvement of the investment climate to tax incentives for venture capital investors and the foundation of a public venture capital fund.

A detailed analysis of foreign experience leads to a conclusion that the most of difficulties in applying public venture capital programmes experienced Anglo-Saxon countries:

1. In 1958, United States launched the *Small Business Investment Company* Programme, under which there were founded 700 companies. In 14 years, only 272 of them survived. In addition, semiconductor manufacturers, involved in the public venture capital *Sematech* programme, have significantly reduced their R&D costs (private investment "crowding out" effect). Finally, a part of winners

in the public venture capital *Small Business Investment Research* programme, whose shares were traded on the stock exchange, have succeeded to reduce their R&D costs immediately after the winning.

2. *Labour Sponsored Venture Capital Corporation* programme in Canada "crowded out" private investments, reducing total volume of venture capital in the country approximately by 1 billion U.S. dollars per year.
3. The investment "crowding out" effect also exists among separate public programmes stimulating venture capital investment: a mixed *Pre-Seed Fund* programme in Australia has diminished incentives of other public programme *Innovation Investment Fund* to invest in pre-seed-stage high-risk activities.
4. Companies, funded from UK's public venture capital programmes, had lower profit margins and survival probabilities than those where private venture capital funds were invested.

Meanwhile, continental Europe had much better results:

1. A public venture capital programme achieved success in Germany, and the Netherlands are a perfect example of how a public venture capital, after having stimulated development of the private one, gives the way to the latter.
2. In Norway, public venture capital investments have been a strong factor in a private venture capital's market recovery after the banking crisis in the late nineties.
3. Spanish venture capital market has been developing rapidly over the past 10 years; this development has coincided with the start of a governmental policy to promote technological entrepreneurship. One of the reasons of Spain's public venture capital programme's success was private venture capital's deficiency, due to which private investments' "crowding out" risk virtually did not exist (or was minimal).
4. Portugal has a similar situation, where large public venture capital investments in the early nineties have led to a significant increase in private venture capital investments.

What makes these findings important for Lithuania? Or, why would public venture capital in Lithuania, like in other continental European countries, function successfully?

1. Anglo-Saxon countries own more private venture capital, therefore, they need less public one (hence various "crowding out" effects).
2. Anglo-Saxon countries are likely to have more private venture capital due to the fact that the common law system ensures a better protection of minor shareholders and creditors than the continental Europe's legal system which is based on the Civil Code – therefore, the latter part of Europe is more needful for public venture capital. In addition, common law system provides a better protection of industrial property (Anglo-Saxon countries register a higher number of patents), thus, there is a lower positive external effect of R&D and a less necessary public venture capital, in order that would "absorb" the effect.
3. The difference in labour market regulation leads to different ways of adapting the economy to an external shock (e.g., upon occurrence of financial crisis): a more flexible labour market regulation in Anglo-Saxon countries allows them to absorb

effects of a shock through a labour market (simple and inexpensive dismissals); meanwhile, adaptation of the economy to a shock in a continental Europe, where labour market regulation is more severe, runs through the financial system: long-term relationships with banks (financial system, based on financial intermediaries) ensure the missing flexibility in case of a shock and do not punish as promptly and rigorously as impersonal capital markets. Public venture capital funds, like banks, maintain long-term relationships, thus, they operate better in countries with a stricter labour market regulation.

Venture capital in Lithuania

Venture capital is a new and little-analyzed topic in Lithuania. Research in the field of venture capital intensified in 2009, most likely, due to an establishment of Lithuanian Private Equity and Venture Capital Association and a newly-appeared JEREMIE initiative.

After establishing Lithuanian Private Equity and Venture Capital Association, European Private Equity & Venture Capital Association started to calculate Lithuanian venture capital industry's data, in fact, in conjunction with the one of Latvia and Estonia. Fig. 5 shows the growth of Baltic venture capital sector in 2009-2011²:

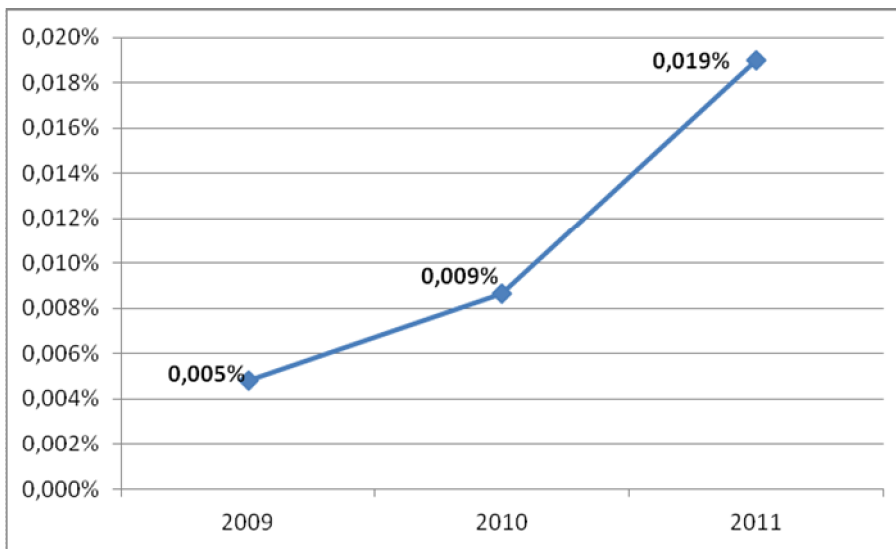


Fig. 5. Venture capital investments in Baltic countries as a percentage of GDP

Source: compiled by the author based on the data of EVCA (EVCA, 2011, 2012)

However, despite the rapid growth Baltic countries are still lagging behind the European average (Fig. 6):

² Latest available data.

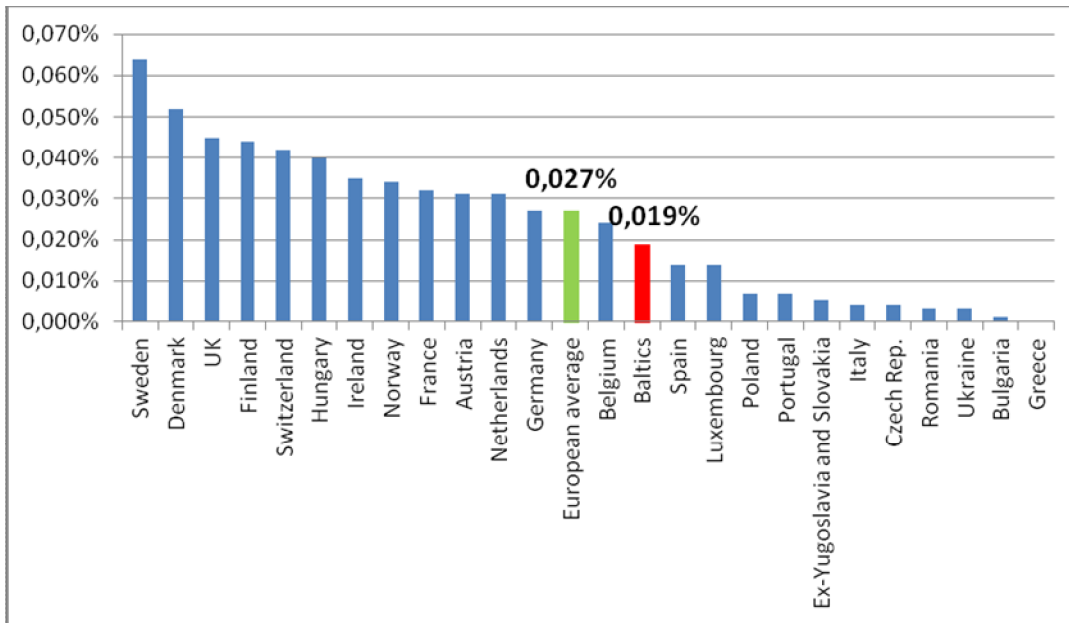


Fig. 6. Venture capital investments in European countries in 2011 as a percentage of GDP

Source: compiled by the author based on the data of EVCA (EVCA, 2012)

As already mentioned, EU initiatives are currently playing the key role in stimulating the development of venture capital in Lithuania. The following diagram (Fig. 7) demonstrates the change in investment of venture capital funds, established under the JEREMIE initiative, in Lithuania (by number of companies). It is also a good initial³ estimate of dynamics in the Lithuanian venture capital industry:

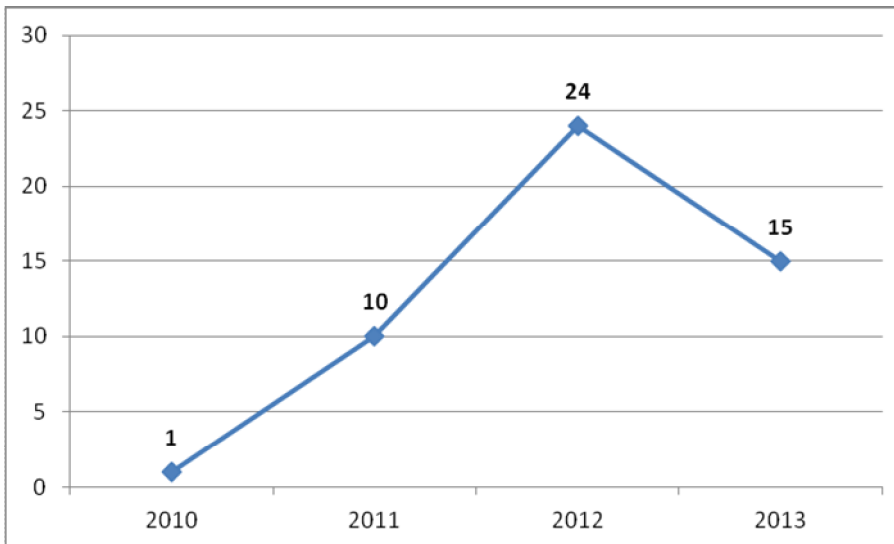


Fig. 7. Investments of JEREMIE venture capital funds in Lithuania (by number of companies)

Source: compiled by the author

³ There was no EVCA Report for 2013 published yet in the beginning of 2014, and the Report for 2012 provides data for 2011 only, presented in Fig. 6.

As one can see, in 2010, when the first venture capital fund was established under the JEREMIE initiative, only one investment was made. Later, a number of investments grew and reached a peak in 2012. The decline in investment in 2013 was apparently influenced by the fact that, by the end of 2012, venture capital funds exhausted their limited financial resources, that had been granted to them under the JEREMIE initiative, while the new investment cycle shall start only upon divesting primary funds (thus, likely in about 3 years). It is also likely that similar trends in venture capital investments in Lithuania will be validated by the EVCA data to be published later.

In total, JEREMIE funds have already invested 27.6 million Euros in 56 companies (including investments made in the beginning of 2014) in Lithuania, that is, nearly half a million Euros in each of them⁴. Turnover of the companies, which were owned by venture capital funds at least a year, has grown on average by 66% since the beginning of investment in the selected company, while the number of employees ó by 14% per year. These results have been evidently achieved owing to the fact that such companies are just commencing their activities, thus, the growth rates are high (69% of the companies in the JEREMIE fund portfolios have been operating less than 3 years). These rates would be more appropriate to compare with similar rates of companies which failed to attract funding; however, this would be a separate study.

Empirical research of public venture capital assumptions and its impact on national venture capital system

In order to reveal an impact of public venture capital on national venture capital and financial sectors as well as on the overall economy, correlation coefficients between public venture capital and various variables were calculated (nearly 200 primary variables were analyzed on the initial phase of the study). After the analysis of correlation between public venture capital and the above variables, the significance of dependence was evaluated; at a statistically high correlation, regression coefficients were calculated.

In summarizing the analysis results, it can be stated that public venture capital affects many variables: a venture capital volume in the country at the early (seed, start-up) and later stages, a number of IPOs on the stock exchange, a volume of local, European and non-European venture capital, a general venture capital volume in the country, a size of follow-on investments and investments in high-tech. The generalised impact of public venture capital on different variables is shown in Figure 8:

⁴ In comparison, 17.6 million Euros were invested in 40 companies in Latvia during the same period.

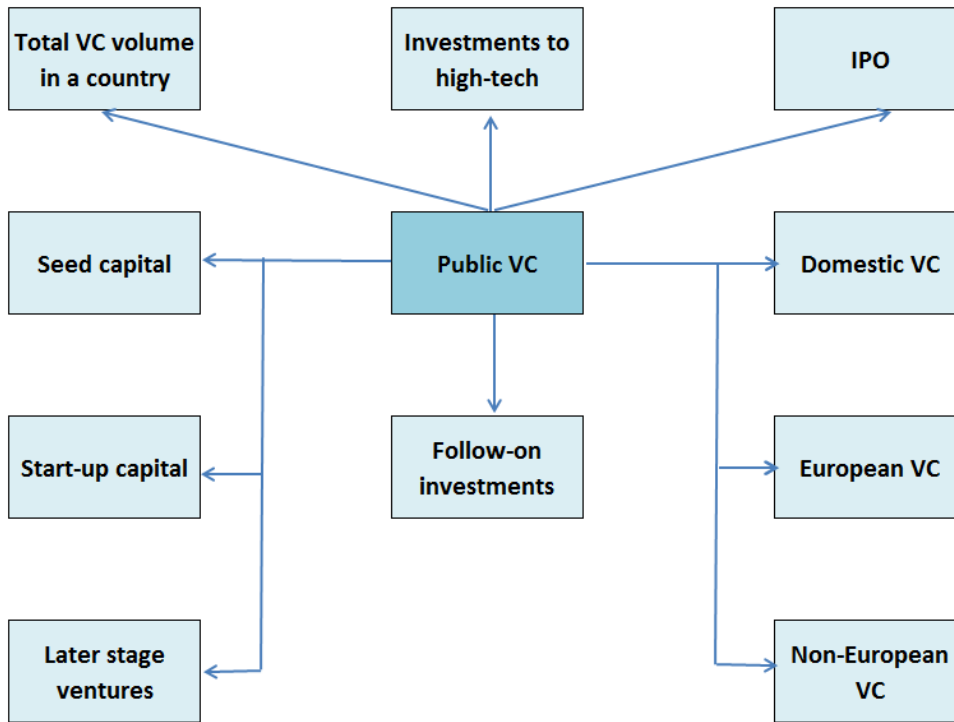


Fig. 8. Impact of public venture capital on different variables

Source: compiled by the author

In order to group the aspects of public venture capital's impact on economy and to adapt them for forecasting, a hypothetical forecasting model, which helps to evaluate a potential benefit of public venture capital policy in the country, has been formulated.

The first equation of the model appears as follows:

$$\Delta X = \frac{1}{0,19} \Delta y_1 - \frac{1}{0,27} \Delta y_2 + \frac{1}{0,02} \Delta y_3 \quad (1)$$

where:

X ó venture capital raised by government agencies

y₁ ó seed capital (by number of companies)

y₂ ó later stage capital (by number of companies)

y₃ ó number of IPO-s (by number of companies)

The 1st equation shows what happens when the proportion of venture capital raised by government agencies increases by 1 percentage point in national venture capital system:

- seed capital (by number of companies) increases on average by 0.19 p.p. (and, consequently, decreases in the later stages of business development). Thus, public venture capital does indeed have a positive effect on early-stage venture capital development, while the empirical study results validate theoretical works by other authors reviewed in the first section of the dissertation;
- later-stage venture capital (also by number of companies) decreases on average by 0.27 p.p. ó validation of the first conclusion on the venture capital structure redistribution in favour of earlier business development stages;

- c) the number of IPO:s (by number of companies) slightly increases which means that public venture capital has a positive even though small impact on stock market development.

The 2nd equation depicting dependency of different variables on venture capital invested by public sector is as follows:

$$\Delta Z = \frac{1}{0,53} \Delta v_1 + \frac{1}{0,27} \Delta v_2 + \frac{1}{0,71} \Delta v_3 + \frac{1}{1,09} \Delta v_4 + \frac{1}{0,78} \Delta v_5 \quad (2)$$

where:

Z ó venture capital invested by public sector

v₁ ó start-up capital (by number of companies)

v₂ ó non-European part of venture capital (by amount invested)

v₃ ó total venture capital volume (by number of companies)

v₄ ó follow-on venture capital investments (by amount invested)

v₅ ó part of venture capital investments in high-tech (by amount invested)

The 2nd equation shows what happens when the proportion of venture capital invested by public sector increases by 1 percentage point in national venture capital system:

- a) start-up capital (by number of companies) increases on average by 0.53 p.p. Comparing the results obtained with the estimates stated above, it can be seen that, upon increase in public venture capital by 1 p.p., early-stage capital (i.e., seed and start-up capital) increases by 0.72 p.p. (0.19 p.p. seed and 0.53 p.p. start-up) As stated above, investments in later-stage venture capital decreases by 0.27 p.p., yet, the overall result still stays positive at almost 0.5 p.p.;
- b) venture capital from non-European countries (by amount invested) has increased by 0.27 p.p. These results could be determined either by the syndication effect of international venture capital funds or by the òcrowding outö effect of private European (or local) venture capital investments, which, unfortunately, occurs as a possible negative side affect of public venture capital investments. Of course, the above result might be caused by both effects together: upon increase in a share of public venture capital in the national venture capital structure, a share of local private venture capital decreases (òcrowding outö effect), while a share of venture capital, raised from other European and non-European countries, increases (syndication effect). To distinguish between these two effects, additional studies are necessary; however, the factor analysis provides certain observations in this respect, with the results summarized in next section;
- c) total size of venture capital (by number of companies) increases by 0.76 p.p. in the national private equity and venture capital structure. Thus, public venture capital raises not only investments in early stages of venture capital, but also a total volume of venture capital in a country ó the conclusion is consistent with the above ones;
- d) number of companies which have attracted follow-on investments (by amount invested) increases as well, even more than by 1 percentage point. Such a conclusion is possible in two cases: public sector invests in ongoing projects

itself or it encourages private sector to do so (of course, there may be a combination of both). Nevertheless, based on the theoretical material provided in the first part of the thesis, there is more credibility in the second assumption, stating that a private venture capital is more likely to invest in companies in their later stages of development if they have attracted public venture capital in their earlier stages. Therefore, upon increase in the volume of public venture capital, a number of follow-on venture capital investments grows as well, that is a valid indicator of the venture capital industry's viability. In this case, a so-called public venture capital "signalling" effect occurs;

- e) finally, high-tech share (by amount) in venture capital investments increases by 0.78 p.p. However, if it is true that the high-tech share in venture capital investments increases owing to public venture capital and almost to the same extent then it is also true that nearly all public venture capital is allocated to investments in high technology (while the total industry average is below 50 percentage). This shows that not only venture capital in general can have a positive impact on the country's high-tech industry, as findings in the first part of the study show, but public venture capital also may have a significant impact on the development of high technology in a country.

After an analysis of aspects of public venture capital's impact on economic development, a national public venture capital model is supplemented with the evaluation of assumptions. This invokes a factor analysis whereupon a set of 14 initial variables, which characterize the observed phenomenon and show a significant correlation with public venture capital, has been replaced by a set of 4 factors (3 general and 1 special). The summarised above-mentioned "conversion" is shown in Fig. 9, with a thickness of the lines denoting the dispersion of initial variables explained by relevant factors:

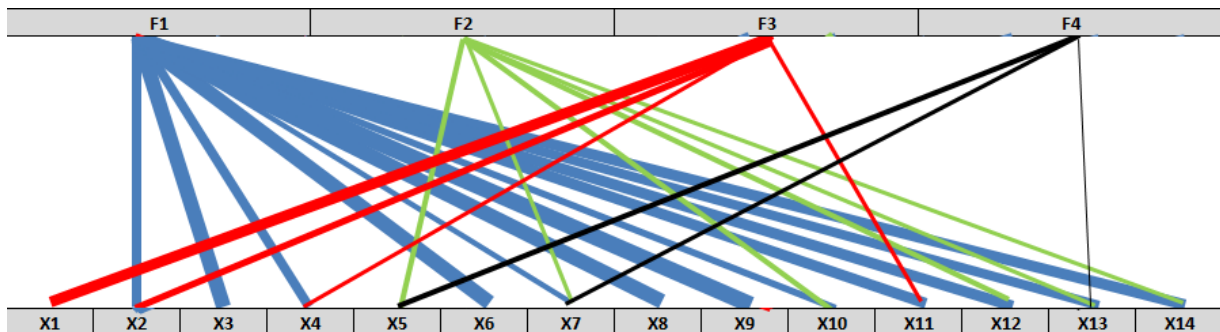


Fig. 9. Relationship between initial variables and newly established factors

Source: compiled by the author

After formation of factors, inter-correlations of initial variables were explained by virtue of general factors. The first factor is situated on the horizontal axis of the following chart (Fig. 10), the second on the vertical axis; a length of a circle radius is equal to 1 (corresponds to the maximum correlation coefficient), thus, initial variables, close to the circle edge, have a greater effect on the marked factors; variables closer to the centre have a lower effect. Initial variables, significant to the first factor, are marked in a

dark blue, to the second factor ϕ are enlarged (regardless of the colour); we can see that all of them are located closer to the edge of the circle than the rest ones:

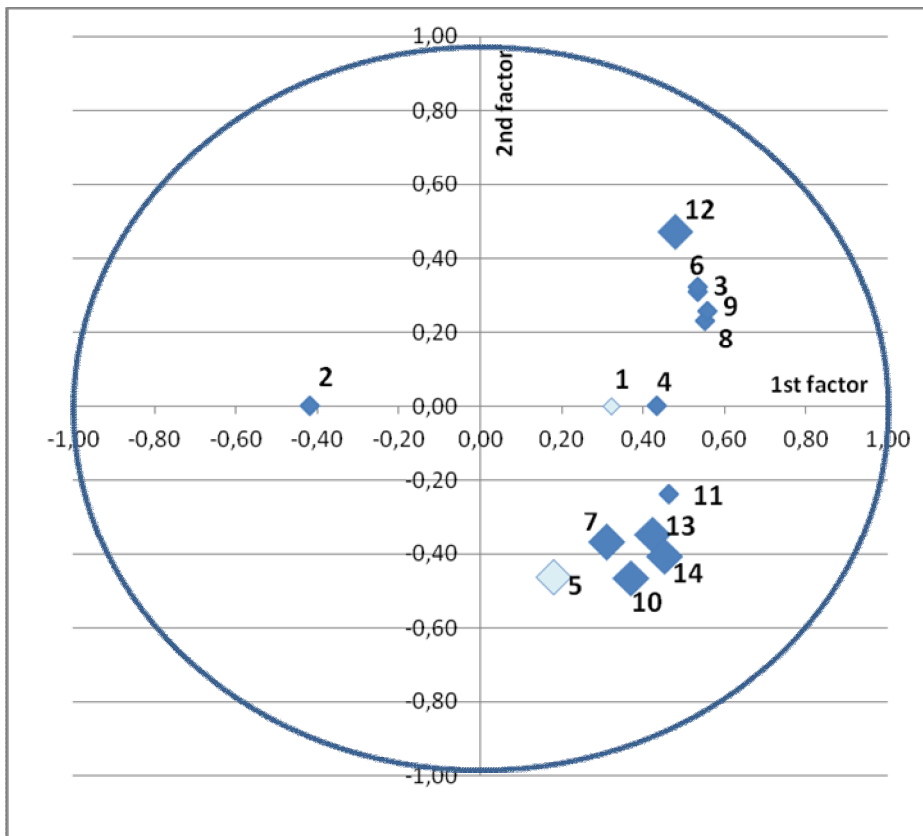


Fig. 10. Correlation between initial variables, and the 1st and the 2nd factors

Source: compiled by the author

Fig. 10 summarizes the results of factor analysis:

1. A greater involvement of public authorities in a venture capital market (in financial, and not in the regulatory terms) is typical for less economically and financially developed countries. This finding complements the conclusion proposed in the first (correlation and regression) part of the study, stating that public venture capital causes a more rapid development of national venture capital and innovation sector: upon reaching a certain level of development by a country, a volume of public venture capital begins to decline.
2. Upon an increasing level of country's development, a "crowding out" effect of private investments decreases as well; thus, it can be argued that public venture capital, whereas acting as an accelerator of a private venture capital market at the earlier development stages, tends to withdraw at later stages in favour of the private one and, thus, reducing the effect of private venture capital "crowding out".
3. If a country has a lot of foreign venture capital or private equity, regardless of its origin, public venture capital will have no incentive to withdraw, and private venture capital "crowding out" effect can occur; on the contrary, if there is a larger part of local venture capital in a country, public venture capital will tend to withdraw faster.

Based on the conducted correlation and regression, as well as factor analyses, hypothetical public venture capital model stated above and presented in Fig. 4 can be supplemented. Factor analysis helped to group initial variables affecting public venture capital (Fig. 9.); while the correlation and regression analysis allowed evaluating the impact of public VC on economic development (Fig. 8). So, an integrated model of public venture capital's impact on economic development can be presented (Fig. 11):

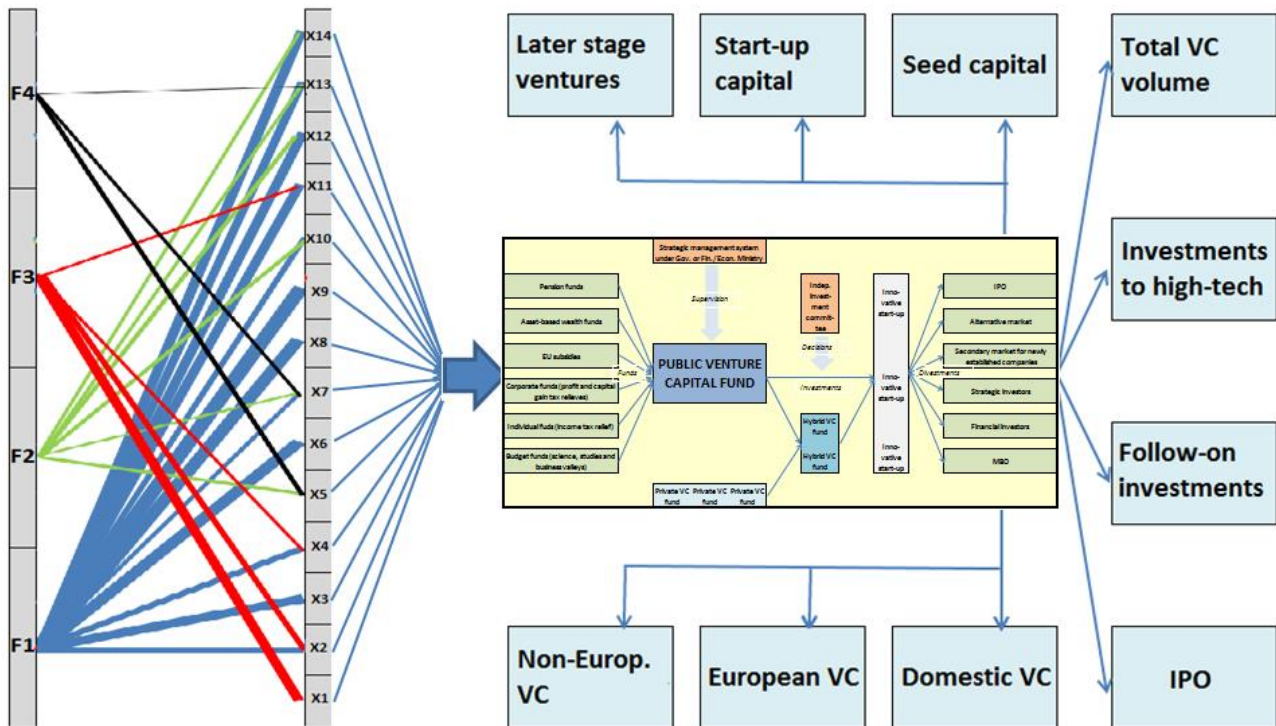


Fig. 11. Extended model of public venture capital impact on economic development

Source: compiled by the author

The integrated model is linking the hypothetical public venture capital model with the tendencies, revealed during the author's study, which affect the level of public venture capital in the country, as well as aspects of public venture capital's impact on the national economy. In this way, the impact of public venture capital on the economy is demonstrated at the background of general tendencies which affect the level of public venture capital in the country.

Conclusions. After having overviewed theoretical aspects of public venture capital, analyzed public venture capital programmes, that were implemented in foreign countries, having evaluated the level of study of public venture capital topic in Lithuanian authors' scientific works, analyzed the state of venture capital system, conducted the author's study on factors influencing the level of public venture capital development in the country, and the ways of public venture capital's impact on the state of national venture capital and financial systems and overall economy, the following **conclusions** can be made:

1. Banks alone cannot assume responsibility for financing or, even more so, for formation of innovative industries due to absence or insufficiency of collaterals ó

this requires venture capital investments; venture capital providers act as financial intermediaries in the markets where lenders and borrowers find too expensive to meet (market costs may be related to the adverse selection, moral hazard, information retrieval and collection).

2. Venture capital is mostly invested in high-tech companies, which are subject to higher business and financial risks ó such high risk investments also assume a higher return, required by venture capital funds. The main advantages of venture capital cover an impact on innovation (the author's empirical study shows the existence of a positive correlation between venture capital and national innovativeness and the number of employees in high-tech sector) and on economic development.
3. A positive effect on technological innovations in some cases may create a negative effect of incentives: by enabling the establishment of new technological companies, venture capital can reduce the expected returns of existing business investments in R&D. Therefore, it can be stated that there is an optimal volume of venture capital: too much of venture capital may actually reduce rather than enhance innovation capabilities of companies.
4. A review of public venture capital tools, that have been implemented in foreign countries, enabled to reveal the following advantages of public venture capital:
 - a) public venture capital funds accelerate the formation and development of private venture capital market (the Netherlands, Singapore, Israel);
 - b) public venture capital stimulates both syndicated and staged investments (Australia), as well, increases the chances of attracting private venture capital at later stages of development (U.S.);
 - c) an increased creation of new jobs and faster growth in sales (U.S., UK), a higher labour productivity (UK);
 - d) public venture capital has a positive impact in imperfect/inefficient market situations: in certain stages of business development (especially, in initial ones), in industries (especially in high-tech) or in areas which lack a private venture capital (financing õgapsõ) due to large geographical distances; public venture capital also reduces information asymmetry (õsignallingõ effect); in addition, it is characterized by a positive external effect of R&D.
5. Shortcomings of public venture capital: private investments õcrowding outõ effect (certain programmes in the U.S.); investments õcrowding outõ risk also exists among separate public programmes (certain programmes in Australia).
6. A comprehensive analysis of public venture capital tools, that have been implemented in foreign countries, leads to a conclusion that more difficulties in applying public venture capital programmes are experienced by Anglo-Saxon countries, while continental Europe has much better results (therewith, it is a good news for Lithuania). This is likely influenced by a number of the following factors:
 - a) Anglo-Saxon countries own more private venture capital, therefore, they need less public one (hence various õcrowding outõ effects);
 - b) Anglo-Saxon countries are likely to have more private venture capital due to the fact that the common law system ensures a better protection of minor shareholders and creditors than the continental Europe's legal system which is

- based on the Civil Code ó therefore, the latter part of Europe is more needful for public venture capital;
- c) the difference in labour market regulation leads to different ways of adapting the economy to an external shock (e.g., upon occurrence of financial crisis): a more flexible labour market regulation in Anglo-Saxon countries allows them to absorb effects of a shock through a labour market (simple and inexpensive dismissals); meanwhile, adaptation of the economy to a shock in a continental Europe, where labour market regulation is more sever, runs through the financial system: long-term relationships with banks (financial system, based on financial intermediaries) ensure the missing flexibility in case of a shock and do not punish as promptly and rigorously as impersonal capital markets. Public venture capital funds, like banks, maintain long-term relationships, thus, they operate better in countries with a stricter labour market regulation.
7. By summarizing public venture capital tools, which have been implemented in foreign countries, three types of state support for venture capital markets can be distinguished:
 - a) direct capital supply: public venture capital funds may invest in early-stage high-tech companies via public foundations (NEOTEC in Spain, *Yozma* in Israel) or directly in the companies (alone or together with private venture capital funds). Another option ó public venture capital funds may entrust their resources to private capital management companies (ENISA in Spain, JEREMIE funds in Lithuania) which invest them along with or without private venture capital;
 - b) creation of financial incentives to invest in venture capital funds or small companies (under tax credits and discounts, or, under loan and venture capital investment guarantees);
 - c) state regulatory policy defining the types of venture capitalists, intellectual property protection, ensuring the efficiency of capital markets, etc.
 8. It should be noted that PPP (Public-Private Partnership) based funds, such as in the U.S. or Israel, bring more social benefits than mutual funds, operating in Canada or the UK and funded by tax incentives. Nevertheless, the choice should be defined not as a search for the best one, but as a search for the best possible option under certain conditions (the country's development level, a certain type of national financial system, capital market size and liquidity, etc.).
 9. The majority of Lithuanian authors opt for the indirect state involvement in the venture capital market, by performing solely regulatory functions rather than those of an active market player. However, according to the author's opinion, the need for public venture capital in Lithuania is determined by an existing great scientific-technical potential and a weak commercialization of its results, by low business investments in R&D, by a complicated access of innovative start-up companies to financing, as well as by a critical innovation condition: by poor industrial property protection rates and by low labour productivity.
 10. Recovery in Lithuanian venture capital market is felt from the end of 2010, after establishment of first hybrid venture capital funds financed under the JEREMIE initiative. However, even they alone, due to their small size (in 2007-2013, only 80 million Euros of the EU support was granted), are not capable to finance innovative business breakthrough and development. This requires a systematic

approach of the Government toward the problem of innovative business financing and an active public venture capital policy. Necessity to establish public venture capital funds arises from the need to shape a national venture capital policy and to develop investments (and innovations) guidelines for other funds and market players in general. Solely by joint efforts, businesses, governmental bodies, and higher education institutions would be capable to ensure a continuous and irreversible progress in innovation and high technology and sustainable economic development in pursuance of a new society development quality.

11. Possible public venture capital funding sources would include a part of pension funds, corporate funds, by exempting companies from capital gain/income tax on profits derived from investment in public venture capital fund, as well as the EU funds (already in use). An additional source of financing could be an asset-based welfare policy (if decided to execute it). This funding source would be of a long-term, thus, highly suitable for venture capital investments.
12. Public venture capital divestment possibilities cover an establishment of alternative stock market (already existing, but not functioning in Lithuania), a search for private investors, MBO, a creation of the secondary stock market for start-ups.
13. In order to evaluate digital characteristics, the hypothetical national public venture capital model is supplemented with the correlation and regression analysis. Based on findings of this analysis, a multiple regression between public venture capital and different variables was formulated. A statistically high positive dependence on public venture capital was shown by:
 - a) seed stage capital,
 - b) start-up capital,
 - c) total volume of venture capital in a country,
 - d) venture capital from non-European countries (syndication effect),
 - e) high-tech part in venture capital investments,
 - f) follow-on venture capital investments (or the "signalling" effect),
 - g) number of IPOs.
14. In order to reveal and group initial variables which influence public venture capital, a factor analysis was performed. During the analysis, 14 initial variables, which have a significant correlation with public venture capital were transformed, using a method of basic components, into 3 general and 1 special factors, which together explain 89% of the phenomenon variance (and, hence, information loss is only 11%). The conducted factor analysis has revealed the following:
 - a) a greater involvement of public authorities in a venture capital market (in financial, and not in the regulatory terms) is typical for less economically and financially developed countries. This finding complements the conclusion proposed in the first (correlation and regression) part of the study, stating that public venture capital causes a more rapid development of national venture capital and innovation sector: upon reaching a certain level of development by a country, a volume of public venture capital begins to decline;
 - b) upon an increasing level of country's development, a "crowding out" effect of private investments decreases as well; thus, it can be argued that public venture capital, whereas acting as an accelerator of a private venture capital

market at the earlier development stages, tends to withdraw at later stages in favour of the private one and, thus, reducing the effect of private venture capital "crowding out";

- c) if a country has a lot of foreign venture capital or private equity, regardless of its origin, public venture capital will have no incentive to withdraw, and private venture capital "crowding out" effect can occur; on the contrary, if there is a larger part of local venture capital in a country, public venture capital will tend to withdraw faster.

Recommendations

1. The choice between private and public venture capital does not necessarily mean the rejection of the other one: public venture capital should help the private one, rather than compete with it; therefore, a goal to form a prosperous private venture capital market assumes a **proposal** to make public investments with the involvement of private sector. In addition, the final goal of public venture capital is a creation of a private venture capital market, an assurance of its vitality and development, thus, any public venture capital strategy should also provide for the transition to a private venture capital market.
2. Prior to the implementation of a national large-scale venture capital policy, it would be appropriate to conduct a national pilot experiment, i.e., empirical research on public venture capital for several years in order to verify whether a participation in a public venture capital programme helps to achieve any of the objectives set out in this work: to attract investments to a seed stage of companies, to enhance a syndication and private investments at the next financing stage ("signalling" effect), to increase the volume of venture capital in the country, to develop high-tech, and, finally, to develop a stock market (due to an increase in the number of IPOs). It should be noted that such a study would be costly (initial investment in a public venture capital fund) and of a long-term, therefore, this controlled experiment should be entrusted to national scientific bodies, along with the governmental agencies, i.e., by establishing a strategic management sub-system under the Government or a relevant ministry (of Economy or Finance).
3. Operating principles of a pilot public venture capital fund are as follows:
 - a) to entrust management of the fund to the private sector,
 - b) to establish simple procedures when applying for funding,
 - c) to widely disseminate information about the development of a new public programme to venture capitalists, investors, and company-owners,
 - d) to continually assess pilot venture capital programme, by estimating the rate of creation of small firms, which generate a commercially attractive profit, or the volume of private investments, which follow-on public venture capital.

Approbation and dissemination of the scientific research results. Statements and results of the scientific research were published in 8 academic publications, of which 6 articles have been published in academic journals and 2 articles in academic conference publications. Statements and results of the thesis have been presented in 3 international academic conferences.

Articles in academic journals

1. Jasien M., Laurinavius A. (2008). Alternatyvus investavimas pltojant ekonomik . - *Viešasis administravimas* 20 (4), 61-67.
2. Jasien M., Laurinavius A. (2009). Kredito rizikos valdymo mon se problemos ir j sprendimo b dai. - *Verslas: teorija ir praktika* 10 (1), 15-29.
3. Laurinavius A., Smilga E. (2011). Strategini galimybi atskleidimas ir j realizavimas rizikos kapitalo fond pagalba. - *Organizacijų vadyba: sisteminiai tyrimai* 60, 115-128.
4. Laurinavius A. (2012). Venture capital as a catalyst of business development in Lithuania. - *BICHNIK* 141, 5-7.
5. Laurinavius A., Smilga E. (2012). J rin s valstyb s potencialas ir jo ugdymas Lietuvoje: strategini sprendim perspektyva. - *Viešasis administravimas* 33 (1), 20-30.
6. Laurinavius A. (2013). Public venture capital fund in Lithuania: mission impossible? - *Ad Alta: Journal of Interdisciplinary Research* 3(2), 23-26.

Articles in academic conference material

7. Laurinavius A., Laurinavius Alg. (2011). Using venture capital for business development in Lithuania. - *Contemporary Issues in Business, Management and Education '2011. Conference proceedings*, 165-180.
8. Laurinavius A. (2012). Public venture capital fund in Lithuania: mission impossible? - *Reviewed Proceedings of the Interdisciplinary Scientific Conference for PhD students and assistants QUAERE 2012 2*, 394-403.

Presentations in scientific conferences

9. International conference "Contemporary Issues in Business, Management and Education" 2011, November 2011, Vilnius (Lithuania).
10. International conference "International Interdisciplinary Scientific Conference for PhD students and assistants QUAERE 2012", May 2012, Hradec Karlovy (Czech Republic).
11. International conference "The Global Challenges for Economic Theory and Practice in Central and Eastern European Countries", October 2012, Kiev (Ukraine).

About the author

Antanas Laurinavičius was born on 28 February 1983, Vilnius (Lithuania).

Education

2009 ó 2014	Doctoral studies, Vilnius University, Lithuania
2005 ó 2008	Master in Finance, Vilnius University, Lithuania
2006 ó 2007	Master in Finance, Orleans University, France
2004 ó 2005	Erasmus student in Paris XII Val de Marne University, France
2001 ó 2005	Bachelor in Finance <i>cum laude</i> , Vilnius University, Lithuania

Professional Background

2012 ó currently	Vilnius university, Lecturer
2009 ó currently	UAB ūIKFAö, CFO
2007 (3 months)	European Parliament, office of MEP V. Landsbergis, Stagiaire

DISERTACIJOS SANTRAUKA

Temos aktualumas. Lietuvoje vis dar sunkiai vystantis inovacijomis ir aukštosiomis technologijomis grįstai ekonomikai, reikalingas išskirtinis dėmesys aukštųjų technologijų finansavimui; tik sutelktos verslo monijos, valdžios institucijų ir aukštojo mokslo staig pastangos gali užtikrinti nuolatinį ir negrįžtamą pažangią inovacijų ir aukštųjų technologijų srityje bei darnią ekonomikos plėtrą, siekiant naujos visuomenės raidos kokybės.

Tuo tarpu pastarųjų metų ekonominė pažanga beveik neturėjo tokos neišalies inovatyvumui, nei gamybos efektyvumui. Pagal Europos Komisijos skaičiuojamą Suminio inovatyvumo indeksą 2006 m. Lietuva tarp ES šalimi užėmė 4 vietą nuo galo, o iki 2012 m. savo reitingą pagerino tik 1 vieta (Europos Komisija, 2013); aukštųjų ir vidutiniškai aukštųjų technologijų gaminiai Lietuvoje 2011 m. sudarė tik 17,4% visos pramonės produkcijos, ir nuo 2002 m. šis rodiklis paaugavo vos 1,7 proc. punkto. Tiesioginės užsienio verslo sektoriaus investicijos moksliniams tyrimams ir eksperimentiniam plėtrai (toliau – MTEP) yra penkis kartus mažesnės už ES vidurkį, todėl šalyje kuriami mažai pažangios technologijų ir inovacijų, o tai, savo ruožtu, prisideda prie mažo gamybos efektyvumo ir nedidelio darbo našumo – darbo našumas Lietuvoje siekia vos 62% ES vidurkio.

Kita vertus, pagal MTEP darbuotojų skaičių Lietuva mažai atsilieka nuo ES valstybių vidurkio. Eurostat duomenimis, 2009 m. 1 000 darbuotojų gaus Lietuvoje teko 7,4, ES – 10,7 MTEP srities darbuotojo. Tačiau dauguma MTEP srities darbuotojų Lietuvoje dirba aukštojo mokslo ir valdžios institucijose, verslo sektoriuje 2009 m. dirbo tik 13% MTEP srities darbuotojų, tuo tarpu ES vidurkis siekė net 44%. Vadinas, Lietuvoje egzistuoja pakankamas žmogiškasis potencialas, problema – tai žmogiškasis komercializavimas. Tapat faktai atskleidžia ir ne tik tinai prasti pramoninės ir intelektinės nuosavybės apsaugos rodikliai: pagal patentų skaičių Lietuva nuo ES vidurkio atsilieka 15-20 kartus (priklausomai nuo patentų rūšių).

Norint pasiekti negrįžtamą proveržį inovacijų ir aukštųjų technologijų srityje, reikalinga tinkama finansavimo infrastruktūra, kuri gali užtikrinti atitinkami finansiniai instrumentai. Kitas patirtis, kuri susistemintai pateikta antrojoje disertacijos dalyje, o kartu ir praktiniai pavyzdžiai Lietuvoje rodo, kad bankai patys vieni negali prisiimti atsakomybės nei už inovatyvią verslo – ak finansavimą, nei tuo labiau už įformavimą.

Tinkami finansiniai sprendimai pradedantio veiklos inovatyvaus verslo finansavimui – visų rizikos kapitalo instrumentai, tokie kaip rizikos kapitalo fondai, verslo angelai, privataus akcinio kapitalo investicinis bendrovės ir kt. Tačiau ne visose šalyse į veiklą vienodai skminga: savo veiklą Lietuvoje pradėję keleri metai po Nepriklausomybės paskelbimo, reikalingo vaidmens nei kuriant inovatyvią ekonomiką, nei formuojant naujas verslo – akas rizikos kapitalo fondai taip ir nesužadino. Daugiausiai tokos tam, žmoguma, turėjo nedidelę tokių fondų apimtį ir polinkis išpirkimo sandorių finansavimą.

Pagyvėjimas rinkoje jaučiamas nuo 2010-ųjų metų pabaigos, steigus pirmuosius hibridinius⁵ pagal europinį JEREMIE iniciatyvą finansuojamus rizikos kapitalo fondus, tačiau net ir jie, atsižvelgiant į mažą dydį (2007-2013 m. pagal JEREMIE iniciatyvą buvo skirta 80 mln. eurų ES paramos), negali patys vieni užtikrinti pradedantio veiklos inovatyvaus verslo finansavimo. Tam reikalingas sisteminis Vyriausybės požiūris

⁵ T.y. mišinys iš dalinai finansuojamus ES paramos, dalinai iš privačių šaltinių lėšomis.

inovatyvaus verslo finansavimo problemą, vis pirma pripažįstant, kad tokia problema egzistuoja, o vėliau nubrėžiant gaires jos galimiems sprendimams.

Todėl galima teigti, kad tinkamą finansinį instrumentą parinkimo pradedantiam veiklų inovatyviam verslui problema kartu suponuoja ir klausimą, kas turėtų būti atsakingas už šį priemonių parinkimą. Tam, viena vertus, reikalingas arsenalas jau paruoštų finansinių instrumentų, kita vertus, aiški Vyriausybės pozicija ir net strategija, nubrėžianti gaires ekonomikos raidos formavimui.

Neegzistuojant tinkamai valstybiniu lygiu suformuluotai strategijai, jau veikiančios fondai, ypač atsivėlgiantįjį mafių dydį, ir toliau atsitiktinai būdu finansuos atskirus projektus, neprišildami prie naujų verslo –aktyvumo ir visuomenės raidos formavimo. Tuo tarpu valstybinis rizikos kapitalo fondas, kaip valstybės politikos rankis naujai kuriamoms verslo –akoms, galėtų paskatinti rizikos kapitalo rinkos vystymąsi –alyje ir tuo būdu prisidėti prie inovatyvios, aukštosiomis technologijomis grįstos nacionalinės ekonomikos formavimo.

Finanoma, vien valstybinio rizikos kapitalo fondo minėtiems tikslams pasiekti nepakanka, o tam reikia koordinuoti vis valstybės institucijų pastangas. Tačiau užtikrinamas sklandesnis finansavimas jaunam inovatyviam verslui ir nubrėžiamas gaires naujoms verslo –akoms, toks fondas galėtų prisidėti ne tik prie rizikos kapitalo rinkos –alyje vystymo, bet ir prie jos finansavimo didinimo, formuodamas teigiamą visuomenės nuomonę rizikos kapitalo klausimu. Tuo metu, kaip rodo atlikti tyrimai, visuomenė apskritai neturi nei nuomonės, nei žinių apie –alyje veikiančią rizikos kapitalą.

Aktualūs inovacijų ir aukštųjų technologijų skatinimo klausimai Lietuvoje, menkai žinuos klausimus sprendžiantį –iandieninį finansavimo infrastruktūrą ir daugelį dantys užsienio –alyse gyvendintą valstybinį rizikos kapitalo fondo veiklos rezultatai buvo tie veiksniai, kurie paskatino mokslinio tyrimo temos pasirinkimą, tikslą ir uždavinių formulavimą.

Mokslinė problema ir jos ištyrimo lygis Lietuvoje ir pasaulyje. Rizikos kapitalas Lietuvoje – nauja ir mažai analizuota tema. Tyrimus, atliktus –ioje srityje, s lyginai galima suskirstyti dvi laikotarpius: laikotarpį iki 2009-2010 m., kuomet buvo steigta Lietuvos rizikos ir privataus kapitalo asociacija bei pirmieji hibridiniai rizikos kapitalo fondai, ir laikotarpį po to.

Ankstyvieji darbai daugiausiai analizuoja inovacinį procesą, rizikos kapitalui daugelį metų neskiriama (Gečas et al., 2003; Valentinavičius, 2006; Jakubavičius et al., 2008). Tyrimai rizikos kapitalo srityje aktyvesni pasidarė nuo 2009 m., steigus Lietuvos rizikos ir privataus kapitalo asociaciją. Pradėtas analizuoti rizikos kapitalo poveikis verslo vystymui (Laurinavičius & Jasienis, 2008; Laurinavičius & Laurinavičius Alg., 2011; Laurinavičius, 2012a, 2012b, 2013; Sniečka & Venckuvienė, 2010a, 2010b, 2011a, 2011b, 2012; Venckuvienė, 2013) ir –alies konkurencingumui (Laurinavičius & Smilga, 2011, 2012), taip pat vairi kintamųjų poveikis –alies rizikos kapitalo sistemai (Jankauskienė & Kaupelytė, 2009; Jankauskienė, 2009).

Užsienio autorių darbuose rizikos kapitalo tema išanalizuota išsamiau. Rizikos kapitalo sąsajos su inovacijomis atskleistos Audretsch et al. (2006) (Vokietijos pavyzdžiu), Sorensen (2006), Cumming (2007), Darin & Penas (2007), Gompers et al. (2007), Wonglimpiyarat (2007), Caselli et al. (2009) (Italijos pavyzdžiu), Klepper (2009), Fritsch (2010) (Vokietijos pavyzdžiu), Fritsch & Schroeter (2010), Baptista & Preto (2011), Dutta (2011), Kelly (2011) darbuose; rizikos kapitalo sąsajos su

kult rin mis dimensijomis analizuotos Da Rin et al. (2006), Gompers et al. (2006), McMullen et al. (2007), Li & Zahra (2012) atliktuose tyrimuose.

Rizikos kapitalas, kaip alternatyva bankiniam finansavimui, nagrin tas Edwards & Fischer (1994), Holmstrom & Tirole (1997), Berger & Udell (1998), o rizikos kapitalas, kaip ekonomikos pl tros veiksnys – Shane (2008), Ferrary & Granovetter (2009), Colombo et al. (2012) darbuose.

Valstybinio rizikos kapitalo privalumai atskleisti Jaaskelainen et al. (2007), Bagby et al. (2008), Ahlstrom et al. (2010), Grundling et al. (2010) (Kinijos pavyzdffiu), Lerner (2002, 2010), Fritsch (2010) Fritsch & Schilder (2011) ir daugyb s kit autori ankstesniuose darbuose, kuri didel dalis susisteminta 1-oje disertacijos dalyje.

Valstybinio rizikos kapitalo tr kumus atskleidffia ir j sprendimo b dus si lo Gompers & Lerner (1999), Lerner (2002), Leleux & Surlemont (2003), Armour & Cumming (2006), Cumming & MacIntosh (2006), Plage (2006), Cumming & Johan (2009) (Australijos pavyzdffiu), o argumentus renkantis tarp privataus ir valstybinio rizikos kapitalo apibendrina Lerner et al. (2005) (N. Zelandijos pavyzdffiu), Avnimelech & Teubal (2006) (Izraelio pavyzdffiu), Da Rin et al. (2006), Meyer (2006), Cumming (2007) (Australijos pavyzdffiu), Jaaskelainen et al. (2004, 2007), Aernoudt et al. (2008) (Olandijos pavyzdffiu), Suchard (2009), Brander et al. (2010), Grundling et al. (2010), Samila & Sorenson (2010), Del-Palacio et al. (2012) (Ispanijos pavyzdffiu) ir Ibrahim (2012).

Tyrimo objektas ó valstybinis rizikos kapitalas, kaip rizikos kapitalo rinkos skatinimo, pradedan io veikl inovatyvaus verslo finansavimo ir valstyb s politikos priemon , padedanti spr sti netobulos/neefektyvios rinkos situacijas, kuriose privatus rizikos kapitalas pasiekia ne visus rinkos dalyvius.

Tyrimo tikslas ó atskleisti valstybinio rizikos kapitalo reik-m –alies rizikos kapitalo sektoriui ir poveik ekonomikai bei, remiantis kit Europos –ali patirtimi, sukurti hipotetin valstybinio rizikos kapitalo pl tros model Lietuvoje.

Darbo tikslui pasiekti keliami tokie **uždaviniai**:

1. Apffvelgti teorinius valstybinio rizikos kapitalo aspektus ufsienio autori mokslo darbuose ir palyginti –i autori si lomas priemones valstybiniam rizikos kapitalui pl toti.
2. I-analizuoti ufsienio –alyse gyvendintas valstybinio rizikos kapitalo priemones, vertinti j privalumus ir tr kumus.
3. vertinti valstybinio rizikos kapitalo temos i–nagrin jimo lyg Lietuvos autori mokslo darbuose.
4. I-analizuoti Lietuvos inovacij k rimo ir finansavimo bei rizikos kapitalo sistem b kl , vertinti j efektyvum bei galim valstybinio rizikos kapitalo poveik –ioms sistemoms.
5. Suformuoti hipotetin valstybinio rizikos kapitalo pl tros model , kur b t galima gyvendinti Lietuvoje; vertinti tokio modelio parametrus ir veiklos principus, j takojan ius veiksnys, finansavimo –altinius, investicij realizavimo b dus ir tik tinus veiklos rezultatus.
6. Atlikti rezultat interpretavim ir, atsiffvelgiant tyrimo apribojimus, pateikti i–vadas ir pasi lymus.

Tyrimo metodai. Numatytam tikslui pasiekti ir iškeltiems uždaviniams išspręsti buvo naudoti užsienio ir Lietuvos autori mokslinės literatūros pirminiai ir antriniai –altiniai rinkimo, grupavimo bei sisteminimo, apibendrinimo ir lyginamosios bei loginės analizės metodai.

Atliekant užsienio –ali praktinės patirties analizę ir vertinimą, pasitelktas absoliutiniai bei santykiniai rodikliai skaičiavimas; analizuojant Lietuvos inovacijų kėrimo ir finansavimo bei rizikos kapitalo sistemas, panaudotas grafinis duomenų vaizdavimas. Absoliutiniai ir santykiniai dydžių skaičiavimas bei grafinis duomenų vaizdavimas atliktas naudojant *Microsoft Office* paketo programas.

Autoriniam tyrimui sudaro:

1. Koreliacinė analizė. Apskaičiuoti koreliacijos koeficientai tarp valstybinio rizikos kapitalo ir vairių jo takojamų veiksnių Europos –alyse. Esant reikšmingai koreliacijai, apskaičiuoti regresijos koeficientai.
2. Remiantis koreliacinės-regresinės analizės išvadamis, suformuluota daugiavarė priklausomybė tarp valstybinio rizikos kapitalo ir vairių jo takojamų veiksnių.
3. Atlikta faktorinė analizė, siekiant atskleisti ir sugrupuoti veiksnius, turinčius takos valstybiniam rizikos kapitalui.

Tyrimo šaltiniai. Disertacijoje analizuojami Lietuvos ir užsienio autori moksliniai darbai. Užsienio –alyse veikiančių valstybinio rizikos kapitalo programų lyginamoji analizė atlikta remiantis empiriniais užsienio –ali autori studijomis.

Lietuvos inovacijų ir rizikos kapitalo būklė vertinta analizuojant informaciją iš Lietuvos statistikos departamento, Eurostat duomenų bazės, Lietuvos rizikos ir privataus kapitalo asociacijos leidinių.

Autoriniam tyrimui reikalinga informacija surinkta iš Europos rizikos ir privataus kapitalo asociacijos, Europos bendradarbiavimo ir plėtros organizacijos (toliau – EBPO), Eurostat ir Europos Komisijos pateiktam duomenim.

Disertacijoje remtasi daugeliu LR ir ES teisės aktų:

- analizuojant rizikos kapitalo reglamentavimą ES, remtasi Bendrijos gairėmis dėl valstybės pagalbos rizikos kapitalo investicijoms mafioms ir vidutinės monės skatinti (2006/C 194/02), Komisijos komunikatu, kuriuo išdalytos keičiamos Bendrijos gairės dėl valstybės pagalbos rizikos kapitalo investicijoms mafioms ir vidutinės monės skatinti (2010/C 329/05), bei Europos Parlamento ir Tarybos reglamentu Nr. 345/2013 dėl Europos rizikos kapitalo fondo;
- analizuojant kolektyvinio investavimo subjektų teisinį reglamentavimą Lietuvoje, remtasi Kolektyvinio investavimo subjektų statymu, Europos Parlamento ir Tarybos direktyva 2004/39/EB dėl finansinių priemonių rinkimų, Europos Parlamento ir Tarybos direktyva 2009/65/EB dėl statymų ir kitų teisės aktų, susijusių su kolektyvinio investavimo perleidžiamais vertybinius popierius subjektais, derinimo (vadinamoji ŠUCITS IV direktyva), Informuotiesiems investuotojams skirtu kolektyvinio investavimo subjektų statymu ir kiti bendrijos statymo pakeitimo statymu.

Ginamieji disertacijos teiginiai:

1. MTEP rezultatai komercializavimas sudėtingas dėl nepakankamo inovatyvaus, pradedančio veikti verslo finansavimo. Rizikos kapitalas, prisidamas prie

MTEP rezultatai komercializavimo, ne tik turi teigiamą poveikį inovacijoms ir aukštųjų technologijų vystymuisi, bet ir ekonomikos plėtrai apskritai.

2. Kai privataus rizikos kapitalo –alyje nėra daug, rinkos plėtra pati savaime vyksta vangiai ir reikalinga tiesioginė valstybės pagalba, vien tik reglamentavimo nepakanka. Valstybinis rizikos kapitalo fondas gali veikti kaip rizikos kapitalo rinkos plėtos akceleratorius: tinkamai parengtas ir gyvendintas valstybinio rizikos kapitalo modelis leistų paskatinti vietinės rizikos kapitalo rinkos plėtrą.
3. Efektyviausios valstybinio rizikos kapitalo programos ir priemonės yra tos, kurios špadeda pamatus tvariam privačios rizikos kapitalo rinkos funkcionavimui ilguoju laikotarpiu. Todėl valstybinis rizikos kapitalo fondas turėtų veikti kaip katalizatorius ir, pritraukdamas užsienio rizikos kapitalą, sindikuotai investuoti –alyje kuriamas aukštųjų technologijų sektoriaus monetas bei tokiu būdu paskatinti tiek privataus rizikos kapitalo rinkos, tiek aukštųjų technologijų pramonės plėtrą.
4. Valstybinis rizikos kapitalas taip pat pageidautinas netobulos rinkos situacijose, siekiant pašalinti finansavimo spragas bei išspręsti informacijos asimetrijos problemas. Be to, valstybiniam rizikos kapitalui taip pat būdingas teigiamas išorinis MTEP poveikis.
5. Dėl skirtingos teisinės, finansinės sistemos bei griežtesnio darbo rinkos reglamentavimo daugiau pranašumų taikydamos valstybinio rizikos kapitalo programos turi kontinentinės Europos –alyse, tuo tarpu anglosaks –alyse rezultatai prasčiau ir kartu tai gera flinia ir Lietuvai.

Darbo mokslinis naujumas ir teorinė reikšmė. Mokslinio darbo naujumas pagrindinis tai, kad valstybinis rizikos kapitalas mažai analizuotas Lietuvos autorių darbuose, o valstybinis rizikos kapitalo fondas, kaip valstybinės politikos rankis skatinant privačios rizikos kapitalo rinkos plėtrą, apskritai nebuvo analizuotas.

Autoriaus atlikti tyrimai reikšmingi ekonomikos mokslo plėtrai –iais aspektais:

- atlikta sisteminė užsienio –alyse gyvendintų valstybinių rizikos kapitalo programų lyginamoji analizė leido išskirti pagrindinius tokių programų privalumus ir trūkumus;
- –alies inovacijų ir rizikos kapitalo sistemų būklės vertinimas atskleidė galimai naujų priemonių finansavimo problemų sprendimui ir valstybinio rizikos kapitalo;
- apibūdinta ir vertinta valstybinio rizikos kapitalo reikšmė –alies rizikos kapitalo sistemai, inovacijoms ir visai ekonomikai;
- sukurtas hipotetinis valstybinio rizikos kapitalo plėtos modelis, kur galima gyvendinti Lietuvoje, aptarti jo parametrai, funkcionavimo principai, teisinė bazė, investicijų realizavimo būdai ir tikėtini rezultatai, išanalizuoti galimi tokios politikos finansavimo –altiniai;
- pasinaudojant sukurtu modeliu, apskaičiuotas galimas teigiamas valstybinio rizikos kapitalo poveikis Lietuvos ekonomikai;
- atlikta faktorinė analizė leido atskleisti ir sugrupuoti veiksnius, turinčius tokios valstybiniam rizikos kapitalui;
- taip pat absoliučiai naujos autoriaus flvalgos ir apibendrinimai apie institucinių papildinių (teisinės ir finansinės sistemos bei darbo rinkos) taką valstybinio rizikos kapitalo programose kmei.

Praktinė darbo reikšmė:

- disertacijos medžiaga gali būti naudinga akademinės bendruomenės nariams, ekspertams, nagrinėjantiems inovacijų ir rizikos kapitalo skatinimo klausimus;
- sukurtas valstybinio rizikos kapitalo plėtros hipotetinis modelis gali būti panaudotas siekiant gyvendinti nacionalinį pilotinį eksperimentą, kurio pagrindu vėliau būtų jam pasiteisinusio Lietuvoje gali būti gyvendinta pilnavertis valstybinio rizikos kapitalo politika;
- gyvendinus autorius siūlomą valstybinio rizikos kapitalo modelį, būtų galima tikėtis paflangos nacionalinės rizikos kapitalo rinkos plėtrę;
- gyvendinus valstybinio rizikos kapitalo modelį, būtų sukurta bent dalinė alternatyva bankiniam finansavimui, kuri gali tapti ypač svarbia krizės metu;
- gyvendintas modelis padėtų užpildyti finansavimo šspragasose tuose pramonės sektoriuose, kuriems rizikos kapitalas dabar nepasiekiamas;
- gyvendintas modelis gali turėti teigiamą tokios MTEP komercializavimui, –alies inovacinei plėtrai aukštųjų technologijų srityje ir net spartesnei ekonomikos plėtrai apskritai.

Darbo struktūra ir apimtis. Disertaciją sudaro vadas, trys dalys, išvados ir pasiūlymai, literatūros ir –alinių šaltinių sąrašas, priedai. Disertacijos apimtis – 217 puslapiai, joje pateikta 29 lentelės, 25 paveikslai ir 6 priedai.

Išvados. Apflvelgus teorinius valstybinio rizikos kapitalo aspektus, išanalizavus užsienio –alyse gyvendintas valstybinio rizikos kapitalo programas, vertinus valstybinio rizikos kapitalo temas išnagrinėjimo lyg Lietuvos autorių mokslo darbuose, išanalizavus rizikos kapitalo sistemos būklę, atlikus autorinį tyrimą apie veiksnius, takojančius valstybinio rizikos kapitalo lyg –alyje, bei tyrimo metu nustatius valstybinio rizikos kapitalo poveikio –alies rizikos kapitalo ir finansų sistemoms bei visai ekonomikai būdus, darytinos tokios išvados:

1. Bankai patys vieni negali priiimti atsakomybės už inovatyvią verslo –ak finansavimą (nei tuo labiau už jo formavimą) dėl užstatymo nepakankamumo arba nebuvimo – tam reikalingi rizikos kapitalo instrumentai; rizikos kapitalo teikėjai veikia kaip finansiniai tarpininkai rinkose, kuriose skolintojams ir skolininkams per brangiu susitikti (rinkos kaštai gali būti susiję su atvirkštine atranka, moraline rizika, administravimu, informacijos paieška ir rinkimu).
2. Rizikos kapitalas daflniausiai investuojamas aukštųjų technologijų monėse, kurios susiduria su didesne verslo ir finansine rizika – tokios rizikingos investicijos flada ir didesnė grąfla, kurios reikalauja rizikos kapitalo fondai. Pagrindiniai rizikos kapitalo privalumai apima poveikį inovacijoms (autorius atliktas empirinis tyrimas rodo egzistuojant teigiamą koreliaciją tarp rizikos kapitalo ir –alies inovatyvumo bei užfilmtųjų skaičiaus aukštųjų technologijų sektoriuje) ir ekonomikos plėtrai.
3. Teigiamas poveikis technologinėms inovacijoms tam tikrais atvejais gali sukurti neigiamą paskatą efektą: sudarydamas sąlygas steigti naujoms technologinėms monėms, rizikos kapitalas gali sumafilinti tik tūn jau veikiančias mones investicijoms MTEP grąflai. Todėl galima teigti, jog yra optimalus rizikos kapitalo kiekis: per daug rizikos kapitalo išties gali sumafilinti, o ne padidinti monės inovacines pastangas.

4. Apftvelgus ufsienio –alyse gyvendintas valstybinio rizikos kapitalo priemonės, atskleisti –ie valstybinio rizikos kapitalo privalumai:
 - a) Valstybiniai rizikos kapitalo fondai paspartina privataios rizikos kapitalo rinkos susikirim ir pltr (Olandija, Singap ras, Izraelis);
 - b) valstybinis rizikos kapitalas paskatina tiek sindikuotas, tiek pakopines investicijas (Australija), taip pat padid ja tikimyb v lesn se vystymosi stadijose pritraukti privat rizikos kapital (JAV);
 - c) spartesnis darbo viet k rimas ir greitesnis pardavim augimas (JAV, JK), didesnis darbo produktyvumas (JK);
 - d) valstybinis rizikos kapitalas turi teigiamos takos netobulos/neefektyvios rinkos situacijose: tam tikrose verslo vystymosi stadijose (ypa pradin se), pramon s sektoriuose (ypa auk-t j technologij) ar vietov se, kuriose d l per didelio geografinio atstumo tr ksta privataus rizikos kapitalo (finansavimo šspragosō); valstybinis rizikos kapitalas taip pat sumaflina informacijos asimetrij (šsignalizavimo efektasō); be to, jam b dingas teigiamas i–orinis MTEP poveikis.
5. Valstybinio rizikos kapitalo tr kumai: privata i investicij ši–st mimoō efektas (tam tikros programos JAV); be to, investicij ši–st mimoō rizika egzistuoja ir tarp atskir valstybini program (tam tikros programos Australijoje).
6. Atlikus i–sami ufsienio –alyse gyvendint valstybinio rizikos kapitalo priemoni analiz , darytina i–vada, kad daugiau sunkum taikydamos valstybinio rizikos kapitalo programas patiria anglosaks –alys, tuo tarpu kontinentin je Europoje rezultatai daug geresni (o kartu tai gera flinia ir Lietuvai). Tam takos gali tur ti, tik tina, keli veiksniai:
 - a) anglosaks –alyse daugiau privataus rizikos kapitalo, tod l joms mafliau reikia valstybinio (i– ia ir visa eil ši–st mimoō efekt);
 - b) tik tina, jog privataus rizikos kapitalo anglosaks –alyse daugiau d l to, kad precedento teis ufttikrina geresn smulki j akcinink ir kreditori bei pramonin s nuosavyb s apsaug nei kontinentin s Europos teisin sistema, paremta civiliniu kodeksu ó tod l pastarojoje Europos dalyje reikalingesnis valstybinis rizikos kapitalas;
 - c) skirtingas darbo rinkos reglamentavimas lemia skirtingus ekonomikos adaptavimo b dus i–orinio –oko atvejais (pvz., prasid jus finansin ms kriz ms): lankstesnis darbo rinkos reguliavimas anglosaks –alyse leidflia joms amortizuoti –oko padarinius per darbo rink (paprastas ir nebrangus darbuotoj atleidimas); tuo tarpu kontinentin je Europoje, kur darbo rinkos reglamentavimas grieftesnis, ekonomikos amortizacija –oko atveju vyksta per finans sistem : ilgalaikiai santykiai su bankais –oko atveju suteikia daugiau lankstumo ir nebaudflia taip greitai ir grieftai kaip beasmen s kapitalo rinkos. Valstybiniai rizikos kapitalo fondai, pana–iai kaip ir bankai, ufttikrina ilgalaikius ry–ius su klientais, tod l geriau veikia tose –alyse, kuriose darbo rinkos reglamentavimas grieftesnis.
7. Apibendrinus ufsienio –alyse gyvendintas valstybinio rizikos kapitalo priemonės, galima i–skirti tris valstyb s paramos rizikos kapitalo rinkoms tipus:
 - a) Tiesiogin kapitalo pasi la: valstybiniai rizikos kapitalo fondai ankstyv sias auk-t j technologij mones gali investuoti kaip valstybiniai fond fondai (NEOTEC Ispanijoje, *Yozma* Izraelyje) arba tiesiogiai mones

- (patys vieni arba kartu su privaiais rizikos kapitalo fondais). Kita alternatyva būtų valstybiniai rizikos kapitalo fondai savo lėšas gali patikėti priviems kapitalo valdymo monėms (ENISA Ispanijoje, JEREMIE fondai Lietuvoje), kurios jas investuoja kartu su privaiais rizikos kapitalo fondais arba be jų;
- b) finansini paskat investuoti rizikos kapitalo fondus ar maflas mones sukrimas (mokestiniais kreditais ir nuolaidomis arba paskol ir rizikos kapitalo investicij garantijomis);
 - c) valstybės reguliacin politika, apibrėžianti rizikos kapitalist tipus, intelektin s nuosavybės apsaugą, uftikrinanti kapitalo rink efektyvumą ir pan.
8. Pastebintina, kad PPP (angl. *public-private partnership*, viešo-privataus sektoriaus partnerystė) pagrindu veikiančios fondai, tokie kaip JAV ar Izraelyje, duoda daugiau socialin s naudos nei savitarpio fondai (angl. *mutual funds*), veikiančios Kanadoje ar JK ir finansuojami mokestiniais lengvatomis. Vis dėlto pasirinkimas tarp valstybinio rizikos kapitalo formų turėtų būti apibrėžiamas ne kaip geriausiojo pasirinkimo, bet kaip ieškojimas geriausio manomo varianto, esant tam tikroms sąlygoms (valstybės išsivystymo lygiui, tam tikram šalies finans sistemos tipui, kapitalo rink dydžiui ir likvidumui ir pan.).
 9. Dauguma Lietuvos autori pasisako už netiesiogin valstybės dalyvavimą rizikos kapitalo rinkoje, atliekant reguliuotojo funkcijas, o ne aktyvaus rinkos dalyvio. Vis dėlto, autoriaus nuomone, valstybinio rizikos kapitalo reikalingumą Lietuvoje apibrėžia –alyje egzistuojantis didelis techninio mokslo potencialas ir silpnas jo rezultatai komercializavimas, maflės verslo investicijos MTEP, sudėtingas inovatyvaus, pradedamo veikl verslo prie finansavimo, taip pat kritin inovacij bkl : prasti pramonin s nuosavybės apsaugos rodikliai bei žemas darbo našumas.
 10. Pagyvėjimas Lietuvos rizikos kapitalo rinkoje jauiamas nuo 2010-ųjų metų pabaigos, steigus pirmuosius hibridinius pagal JEREMIE iniciatyvą finansuojamus rizikos kapitalo fondus. Tačiau net ir šie fondai, atsižvelgiant į mafl dydį (2007-2013 m. laikotarpiu buvo skirta tik 80 mln. eur ES lėšų), negali patys vieni uftikrinti pradedamo veikl inovatyvaus verslo finansavimo. Tam reikalingas sisteminis Vyriausybės požiūris inovatyvaus verslo finansavimo problem ir aktyvi valstybinio rizikos kapitalo politika būtų reikalingi Vyriausybės iniciatyva steigti valstybiniai rizikos kapitalo fondai, formuojantys rizikos kapitalo politik –alyje ir nubrėžiantys investicines (ir inovacines) gaires kitiems fondams ir rinkos dalyviams apskritai. Tik sutelktos verslo monės, valdžios institucij ir aukštojo mokslo staig pastangos galėtų uftikrinti nuolatin ir neįprastam pažang inovacij ir aukštą technologij srityje bei darni ekonomikos plėtrą, siekiant naujos visuomenės raidos kokybės.
 11. Galimi valstybinio rizikos kapitalo lėšų –altiniai apimtinai pensij fond lėšų, verslo lėšų, atleidžiant versl nuo kapitalo prieaugio/pelno mokesti už pelną, gauti investicij valstybin rizikos kapitalo fond , taip pat ES paramos lėšų (jau naudojamų). Papildomai lėšų –altiniu galėtų būti valstybės vykdoma turto pagrįstos gerovės politika (jei būtų nuspręsta ją vykdyti). Tiesioginiai lėšų –altiniai ilgalaikis, todėl labai tinkamas rizikos kapitalo investicijoms.

12. Galimybė likviduoti (parduoti) valstybinio rizikos kapitalo investicijas apima alternatyvios akcijų rinkos sukrimas (Lietuvoje jau egzistuoja, tik nefunkcionuoja), privačių investuotojų paieška, MBO, antrinės rinkos naujai steigiami akcijoms sukrimas.
13. Siekiant vertinti skaitines charakteristikas, hipotetinis valstybinio rizikos kapitalo modelis –alyje papildytas koreliacine-regresine analize. Remiantis šios analizės išvadomis, suformuluota daugiavarė regresinė priklausomybė tarp valstybinio rizikos kapitalo ir jo takojamų rodiklių. Statistiškai reikšmingą teigiamą priklausomybę nuo valstybinio rizikos kapitalo parodė:
- parengiamojo etapo kapitalas,
 - veiklos pradžios kapitalas,
 - bendra rizikos kapitalo apimtis –alyje,
 - rizikos kapitalo dalis –ne Europos –alyje (sindikacijos efektas),
 - aukštesnė technologijų dalis rizikos kapitalo investicijose,
 - teigiamas rizikos kapitalo investicijos (privataus rizikos kapitalo pritraukimas) vėlesniuose raidos etapuose –signalizavimo efektas),
 - pirminių viešųjų akcijų skaičius.
14. Siekiant atskleisti ir sugrupuoti pradinius kintamuosius, turinius tokios valstybiniam rizikos kapitalui, atlikta faktorinė analizė. Jos metu iš pradinių kintamųjų, turinių reikšmingas koreliacijas su valstybinio rizikos kapitalo dalimis –alies rizikos kapitalo sistemoje, pagrindiniai komponentai metodu transformuoti į 3 bendruosius ir 1 specialųjį faktorius, kurie kartu paaiškina 89% reikšminio dispersijos (tad informacijos praradimo nuostoliai –tik 11%). Atlikta faktorinė analizė atskleidė, kad:
- didesnis valstybės institucijų dalyvavimas rizikos kapitalo rinkoje (finansinė, ne reguliacinė prasme) b) didesnis mažiau ekonomiškai ir finansiškai išsivysčiusiems –alims. Tyrimo pavidalo papildo pirmojoje (koreliaciniame –regresiniame) tyrimo dalyje suformuluoti išvada, teigianči, kad valstybinis rizikos kapitalas lemia spartesnį –alies rizikos kapitalo ir inovacijų sektoriaus vystymą: –aliai pasiekus tam tikrą išsivystymo lygį, valstybinio rizikos kapitalo apimtis –alyje pradeda mažėti;
 - didėjant –alies išsivystymo lygiui, kartu mažėja ir privačių investicijų –ši–stimo efektas, todėl galima teigti, kad valstybinis rizikos kapitalas, ankstyvesnė –alies vystymosi stadijose veikdamas kaip privataus rizikos kapitalo rinkos akceleratorius, vėlesnėse yra linkęs pasitraukti, uždelsdamas vietiniam ir taip sumažindamas privačių rizikos kapitalo investicijų –ši–stimo pavojų;
 - jei –alyje daug išsvetimo rizikos kapitalo arba privataus kapitalo (angl. *private equity*), nepriklausomai nuo jo kilmės, tuomet valstybinis rizikos kapitalas neturės paskatinti ir galimas privačių rizikos kapitalo investicijų –ši–stimo pavojus; ir priešingai, jei –alyje didesnė vietinė rizikos kapitalo fondų dalis, valstybinis rizikos kapitalas bus linkęs trauktis greičiau.

Pasiūlymai

- Pasirinkimas tarp privataus ir valstybinio rizikos kapitalo nebūtinai reikšmingas, kad vieno kurio reikia atsakyti: valstybinis rizikos kapitalas turi padėti privatumui, o

ne su juo varfytis, todėl siekis sukurti klestinę privačios rizikos kapitalo rinką kartu apima ir **pasiūlymą**, kad valstybinės investicijos būtų atliekamos kartu dalyvaujant ir privačiam sektoriui. Be to, galutinis valstybinio rizikos kapitalo tikslas – privios rizikos kapitalo rinkos sukūrimas, jos gyvybingumo ir plėtros užtikrinimas, todėl bet kokia valstybinio rizikos kapitalo strategija kartu turi numatyti ir perėjimą prie privios rizikos kapitalo rinkos.

2. Priešgyvendinant valstybinį plataus masto rizikos kapitalo politiką būtų tikslinga atlikti nacionalinį pilotinį eksperimentą, t.y. kelerių metų trukmės empirinius tyrimus valstybinio rizikos kapitalo srityje, siekiant patikrinti, ar dalyvavimas valstybinio rizikos kapitalo programoje padeda pasiekti nors vieną iš tikslų, išdėstytame darbe: investicijų pritraukimo parengiamajame moniavimo etape, sindikacijos, privios investicijų pritraukimo sekančiame finansavimo etape (signalizavimo efektas), bendros rizikos kapitalo apimtį –alyje didėjimo ir aukštesnių technologijų plėtros, galiausiai – akcijų rinkos plėtros (dėl išaugusio pirminių viešųjų akcijų silymskai iaus). Paflymtina, kad toks tyrimas brangiai kainuotų (pradinė investicija valstybinio rizikos kapitalo fondui) ir būtų ilgos trukmės, todėl tokio kontroliuojamo eksperimento turėtų būti pavesta atlikti nacionaliniais mokslo staigoms kartu su valdžios institucijomis, t.y. kuriant strateginio valdymo posistemą prie Vyriausybės ar atitinkamos ministerijos (kio arba Finansų).
3. Siūlomi pilotinio valstybinio rizikos kapitalo fondo funkcionavimo principai:
 - a) fondo valdymą patikėti privačiam sektoriui,
 - b) taikyti paprastas procedūras, kurios bus naudojamos kreipiantis dėl paramos,
 - c) plačiai paskleisti informaciją apie kuriam valstybiniam programai rizikos kapitalistams, investuotojams ir monims,
 - d) sukurti rizikos kapitalo programą nuolat vertinti, skaičiuojant rizikos kapitalo fondų ar maflūmonių, kurios generuoja komerciškai patrauklią grąžą, kėrimo tempus, arba privios investicijų, kurias padeda pritraukti valstybinis rizikos kapitalas, apimtį.

Mokslo tyrimo rezultatų aprobavimas ir sklaida. Mokslinio tyrimo teiginiai ir rezultatai paskelbti 8 mokslinėse publikacijose, iš kurių 6 straipsniai paskelbti moksliniuose žurnaluose ir 2 straipsniai – tarptautiniuose moksliniuose konferencijų recenzuotuose leidiniuose. Mokslinio tyrimo teiginiai ir rezultatai pristatyti 3 tarptautinėse mokslinėse konferencijose.