

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Financing and Innovative Entrepreneurship

Good Practices and Policy Recommendations



UNITED NATIONS

United Nations Economic Commission for Europe

**FINANCING INNOVATIVE
ENTREPRENEURSHIP**

**A COMPENDIUM OF POLICY RECOMMENDATIONS
AND GOOD PRACTICES 2008-2012**



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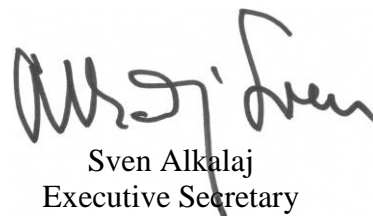
FOREWORD

Innovation is a key driver of sustainable development and economic growth, and for meeting the Millennium Development Goals, as re-affirmed by the 2013 Annual Ministerial Review of the United Nations Economic and Social Council. The global financial crisis of 2008-2009, the effects of which are still being felt in many countries, has only reinforced the need for innovation as a way of recovering lost ground and of making economies more resilient.

The region covered by the United Nations Economic Commission for Europe (UNECE) includes many of the most technologically advanced and innovative economies, but also most of the countries with economies in transition, and even some that qualify as developing economies. As such, our region is a very fertile ground for assessing innovation policies, learning from experience, and sharing the lessons thus learned.

UNECE has been doing this by organizing a series of international policy dialogues on the key aspects of innovation policy; distilling international good practices; developing policy recommendations; providing policy advice to requesting governments; and building capacity to implement policy reforms.

This Compendium is part of a series collecting the policy recommendations and good practices developed under the auspices of the UNECE Committee on Economic Cooperation and Integration (CECI). They are developed through an extensive multi-stakeholder policy dialogue within our international expert networks. The Compendium is intended to disseminate this work to a broader audience. The present volume focuses on policies which nurture the specialized financial intermediaries needed to provide early-stage financing for entrepreneurs and fledgling innovative companies, as well as on entrepreneurship support more generally.



Sven Alkalaj
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ABBREVIATIONS

| | |
|----------------|---|
| BANs | Business Angel Networks |
| CECI | Committee on Economic Cooperation and Integration |
| IPRs | Intellectual property rights |
| IPOs | Initial public offerings |
| LLP | Limited liability partnership |
| MFI s | Microfinance Institutions |
| R&D | Research and development |
| SMEs | Small and medium-sized enterprise |
| UNECE | United Nations Economic Commission for Europe |
| VC | Venture capital |

EXECUTIVE SUMMARY

This volume first discusses the regulatory environment for the financing of innovative enterprises. Innovative enterprises are engines of economic growth and job creation. Most of them start out small and private, seeking to reveal the uncertain commercial promise of a novel idea. Many of the traditional sources of financing are not fully suitable for innovative enterprises, particularly in their early stages of development. Given the negative cash flow and high risk of failure at these stages, innovative enterprises ideally need forms of financing that do not seek guaranteed repayment. Two forms of finance are particularly suitable: Merit-based awards (grants) and external equity provided by business angels, seed funds and incubators, and venture capital funds. The challenge for policy in this area is to facilitate the emergence of markets for these types of private financing, i.e. of simultaneously mobilizing capital, nurturing specialised financial intermediaries and encouraging innovative entrepreneurs. Each of these elements can emerge and develop only if the other two are present.

We then explore the financing of innovation in one particularly crucial area, clean technologies. Innovation, resulting in new technological solutions, is essential in order to reconcile the need to address climate change concerns with sustained improvements in living standards. However, the financing and development of innovative clean technologies present particular difficulties that require policy support. Market-based mechanisms such as full-cost pricing are important for creating incentives for innovation. However, given the pervasive character of market failures in this area, market mechanisms alone are unable to stimulate change at the scale and speed required. Regulatory intervention is also necessary. The public sector plays a crucial role not only in defining the regulatory and policy framework that drives change, but also in designing and funding arrangements to overcome the market failures that hamper progress.

IMPROVING THE REGULATORY ENVIRONMENT FOR THE FINANCING OF INNOVATIVE BUSINESSES¹

The present chapter identifies a number of policy options and instruments to support innovative enterprises in their effort to raise finance. These include general aspects of the tax and regulatory environment but also specific targeted programmes.

The Policy recommendations are derived from the experiences of UNECE member States, which provide ample scope for transnational policy learning. The activity of innovative enterprises and their efforts to raise financing have a strong international dimension, which has also been reflected in the elaboration of these Recommendations.

The chapter draws on the findings of a [comparative review of national policies and practices](#),² drafted in consultation with the CECI network of experts and stakeholders, and on the outcome of an [international conference](#), which took place in Geneva on 10-11 April 2008.³

1.1 The Nature and Financing of Innovative Enterprises

Innovative enterprises are engines of economic growth and job creation. They seek to commercially exploit new ideas, technologies, inventions or other scientific or market knowledge and business practices by introducing new products or services, creating or entering new markets, or applying new, more efficient methods of production or organization. Most innovative enterprises start out small and private, seeking to reveal the uncertain commercial promise of a novel idea.

There are distinct development stages through which an innovative idea germinates into a commercially successful enterprise:

- The seed stage covers the initial research and development of an idea or business concept, focused on determining its technical feasibility, market potential, and economic viability;
- The start-up stage includes the development of a product prototype, initial market research and market reach activities, and the establishment of a formal business organization;
- The early-growth stage pertains to small-scale commercialisation and growth as well as to the development of the pillars for the scalability of the business; and

¹ This chapter is based on UN document ECE/CECI/2008/4 “Policy Recommendations on Improving the Regulatory Environment for The Financing of Innovation-Related Activities”.

² See: <http://www.unece.org/fileadmin/DAM/ceci/publications/fid2.pdf>.

³ United Nations Economic Commission for Europe (2009), Policy Options and Instruments for Financing Innovation: A Practical Guide to Early-Stage Financing, New York and Geneva. Additional materials are available at: http://www.unece.org/ceci/documents/2008/fid/conf_fid08.html.

- The expansion stage covers the substantial growth in the scale and market impact of the business.

The net cash flow of an innovative enterprise follows a distinct pattern over time, being negative at the seed and start-up stages before it becomes positive. Nascent innovative enterprises need to overcome their early-stage uncertainty in order to reveal or create their commercial potential.

Many of the traditional sources of early-stage finance are not fully suitable for innovative enterprises. Given the negative cash flow and high risk of failure at their early stages of development, innovative enterprises ideally need forms of financing that do not seek guaranteed repayment.

Two forms of finance are suitable for the early development stages of innovative enterprises:

- Merit-based awards (grants). Enterprises receive funds unconditionally, i.e. the funds do not have to be repaid if the enterprise is not successful. Such funds can be used for early concept development or exploratory market research. This can provide important certification to the recipient enterprises when they subsequently seek to raise private capital for their further development.
- External equity. By receiving equity stakes in exchange for their capital, investors have claims on the residual value of the enterprise, sharing not only its upside potential but also its downside. Typical providers of external equity financing are business angels, seed funds and incubators, and venture capital funds (including private, corporate affiliates, or government-sponsored).

Any policy initiatives aimed at improving the environment for early-stage financing of innovative enterprises should consider the fundamental challenges associated with establishing markets for private financing as well as the more general challenges associated to public intervention.

These initiatives need to address the problem of simultaneity of three central inputs: (1) capital; (2) specialised financial intermediaries; and (3) entrepreneurs. Each of these elements can emerge and develop only if the other two are present.

Given the development stages of innovative enterprises, there are different clusters of financial intermediaries, each seeking to accomplish distinct goals, harnessing specific sources of capital and serving particular classes of entrepreneurs. Therefore, public interventions aimed at facilitating the emergence and development of such intermediaries requires understanding of the challenges that they face in raising capital, making investments, and obtaining proper returns that can sustain their activity.

1.2 From Ideas to Start-ups

It is difficult to predict whether a particular innovative enterprise will turn out to be successful on a large scale. The emergence and development of innovative companies requires a constellation of promising opportunities, sufficient allocation of financial resources, and access to operational, marketing, financial, and managerial expertise. This demands an innovation support system that

continuously screens promising ideas and allocates increasing amounts of resources to the projects that gather momentum.

The establishment of such a system depends on the supply of ideas and on the efficient decision structure that evaluates, selects, and supports promising ideas. The sourcing and proper evaluation of these ideas requires both geographic and knowledge proximity.

Implementing an innovation support system needs an incentive framework for such agents to emerge and an overall coordination of these agents in order to ensure that all areas of the innovation enterprise spectrum are well covered. Public policy can be effective in implementing these tasks by means of both direct involvement and indirect incentives and support.

Formulating public policy initiatives should be based on the understanding of the distinct challenges to both potential entrepreneurs and investors in the early stages of the enterprise development process. Potential entrepreneurs face the challenge of generating, assessing, and developing promising ideas. Success requires feasibility assessment and understanding of the business development and funding process. In turn, potential investors need to select promising projects when they lack sufficient information, monitor the development of these projects to ensure that resources cease to flow to projects with poor prospects, and obtain returns commensurate with the risk of the funded projects.

Public initiatives can be designed to deal with one or more of these issues. But collectively, as part of a broader policy framework, they need to ensure that all challenges are addressed. Individual initiatives can comprise direct involvement with potential innovative enterprises, through provision of feasibility grants, promotion of relationships with research and development (R&D) institutions, and provision of business support services, and indirect involvement, through financial and technical support and incentives to specialised intermediaries such as microcredit institutions, business angels, and corporate venture capital units.

Feasibility grants provided by public agencies are an effective source of seed financing for innovative companies. The ultimate goal of such programmes is to enable the transformation of innovative ideas into proposals that can generate a strong supply of investment opportunities to private investors and eventually develop into enterprises with large economic and social impact. However, such programmes are susceptible to political and bureaucratic influences that may interfere with the soundness of the business decisions.

There are several areas that need to be properly addressed for such programmes to achieve their intended goals:

- Structure of the decision making process (i.e. who makes the funding decisions?);
- Decision criteria (nature and consistency across decision agents);
- Certification to private investors (i.e. will they perceive the grants as positive signals?);
- Monitoring and support of selected projects;
- Proper programme evaluation measures; and
- Ensuring quality deal flow.

The commercialisation of cutting-edge scientific knowledge through the establishment of innovative, technology-based enterprises requires effective integration and information exchange between public R&D and business and educational institutions.

Relationships between businesses and public R&D institutions can be fostered in different ways:

- Education of faculty staff and researchers on possible entrepreneurial opportunities, the process involved in developing these opportunities, and the available resources for the pursuit of these opportunities;
- Provision of information to business partners on the nature and possible application of the scientific knowledge developed in public R&D institutions;
- Granting technical and financial support for the early exploration of ideas; and
- Provision of technical and financial assistance for the incubation of promising enterprises.

A number of specific intermediaries can be used to develop these relationships:

- Technology transfer offices or cooperation networks among R&D, business, and educational institutions;
- Specialised service intermediaries; and
- Technology incubators or innovation accelerators.

Special attention should be devoted to the ability of supported enterprises to attract follow-up financing once they “graduate” from the support provided by these intermediaries.

Business support services can help entrepreneurs to overcome the initial challenges in the development of a company. These services can serve as platforms for ensuring the “investment readiness” of their recipients in terms of the entrepreneurs’ preparing suitable business plans and understanding the different sources of finance available to their businesses at different stages of development.

There is a wide range of services that can be provided to potential enterprises, based on the following goals:

- Awareness raising (information to generate and support business opportunities);
- Networking (i.e. promoting contacts between various stakeholders);
- Match-making (matching entrepreneurs with sources of expertise and funding);
- Training in feasibility studies and business planning; and
- Coaching (i.e. guidance through feasibility studies and business planning).

The provision of small loans (microcredits) is a suitable instrument to support initial concept development or feasibility studies. Due to the combination of high transaction costs and small loan amounts, such loans are uneconomical for most banks and are often granted by specialised

microfinance institutions (MFIs). MFIs use different appraisal methods, have different collateral requirements, and may also provide business advice and support.

Various instruments can be used to increase the flow of microcredits to eligible entrepreneurs:

- Provision of grants and technical support to defined MFIs to provide initial capital or offset the high costs inherent to their micro-lending activities;
- Direct financing or co-financing of projects that have been initiated by MFI or other eligible microcredit organizations;
- Provision of microloan guarantees to encourage currently non-involved financial institutions to engage in micro-lending; and
- Provision of tax incentives for micro lenders or for their third-party capital providers. Such incentives can improve the cost efficiency of the MFI and enhance their stand-alone viability.

The effectiveness of these instruments in advancing the overall mission of promoting innovative enterprises depends on:

- Effective credit assessment procedures that reduce the ratio of operating costs to loans;
- A clear specification of the types of enterprises to be supported – down to operational definitions to be used by field loan officers in appraising potential applicants;
- Operation in close proximity to places where innovative enterprises originate, such as universities and research institutions; and
- Possession of specific business, analytical, or technology knowledge and skills related to the appraisal of the feasibility and preparation of plans for innovative enterprises.

Business angels play a critical role in financing the early development of innovative companies. Business angels are individuals that make equity investments in promising ventures. For many angels, the source of their wealth is the sale of businesses that they had founded and operated. They can provide a substantial portion of the seed and start-up capital to entrepreneurial ventures, including through syndicated deals involving several angels.

Business angels provide not only capital but also:

- Facilitate valuable strategic, operational, and market advice based on their extensive business and entrepreneurial experience; and
- Introduce the entrepreneur to major stakeholders such as customers and suppliers.

Information between business angels and entrepreneurs does not flow easily. Business angel networks (BANs) have emerged in recent years to address this market and information inefficiency as well as provide value added services to both individual angels and entrepreneurs. BANs pool the financial, knowledge and information resources of groups of angels to become more visible to prospective entrepreneurs, to attract bigger deal flow and thus sift better-quality deals, and to apply more formal screening and investment selection.

The key services rendered by BAN include:

- Matchmaking through networking events or investment forums;
- Business plan coaching to prospective entrepreneurs;
- Training to participating investors and entrepreneurs;
- Syndication support and set-up of co-investment funds; and
- Liaising with other finance providers for co-investment opportunities.

Investment by business angels depends on a number of factors, which can be influenced by policy interventions:

- Return potential: The returns to private investments depend on the quality of recipient enterprises, the availability of subsequent private growth capital to spur the large-scale development of these enterprises, and the conditions under which the business angel can exit their investments.
- Supply of high-quality entrepreneurial enterprises: Business angels can be discouraged by the limited number of deals meeting their investment criteria as well as by the poor quality of the investment proposals they receive.
- Tax conditions: The availability of income, capital gains, and dividend tax relief for private investments can provide a strong incentive for investing in private enterprises.
- Economic conditions: Economic growth, interest rates and inflation can affect angel activity by increasing or decreasing the returns to be made on alternative investment opportunities.
- Stock market conditions: Stock market movements and expectations can affect the amount available for private investments as well as the opportunity cost of such investments.

Policy initiatives that aim to increase the supply of high-quality innovative enterprises can have a spillover effect on business angel activity. In addition, there are several possible policy instruments that can be used to encourage business angel activity:

- Tax incentives, including tax rebates or deductions and exemption or deferral of capital gains on investments in specific types of company;
- Technical or financial support for the establishment and expansion of BANs, particularly in regions where such networks do not yet exist;
- Technical or financial assistance for business angel training in standalone facilities or through BANs; and
- Financial leverage instruments such as co-investments with business angels or business angel investment funds and allocation of capital to business angel investment funds, based on the attraction of certain amount of private capital.

Corporate venture capital refers to equity or equity-type investments by subsidiaries of non-financial corporations in private, entrepreneurial firms. Compared to traditional venture capital investors, corporate venture capital investors may be less concerned with financial returns and more with the strategic value that the entrepreneurial firm may eventually bring to the parent organization.

Established companies look for innovative ideas and new opportunities, as part of their strategies to remain competitive. Various policy instruments can be used to attract them as partners in the financing and support of innovative enterprises:

- Tax incentives for investments in private, innovative enterprises;
- Public-private partnerships that involve financial participation; and
- Establishment of administrative structures (such as industry-related incubators) that facilitate the commercialisation of new ideas.

Direct instruments can increase the entrepreneurial awareness and skill sets of potential entrepreneurs located in R&D institutions as well as provide them with critical early means to explore the feasibility of their ideas. Indirect instruments can encourage and facilitate the involvement of other funding agents, such as microcredit agencies, business angels, and corporate venture capital funds, by improving the flow of information to them or providing them with support or incentives that ensure the economic viability of their investments in innovative enterprises.

1.3 Early-stage Growth

Once the commercial potential of the enterprise is deemed real, capturing it requires sufficient financial and technological resources as well as managerial and strategic skills. This demands the provision of special development capital that combines financial resources with managerial oversight and strategic expertise that traditional financial intermediaries cannot facilitate.

Venture capital (VC) financing pertains to the provision of professionally managed capital to promising enterprises in exchange for equity stakes, with the anticipation of selling those stakes in 5-7 years at substantial premiums once these enterprises reach certain developmental milestones or fulfil their commercial promise.

As providers of development capital, VC firms perform an important intermediary function: they channel funds from institutional investors to high-potential enterprises. Although institutional investors stand to benefit from portfolio diversification into private, innovative enterprises, they lack the expertise to select and help develop such enterprises.

A developed VC industry thus requires well-functioning interfaces for the flow of funds from institutional investors to VC firms, from VC firms to high-potential enterprises, and from there back to the VC firms and institutional investors. Any interruption of that cycle can undermine the vitality and sustainability of the VC industry.

The characteristics of a typical private VC fund include:

- **Structure.** Each fund is typically organized as a limited liability partnership (LLP), in which some or all of the VC firm managers act as general partners and provide a small part (typically 1%) of the fund's capital. The rest of the capital is provided by institutional investors (e.g. pension funds, university endowments, banks or insurance companies) or wealthy individuals and family trusts, who serve as limited partners.
- **Term.** LLPs have a fixed-term life, typically 10-12 years. Transfer of partnership stakes and early withdrawals from the partnership before the termination date is prohibited.
- **Management.** The general partners make all investment and divestment decisions. Limited partners are prohibited from active management of the fund.
- **Distribution.** LLPs allow distributions to flow through the partnership structure to the limited partners and be taxed at the limited partners. The exact tax treatment of LLPs varies across countries.
- **Compensation.** The VC firm typically receives an annual management fee of 2-2.5% of the committed capital for the life of the fund and 20%-25% of the distribution to the partners beyond a minimum (the nominal amount plus a statutory minimum return).

VC managers use a multi-stage process to select investment opportunities. They monitor the progress and potential of their portfolio companies, and provide staged infusion of capital, tied to the achievement of specific milestones. Finally, VC investors add value to their portfolio companies by providing strategic and managerial advice, network contacts and playing an active role in the recruitment and professionalization of management.

The venture capital financing process is essentially a cycle through which money flows: from institutional investors to VC funds, from VC funds to promising entrepreneurial companies, from the entrepreneurial companies back to the VC funds, and from the VC funds back to the institutional investors. This self-reinforcing cycle consists of four main stages: fund-raising, investing, managing / value adding, and exiting.

While each of these stages can be viewed as a policy lever, all four stages need to be developed and active for the early-stage VC financing process to function and create its impact. Each lever needs to be attuned to the specific needs of the VC firms it aims to attract.

Because VC firms do not invest their own funds, fundraising is a critical component of the VC cycle. For external investors, allocating funds to VC firms makes economic sense only to the extent that the returns achieved by VC firms exceed the investors' opportunity costs and adequately compensate them for the undertaken risks.

There are several formal tax and regulatory issues that determine whether venture capital is a suitable class for asset allocation and whether venture capital funds will be allocated to early-stage enterprises. Policy interventions in the area of early-stage financing should be mindful of the implications of different tax and regulatory set-ups.

The existence of a dedicated or suitable structure for raising capital from institutional investors is of vital importance for avoiding double taxation and deferring tax liabilities until securities are actually sold. Tax regulations such as permanent establishment exemption (under which funds by international investors are not subject to local country tax) and capital gains tax can have a direct impact on investor returns.

Convertible preferred shares play an important role in aligning the interests between investors and managers, and can provide powerful incentives if subject to favourable tax treatments. The applicability of convertible preferred stock in a given country depends on whether the local rule of law can enforce its contractual protection and the tax rules related to the valuation of convertible securities and treatment of stock options.

Many institutional investors – and especially those handling public or regulated funds – are subject to explicit quantitative restrictions for allocation to “alternative” asset classes such as venture capital (private equity). In addition, such investors also need to comply with “safe haven” and “prudent man” rules that guide investment decisions. Public regulations in this area can affect the fundraising possibilities of VC.

Investment allocation decisions by VC are affected by a range of factors:

- Local institutional investors may have insufficient knowledge of the VC industry, the nature of VC investing, and the return profile of VC funds. Such knowledge can be provided by specialised gatekeepers or investment advisors, supported by public initiatives.
- The degree to which local VC firms possess skills and social capital relevant for managing innovative enterprises depends on the availability of career paths from high-technology industries to VC firms, as well as on the mobility of VC managers across firms and countries.
- Institutional investors can be concerned about the prospects of funds that are newly established or led by relatively inexperienced managers. The presence of cornerstone investors (such as government agencies) or the establishment of public-private partnerships can provide vital certification and compensate for investors’ risk aversion.
- Fund-raising goes through natural cycles of ebbs and flows, exposing the need for VC firms to provide follow-on financing to their portfolio companies during downturns in fund-raising. Public programmes can be deployed to offset this variability.
- VC investors seek to add value when they stand to gain from the upside swings of their investments. The inability to participate in follow-on rounds due to small fund size can lead to subsequent dilution of ownership stake and thus to reduced return potential. Public programmes can employ specific instruments to leverage the VC firms’ returns.

In addition to VC firms, more traditional financial intermediaries, such as banks, can play a role in the financing of innovative enterprises. However, early-stage companies do not have a historical performance or tangible assets while cash flows are negative or volatile. Specific instruments of support are necessary to entice these lenders to support the early-stage growth of innovative enterprises.

Public or private financial instruments can be implemented in ways that improve the risk – return parameters to bank lenders through various forms of credit enhancements. In the absence of sharing the upside gains of the supported enterprises, these instruments protect finance providers against potential losses.

Guarantees by third parties are an external form of credit enhancement, whereby such parties (e.g. insurers or government agencies) promise to reimburse investors (lenders) for losses up to a pre-specified amount incurred due to the borrower's defaulting on a loan or other payment obligations.

Guarantees eliminate or mitigate the risk for the lending institution but they pose challenges to the administering government agency regarding potential adverse selection and moral hazard problems. Eligibility criteria need to be clearly specified so that only the group of intended recipients receive such guarantees. Effective selection criteria are required to ensure that entrepreneurs will put their best efforts towards establishing and growing their business and that an element of risk remains.

Credit enhancement can be provided in partnership with private institutions. Public agencies can assist in the establishment or funding of such institutions. Public agencies can provide counter-guarantees to or co-guarantees with private companies that act as third-party guarantors.

The early-growth of innovative enterprises requires both sufficient capital and proper management expertise. Public policy can play an important role in facilitating the flow of growth and development capital to innovative enterprises by engaging both venture capital firms and traditional financing institutions.

Venture capital firms can perform a vital intermediary function in connecting capital from institutional investors with high-potential enterprises. But the scale, scope, and quality of their activity depend on a smooth transition through four stages of the VC process: fund-raising, investing, value adding, and exiting. Policy initiatives can target any of the deficient areas in the cycle but the effectiveness of such interventions ultimately depends on the coordination of efforts through this cycle.

Three of the stages – fund-raising, investing and exiting –require an enabling regulatory and tax environment, strong supply of innovative enterprises, and public capital markets receptive to such enterprises. This suggests that efforts to develop a VC industry should be part of a more comprehensive innovation policy.

1.4 Financial Development and Public Capital Markets

Well-functioning stock exchanges are instrumental for the development of innovative companies because they can provide both fresh capital for their large-scale expansion and new product development and opportunity for the seed and early-stage investors to trade their stakes, realize capital gains (or losses), and ultimately redeploy their capital into new investment opportunities.

The same challenges that innovative enterprises pose to prospective investors also limit their suitability for traditional stock exchanges. More flexible regulations and operations are required to meet the needs of younger, high-growth enterprises.

Stock markets can provide liquidity for private investors and have served as major pillars for the development of VC industries. Two components of stock exchange activity are particularly relevant for the financing of innovation:

- Initial public offerings (IPOs). An IPO is the issue of new stock by a once private company, whereby it transforms itself into a publicly held one. IPOs are used to raise growth or expansion capital for companies (young or established) that have capital requirements that are too large or too costly for the private owners to provide.
- Secondary market. When stocks or bonds are traded or resold, these transactions take place on a secondary market. Its proper functioning requires sufficient trading liquidity, i.e. many ready and willing buyers and sellers. A stock exchange can suffer from low liquidity if it lacks sufficient scale or impedes trading by institutional investors, including foreign ones.

There are several common areas of regulation that affect the degree to which a country's public markets can meet the needs of younger, high-growth enterprises:

- Listing requirements, including minimum market capitalization, sufficient working capital for a period of time, etc.
- Companies seeking listing on a public stock exchange need to register with the respective regulatory Commission and meet certain disclosure and legal compliance requirements.
- At the IPO, certain securities may be subject to trading restrictions for a certain period of time, which reduces their attractiveness.
- Once listed on a stock exchange, companies need to provide periodically information to the public related to their operating and financial results and business prospects.
- The prevailing legal regime and the degree of law enforcement can influence the degree of investor protection.

Several stock exchanges have emerged to provide financing for small and medium-sized businesses, particularly those that are innovative and growth oriented. Their "junior" characterization comes from their affiliation with major stock exchanges and from their offering of rules and regulations tailored for high-potential companies.

These emerging markets for small and medium-sized companies are increasingly shifting their strategic focus to international/pan-European activity in order to broaden their investor base and achieve higher trading liquidity. In addition, with the rapid internationalization of market activity, especially for innovative enterprises, and growing economic integration, the "home bias" towards domestic exchanges is beginning to dissipate.

There are several areas in which policy initiatives related to the promotion of innovative enterprise can – alone or in partnerships with the private stakeholders – support cross-border exits:

- Facilitation of information exchange and increased awareness of the capital market possibilities offered by the junior exchanges. Such efforts can be directed towards both

institutional investors (to increase trading liquidity) and potential or current entrepreneurs (to increase the number of new listings); and

- Training of support service providers such as stock analysis, consultants, and gatekeepers to develop and disseminate specialised knowledge of the needs, regulations, and opportunities for small and medium enterprises.

Trade sales, although on average less lucrative and less visible, represent a more frequent form of exit for business angels and venture capital firms. For established companies, acquisitions represent an important option for enhanced competitiveness and strategic renewal. The actual opportunities for acquisitions in turn depend on the existing firms' abilities to both identify promising acquisition targets and finance the actual acquisitions.

A favourable environment for trade sales is defined by:

- A supply of high-quality innovative enterprises, offering products or services that could potentially enhance the revenue streams of established companies;
- The existence of active and internationally oriented investment banking and consulting communities; and
- The existence of active stock markets, particularly those better attuned to the needs of new, innovative, high-growth enterprises.

Public capital markets can provide closure to the innovation process by facilitating the recycling of capital from one generation of innovative enterprises to the next. Given the distinct needs and characteristics of innovative enterprises, several specialised, "junior" stock exchanges have emerged to facilitate the flow of funds to such enterprises.

The ultimate success of these exchanges depends on their scale and trading liquidity, which in turn depends on their abilities to span geographical boundaries, attract institutional investors, and develop a network of specialised service providers.

Public policy can play a supporting role in this process by facilitating (1) the scaling up of domestic exchanges by attracting foreign investors and enterprises and encouraging the development of a support network of analysts, investment bankers, and consultants, and (2) the access of domestic enterprises to foreign exchanges by increasing their awareness of the opportunities offered by these exchanges.

1.5 General Conclusions

Effective public policy for promoting the emergence, development, and financing of innovative enterprises requires a profound understanding of the environment in which innovative enterprises emerge and thrive and the factors that sustain them through their various stages of development. Each individual initiative or instrument is part of a broader picture – and an integrated framework that needs to be put together to define effective interventions.

The emergence and effective functioning of markets for private financing of innovative enterprises requires the simultaneous presence of several conditions: capital, specialised financial intermediaries, and entrepreneurs.

Given the distinct development stages of innovative enterprises, there are different types of financial intermediaries, each seeking to accomplish distinct goals, harnessing distinct sources of capital and serving particular classes of entrepreneurs:

- Seed-stage intermediaries such as incubators, grant programmes or microcredit institutions need to engage as many potential entrepreneurs as possible in a way that can efficiently identify promising entrepreneurial ideas;
- Start-up-stage intermediaries such as seed funds and business angels take the promising ventures through the hurdles of product development and initial market testing to reveal small-scale commercial success.
- Early-growth and expansion-stage intermediaries such as venture capital funds can fire up the growth process by accessing and deploying larger amounts of capital and providing critical management expertise and social capital to the new venture.

For each development stage and financial intermediary, there are four interfaces that ensure that the three components (capital, intermediaries, and entrepreneurs) engage and operate in a self-propelling, cyclical process. All four levers need to be developed and active for the financing process to function and create its impact. Financial intermediaries need to:

- Have access to sufficient amounts of capital (fund-raising);
- Be able to allocate that capital to promising enterprises (investing);
- Provide appropriate value added to these enterprises, to enhance their potential for success (value adding); and
- Be able to liquidate their investments and re-deploy their capital to a new wave of enterprises (exiting).

Government programmes can employ several different generic modes of allocating resources and providing incentives that ultimately lead to increased supply of innovative enterprises and larger mobilization of private funds for the financing of these enterprises. Each of these instruments seeks to create conditions for the engagement of private companies into a well-functioning market for private financing.

The involvement of the private sector in public early-stage financing initiatives is critical, not just as a way to increase the resources available but also to ensure that appropriate professional expertise can be relied upon on the management of public schemes.

Policy initiatives need to be both effective and efficient, i.e. it needs to be clear that innovative enterprises do emerge as a result of their implementation and that the economic and social benefits these enterprises bring outweigh the cost of the initiatives. Determining whether this is the case is not an easy task. Therefore, successful programmes require both careful design – that

anticipates and averts possible challenges and conflicts of interest – and attentive monitoring of operations and results.

Some of the areas that need special consideration in the design and monitoring of programmes include:

- Displacement of private funding. Would an enterprise have been able to obtain funding if the public programme were not in place?
- Targeting the right recipients. If left to be interpreted by individual agents, the term “innovative enterprise” could apply potentially to a diverse group of enterprises. Carefully derived and tested operational definitions are essential for guiding field decision makers towards supporting the desired group of enterprises.
- Measuring success. Success can be defined in many different ways – survival, growth, profitability, social impact, etc. – and apply to short or long-term time frames. Employing a common metric of success is important for comparing different programmes, but excessive focus on a particular indicator can also distract from other, longer-term aspects in which an enterprise can benefit the economy and society.

Synergies and complementarities among various programmes deserve special attention, in particular if they are run by different agencies. A country’s set of initiatives can be effective only to the extent that it addresses all the inactive components of the private finance markets. This requires high-level coordination of policies in the areas of regulation, tax, innovation, and early-stage financing. Coordinated approaches should introduce schemes that build on previous experiences or seek to complement concurrent programmes. Financial assistance is often more effective when provided together with business support services.

Comprehensiveness and coordination can be facilitated by instituting effective policy learning mechanisms that can take advantage of both the local and other countries’ policy experience. Such mechanisms require careful understanding of the goals and results from previous policy interventions, which in turn require proper and effective measurement and evaluation of programme outcomes.

FINANCIAL AND ENTREPRENEURIAL CHALLENGES IN HIGH-GROWTH INNOVATIVE FIRMS⁴

This chapter builds on the discussions that took place during an international conference on [Policies to Address Financing and Entrepreneurial Challenges in High-growth Innovative Firms](#).⁵ The Conference, which was held in Helsinki on 2-4 June 2010, was organized by the UNECE in cooperation with the Ministry of Employment and the Economy and the Ministry of Foreign Affairs of Finland.

In modern economies, a small percentage of new companies account for the bulk of job creation. These high-growth firms, which according to widely used definitions are those with an annual growth in employment or turnover exceeding 20% for three consecutive years, tend to display higher productivity rates and therefore have a disproportionate impact on economic activity. In addition, these companies are critical in driving innovation because existing organizations are reluctant to adopt radical changes that may negate the value of their existing assets or business models. Disruptive innovations find a more fertile ground in these high-growth firms.

Given the importance of these firms for economic dynamism and prosperity, nurturing them has emerged as an important policy target. This chapter presents some of the main relevant policy issues and good practices that can be derived from the experience of UNECE Member States. Its structure reflects the policy areas that were the main focus of the Helsinki International Conference. First, it presents a general discussion of policies promoting innovative high-growth entrepreneurship, with particular consideration to the challenges that have emerged during the economic crisis and the lessons that may be drawn. Second, it discusses the role of different types of collaborative arrangements to foster innovation and the requirements for their success. Finally, it introduces the particular challenges that high-growth innovative enterprises face in raising finance and various policy experiences to address them in an effective way.

2.1 Nurturing High-growth Firms: Policy Challenges

There are many factors that influence entrepreneurship, including the regulatory framework, market conditions, access to finance, creation and diffusion of knowledge, entrepreneurship capabilities and culture. General framework conditions for economic activity, such as macroeconomic stability or the development of infrastructure are also important determinants of entrepreneurial success.

Given this varied and complex set of factors, an improved understanding of how these elements affect the emergence and development of new firms contributes to the capacity of policymakers

⁴ This chapter is based on UN document ECE/CECI/2010/6 “Synopsis of good practices and policies to address financial and entrepreneurial challenges in high-growth innovative firms”.

⁵ Additional materials are available at : http://www.unece.org/ceci/documents/2010/icp/conf_icp10.html.

and other stakeholders put in practice effective supportive measures. This understanding should be backed by statistical and benchmarking tools to assess the impact of actions in different policy areas.

It is important that policies distinguish between small and medium enterprises (SMEs) that will remain small or disappear and those that have the potential for sustained high growth. From a policy perspective, a difference should be made between supporting new firm creation and new firm growth. Increasing the number of firms does not necessarily translate into significant jobs expansion if the firms created are not of high-quality.

Nurturing high-growth firms requires specific policies that go beyond those that may be required to support the development of entrepreneurial activity. More focussed policies are necessary to address the specific challenges faced by high-growth companies, with an emphasis that lies not on the quantity of new firms but on their quality. A focus on high-growth companies may require more selective entrepreneurship policies but this raises the challenge of how to identify these firms with high potential effectively.

In high-growth companies, a continued commitment to innovation is an essential driver of their expansion. Many studies support the notion that a key factor explaining the difference between faster and slower growing firms is innovation. However, there is a need to avoid an excessively restrictive view of innovative entrepreneurship, which should encompass not only high-tech and knowledge-intensive companies but also other instances of radical innovation that challenge existing firms and create new economic opportunities.

In doing this, an appropriate balance should be found between the aim to continue improving framework conditions, which have a more general significance but also benefit high-growth firms, and more specific policies targeting innovation.

The success of high-growth companies depends on:

- Internal factors such as managerial competences and technical expertise; and
- The ability of these firms to operate in an environment where they have access to necessary external resources, including high-quality business services.

The importance of both internal and external factors should be recognized in policy interventions, which should target not only the firms but also the environment in which they operate. This dual approach would serve to better diagnose problems and design measures that can generate effective synergies.

Skills play an important role in explaining the performance of high-growth enterprises. These companies need to have access to qualified staff, including through the ability to hire skilled foreign workers if required. High educational standards should be a permanent focus of public policies, which need to include also lifelong learning initiatives.

Entrepreneurs in high-growth companies are often highly educated individuals, so measures that facilitate career mobility may have a positive effect on the emergence of this type of ventures.

Interventions in this area may encompass general features of the pension and health provision systems and labour market regulations.

High-growth firms thrive when they find favourable conditions for expansion. Policies can facilitate the development of these firms by increasing the size of potential markets, reducing barriers and coordinating standards that facilitate entering new markets. Deregulation may also create new opportunities that can be seized by these dynamic firms.

Internationalization is always difficult for SMEs but access to foreign markets is essential for high-growth firms to reach their potential. Public initiatives can support these efforts through a variety of means, both at the national and international levels. At the national level, public schemes can help businesses to gather information on foreign markets, which is always costly for the individual firm. At the international level, a commitment to open markets, including through the avoidance of discriminatory public procurement procedures, contribute to create conducive conditions for international expansion.

Foreign markets provide not only opportunities for growth but also facilitate access to technology. Imports of knowledge-intensive products are an important channel for the dissemination of innovation across borders, thus eventually increasing domestic innovation capabilities. Policies should be mindful of these positive effects and not create unnecessary barriers.

Public research and development (R&D) is a key catalyst for related private spending and a source of quality inputs and business opportunities for smaller companies. Public R&D is particularly important in maintaining innovation activity during economic slowdowns, as this creates the basis for future growth. This lesson, which is backed by the experience of a number of countries, is especially pertinent in current conditions, as the financial pressures created by the worldwide economic crisis is resulting in a drive for fiscal austerity.

It is important to note that countries find themselves in different positions in relation to the technological frontier, which has implications for R&D policies. In countries with economies in transition, the prevalence of public R&D creates particular challenges to ensure that such spending reflects market needs.

Generation of new knowledge and its dissemination across the economy are enhanced by the development of an effective innovation infrastructure, including a network of business incubators, science, technology and research parks. Different types of tax benefits, subsidies and other forms of public support can be granted to these elements of the innovation infrastructure. The effectiveness of these mechanisms of support is enhanced when they are coordinated closely with different programmes for SMEs development.

High-growth innovative firms develop and respond to market opportunities. Therefore, the emphasis on policies should be not only on the generation of new knowledge but on the diffusion of this new knowledge, including through policies that raise the capacity of these firms to absorb new technology.

Technology diffusion programmes need to be customer-oriented and contribute to increase the demand for technology and innovation in targeted firms, including through their contribution to

raising awareness on the value of innovation. In order to ensure its effectiveness, it is important that these programmes are based on a good understanding of the relations between the various stakeholders of the national innovation system, which would make possible the identification of the appropriate delivery channels and the most suitable targets for intervention.

These technology diffusion programmes may have different objectives, including:

- Improving the adoption of specific technologies, in many cases targeting specific sectors;
- Enhancing the general technology skills of companies, thus supporting their ability to diagnose their technology needs; and
- Developing the innovation capacity of firms, which may help companies to develop innovation-oriented strategic management while increasing their skill base.

Intermediary organizations with public funding can be used to increase the innovation ability of high-growth companies, providing specialized advice and helping to connect them with other innovation stakeholders.

Public demand is widely recognized as an effective tool to increase the demand for innovation. However, it is important to ensure that public procurement mechanisms do not implicitly discriminate against SMEs, putting them at disadvantage by including requirements that are difficult to fulfil. By contrast, public procurement should actively encourage the formation of consortia or other forms of collaborative arrangements that facilitate the access of SMEs to public contracts.

Authorities should remain vigilant to the impact of new regulations on the business environment and, in particular, on high-growth firms. Regulations have a disproportionate impact on SMEs because, given their size, they are less prepared to bear these costs, which have a larger relative significance for them in comparison with established firms. Regulations can be particularly damaging for flexibility, which is a major competitive strength of high-growth companies. As high-growth firms activities involve significant commercial and, in some case, technological risks, they may be particularly sensitive to the additional uncertainties created by changing regulations.

Auditing and monitoring of new legislation, as adopted in some countries, is a good practice that contributes to ensuring that no unnecessary obstacles constraining the development of private business are introduced. In particular, regulations that limit competition and discourage entry by new dynamic companies should be carefully scrutinized.

Public authorities should strive to facilitate access to information by SMEs and, in particular high-growth companies, concerning regulations, so to facilitate compliance without imposing undue costs.

Broadly speaking, governments have an important role to play providing different types of public goods related to access to knowledge and the development of networks, thus overcoming coordination problems in the private sector. The close involvement of the private sector in designing and developing these initiatives is important to ensure that their needs are appropriately recognized and addressed.

Differences in institutions and the level of economic development should be considered when trying to identify the types of policies that are appropriate. While international experience creates significant opportunities for policy learning, there is a need to bear in mind specific national contexts and needs. This requirement concerns not only the intermediate targets that are pursued when promoting innovative high-growth enterprises but also the choice of instruments and the mechanisms of delivery.

Strategies and policies should have a time horizon that is long enough to yield results, while providing the necessary stability so the arrangements put in place are well understood by private sector participants. Budgetary allocations should fit the targets that are being pursued. Appropriate delivery mechanisms, which rely on an infrastructure that is consistent with the envisaged targets and modalities of intervention, should be an essential part of policy design.

Programmes targeting high-growth firms should be subject to strong quality control requirements and on-going monitoring of their effectiveness. A key factor in this assessment is their continuous responsiveness to customer needs.

Entrepreneurship policies targeting high-growth entrepreneurs depend on a complex number of factors. Therefore, these interventions should be comprehensive and consider both demand and supply elements, while working together with the private sector and exploiting synergies between the activities of different government departments and agencies.

There is a need to develop a coherent and comprehensive framework that addresses all relevant issues in a systematic matter, including those concerning the coordination of the activities of various government layers. Policies should not be assessed on isolation but as part of complex sets of interventions.

2.2 The Role of Cooperation in Promoting Innovation: Best Practices

Innovation activities do not emerge in a vacuum. High-growth firms rely on other firms, as suppliers or partners, to create competitive commercial proposals. Proximity to research and education institutions facilitates access to specialized knowledge and highly skilled staff. Customers, suppliers and competitors are often the most important sources of new ideas.

Successful companies often combine available knowledge or technical solutions in novel ways that improve existing products or services or create new commercial concepts. High-growth firms, which are flexible and inventive, are particularly adept at exploiting the potential of existing technologies, despite the fact that they do not have the resources to conduct themselves large-scale R&D activities.

High-growth firms need to be closely connected with research efforts conducted elsewhere, so they can tap into this potential to anticipate and respond to market needs. This concerns not only relations with public education and research institutions but also with established large companies.

Different types of public-private partnerships should be developed to create close links between the research base and the industry. This would facilitate pooling resources, sharing knowledge, experiences and good practices and increasing mobility of researchers.

These arrangements should promote the development of bridging institutions, supported by a system of incentives that favours collaboration and coordination between various innovation stakeholders in both the private and public sectors. These institutions can help to increase the degree of connectivity of the national innovation system, through network effects, an effective system of referrals and the dissemination of information. These institutions can also be formed along sectoral lines in order to increase their effectiveness and focus.

There is wide national diversity of institutional arrangements regarding research, reflecting different historical traditions and multiple priorities in science and technology policies. Despite these variations, good practices in this area share an emphasis on decentralization, the role of appropriate incentives and the importance of mixed systems of financing as creating better conditions for closer relations between science and industry. Policies should support the role of research institutions as a key element of knowledge markets and active contributors to the creation and exploitation of business opportunities.

In many countries, there are schemes that facilitate joint technological projects between the private sector and public research institutions or encourage the mobility of researchers. However, it is important that such initiatives are open to small enterprises and actively seek to associate them into these projects. New business models and radical forms of innovation are likely to find more fertile ground in these dynamic firms, which enjoy more flexibility to explore new possibilities.

Innovation vouchers, which allow companies to purchase support from research institutions to explore potential opportunities for further collaboration, have been used in some countries, specifically targeting SMEs. These are demand-based mechanisms that in a flexible way have served to encourage relations between the research base and SMEs.

The development of networks is important for innovation as these collaborative arrangements allow sharing risks and pooling resources. However, despite their wider social benefits, private costs may be substantial, so public involvement may be necessary to promote the formation of networks. Potential participants may be not fully aware of the benefits of collaboration and because of this, they are not able to share the costs involved in the formation of these networks.

Public programmes can also encourage the interaction between various types of enterprises by providing financial support to projects that are submitted by networks of companies, including consortia formed by established large companies and SMEs. Collaboration may be horizontal, involving similar groups of companies, or vertical, encompassing the whole technology chain from the research base to the commercialisation of new products.

The public sector may provide support to formal organization structures but concrete arrangements are better left to participants. Good practices in this area show that best results are obtained when public programmes are built on the basis of self-organization principles, rather than taking a top-down approach.

Initiatives to promote networks should acknowledge that building trust takes time, so continued commitment and stability are essential. As benefits become apparent and well established networks emerge, the rationale for public involvement will diminish and, therefore, policy

interventions should incorporate clear monitoring mechanisms and exit criteria for the withdrawal or reduction of initial support.

Specialized intermediaries can play an important role as matchmakers and facilitators. However, policies should also help individual enterprises to assess and develop their network management skills and competences. Public schemes can provide information in these areas and help to disseminate good organizational practices with the support of specialized consultancy services.

Intellectual property issues play a prominent role in ensuring effective forms of collaboration and should therefore be given due consideration in policy initiatives. Lack of awareness or inappropriate skills for intellectual property management are often stumbling blocks that prevent more fluid forms of collaboration. This should be addressed through continued attention to training both in public research institutions and SMEs. Training should be focussed and practical enough so participants can recognize its benefits.

The overall quality of the intellectual property system influences the willingness of stakeholders to enter into collaborative arrangements in the innovation process, as this determines the scope for technology licensing, patent pooling and other arrangements. Efficient and well developed technology markets need appropriate intellectual property regulations. As part of the efforts to create favourable framework conditions for innovation, public authorities should strive to adopt suitable intellectual property regimes. Public initiatives can also help to develop information standards for intellectual property licensing and valuation and increasing the visibility of technology markets.

More broadly speaking, the development of technological standards can encourage new forms of specialization and facilitate collaboration between different companies. Standards can also have a direct impact on innovation, prompting the introduction of new products or services.

Collaboration across borders has a positive impact on innovation and should be encouraged. External demand in the form of projects with foreign partners may compensate for the lack of sophisticated local demand. Multinationals are a channel for technology and skill transfer. Policies should promote the development of linkages between domestic SMEs and large foreign companies.

Firms benefit from the proximity of other high-growth companies, which facilitates access to specialized inputs, mobility of the workforce and other knowledge spillovers. Clusters are of particular importance to small firms, which cannot provide a number of specialized services in-house and have to rely on external providers. Clusters offer markets for skilled labour and other high-quality inputs. They also favour the circulation of information. Public support to the formation and development of clusters, including through infrastructure investment, can help companies to gain competitive advantages.

The development of clusters can also be seen as part of the policies that seek to strengthen relations between high-growth firms and the science base, as these links often take place over a defined territorial domain. Typical elements of the innovation infrastructure, such as science parks or business incubators, have a clear geographical dimension. Science parks are often created with the aim to encourage firms to relocate within the proximity of research institutions,

strengthening the links between industry and science but often contributing also to achieve the aims of regional policies.

An important aspect of the definition and implementation of policies supporting high-growth firms is the election of the appropriate level for the delivery of these policies. Regional and local authorities are often better placed to identify and address the needs of these firms, since the public agencies at the sub-national level are able to establish closer contacts with them.

While national strategies can define general frameworks for intervention with general implications and can affect the overall business environment, it is important to obtain the input of lower levels of government and to engage them in the implementation of national programmes. The impact of national policies depends on the regional context in which they will be implemented. In many cases, regional and local programmes may be more effective than national initiatives when immediacy and recurrent contacts are of paramount importance.

2.3 Financing High-growth Firms

Innovative companies face particular difficulties in raising finance, as their future cashflows are difficult to predict and they have little collateral to pledge as a guarantee. New and young firms have non-existing or limited credit stories, which are important to facilitate access to financing.

High-growth firms offer the promise of large returns but they are not easy to identify by investors, so this is an area where risks are high. Given these challenges, public financing and other programmes of public support play an important role in facilitating access to finance by this type of firms. However, public resources cannot replace private financing in funding high-growth firms. The ultimate aim of public policies should be to create effective forms of partnership with the private sector resulting in increased private financing.

There are many different ways in which public interventions and policies can support access to finance by high growth firms. These can be:

- Indirect, such as changes in the fiscal regime for different types of investments or the rules concerning asset allocation in regulated institutional investors such as pension funds; and
- Direct, through public institutions such as development banks or working together with private providers through various types of hybrid funds.

In some countries, the recognition of the special difficulties of early-stage, research intensive firms has led to the creation of a special status for this type of companies, which brings a number of tax and regulatory benefits. By improving the operating conditions of these firms, such schemes may also have a positive influence on their ability to raise finance.

The financing requirements of high-growth firms and, accordingly, the appropriate funding mix, changes with the stages of development of these companies. Continued expansion of high-growth firms often requires sharing equity with outsiders, as this is commensurate with the risks involved. There may be scope for some borrowing, but this needs to be supported by public schemes which reduce risks for private lenders and lower financing costs for SMEs.

Venture capital financing is often the only source of long-term capital for high-growth but risky firms. However, there is a tendency for venture capital funds to concentrate on relatively late stages of the life of a company, where deal sizes are larger and risks smaller.

Public policies should avoid an excessive focus on measures targeting the development of venture capital, which may be inappropriate to address the financing needs of very early-stage companies. In order to generate a pipeline of deals that can be eventually considered by venture capital firms, there is a need for:

- Direct public financing in the form of grants, so ideas with potential can be explored and developed before they can attract private financing; and
- The promotion of other specialized financial intermediaries, such as business angels, who can consider smaller deals and help companies to grow to a size that allows them to attract venture capital financing.

The main role of public policy in this area is to reduce risks to private providers of financing, so to encourage them to engage actively with high-growth firms. However, in doing this, it is essential that the incentives for effective decisions are not distorted.

There are a number of dangers that public interventions should strive to avoid including:

- Selecting unsuitable managers, which may result in poor returns and therefore, a negative demonstration effect that discourages the involvement of private players. An excessive emphasis on guarantees may have this negative consequence; and
- Providing additional benefits to projects that would be financed by the private sector in the absence of public support.

Besides reducing risk for private sector involvement, public programmes can contribute to:

- Developing specialized financial intermediaries, through the support to the emergence of complementary business services providers and professional and investors networks;
- Encouraging relations between different types of investors, in order that there is no discontinuity in the provision of finance through the various stages of the development of companies; and
- Facilitating interaction between investors and companies through support to platforms for networking, such as venture fairs.

Tax policies that reward long-term investment and entrepreneurial-risk taking can have positive effects on the development of the venture capital industry. Legal and regulatory reforms can also facilitate fundraising by venture capital firms, encouraging pension funds and other institutional investors to channel resources to these specialized financial intermediaries.

As the venture capital industry is global in scale, it is important that countries try to develop tax and regulatory policies that can offer the same competitive advantages that are available in the best environments.

Growth markets that provide an effective exit mechanism for investors are essential for the development of the venture capital industry. This is an aspect which should receive more attention, as it is often overlooked in policy initiatives in this area. In Europe, where there are too many small illiquid markets, this requires overcoming the existing fragmentation along national boundaries.

Trade sales may be an alternative to the existence of organized markets. Public initiatives should facilitate these transactions through appropriate tax and regulatory regimes and the creation of platforms for the dissemination of information.

Appropriate intellectual property rights management is important for innovative firms seeking external financing. Intellectual property rights provide a degree of protection from competition but they also facilitate funding, including through asset-based forms of financing. Investors can sell their stakes to other investors more easily when intellectual property rights are well defined and appropriately managed. Given the relevance of intellectual property issues, public initiatives should increase awareness of their implications for raising finance among both investors and young firms.

Supply-side policies, which aim to increase the amount and quality of investable projects, play an indirect but important role in facilitating access to finance. These public interventions may include educational programmes that foster entrepreneurship, cultivating competences that go beyond the emphasis on technology development to stress the creation of successful business models and applications. Public interventions may help companies to become “investment ready”, providing the necessary advice on how to deal more effectively with prospective investors.

In some countries, schemes that combine the provision of financial support with training and technical assistance to upgrade managerial and other capabilities have yielded positive results. The involvement of private investors in the design of these programmes can enhance their effectiveness.

POLICY OPTIONS TO FOSTER THE FINANCING AND DEVELOPMENT OF CLEAN TECHNOLOGIES⁶

This chapter is based on the outcomes of the international conference "[Promoting Eco-innovation: Policies and Opportunities](#)" which was held in Tel Aviv from 11 to 13 July 2011, in response to a proposal by the Government of Israel.⁷

The chapter is structured as follows. First, it presents the rationale for public intervention, given the presence of multiple market failures in this area. Second, it introduces different policy options and instruments to foster the development of clean technologies, while arguing for the need for designing comprehensive strategies. Next, it identifies the particular challenges faced when attempting to raise finance for innovative clean technologies and how these can be overcome. Finally, the main conclusions and policy recommendations are presented.

3.1 The Need for Public Intervention

Environmental challenges require innovative policy responses that reconcile the need to reduce the use of resources and to address climate change concerns with sustained improvements in living standards. Innovation, resulting in new technological solutions, provides possible answers to this dilemma. However, while the rationale for public intervention in this area is clear and the rewards significant, the financing and development of innovative clean technologies present particular difficulties that require a suitable policy response.

The most basic incentive for the promotion of innovative clean technologies is the elimination of price distortions that provide an advantage to existing, more polluting technologies. In some countries, this is due to the existence of explicit subsidies that favour the continued dominance of existing conventional solutions. The presence of market failures - the inability of market prices to reflect the full social and environmental costs of using conventional technologies - is a more common deterrent to the emergence of competitive alternatives. The gap between social returns and expected private returns can be particularly large because of the uncertainty regarding the future characteristics of climate policy and environmental regulations over a long horizon, given the absence of clear and well-defined commitments.

The correction of market failures is a basic rationale for the need for policy intervention. Market failures are also present in the diffusion of technologies, in particular, due to the presence of network effects. Other instances of market failures include the lock-in impact of existing technologies and the high costs for early adopters of less environmentally damaging options.

⁶ This chapter is based on UN document ECE/CECI/2011/3, "Policy options to foster the financing and development of clean technologies".

⁷ Additional background materials are available at:
http://www.unece.org/ceci/documents/2011/icp/conf_icp11.html.

Environmental problems cross borders and therefore externalities can only be properly assessed at the international scale. A solution generates benefits for the country involved but this may also involve higher costs in the short term. This negative impact on competitiveness can be a deterrent in the absence of cooperation, which represents an important argument in favour of international collaboration in this area.

Market-based mechanisms (such as pricing) are important for creating incentives for innovation. A distinct advantage in relation to command-and-control instruments is that market-based mechanisms require less information than regulatory targets. However, price signals for investing in technology development are still weak. Given the pervasive character of market failures in this area, these market mechanisms alone are unable to stimulate change at the scale and speed required. Regulatory intervention is also necessary to complement other types of policies that seek to influence the price system.

A fundamental condition to facilitate the transition to a less environmentally damaging economy is the existence of a framework that reassures investors, firms and consumers that their decisions would generate an adequate return that can be estimated within an acceptable range. A long-term perspective is required to reduce the financial risk of investments and to encourage research and development (R&D) efforts. Coordination failures also require the intervention of the public sector. Given the long life of infrastructure used in energy production, long-term price signals are critical in the deployment of appropriate technologies.

3.2 Policy Options and Instruments

Governments are expected to play multiple roles in promoting eco-innovation, i.e. the development of more resource efficient and less environmentally damaging technologies. These roles include not only direct support to R&D and facilitating the exchange of knowledge but also increasing the demand for eco-innovative solutions, raising market acceptance among consumers and providing a source of demand for new technologies through public procurement.

The promotion of eco-innovation requires a balanced strategy that combines different policy tools. The starting point must be the appropriate pricing of environmental goods and services. The appropriate policy mix in different countries depends on national circumstances, including the sophistication of the knowledge base, the size of the domestic market, the industry structure and the degree of development of specialized financial intermediaries, such as business angels and venture capital firms.

Technological innovation avoids the need to make hard choices and negotiate difficult trade-offs between environmental protection and economic growth. However, technology support policies provide no certain outcomes and risk is an inherent element of these activities. The intensity of the R&D efforts required depends on the incentives created by the price system and other policy actions, so there is a need to pay attention to the consistency of public initiatives. R&D policies need to be complemented with mutually supporting actions in other areas.

The type of appropriate policies depends also on the maturity of technologies. At the very initial stage, i.e. the development of prototypes and demonstration of new technologies, public support should focus on infrastructure planning, R&D financing and contribution to capital costs of large-scale demonstrations. At a later stage, some technologies may be already suitable for niche markets but they still find significant cost disadvantages. At this point,

technology-specific incentives, such as feed-in tariffs, tax credits or loan guarantees could be appropriate. As technologies mature and become more competitive, support can be reduced and become more general. For mature technologies, the key policy question is how to accelerate its adoption by addressing market barriers through instruments, such as building codes, efficiency standards and information campaigns.

However, in the search for new technological solutions, it is important that policies do not appear excessively prescriptive, imposing both solutions and the way to reach them. On the contrary, a certain degree of experimentation and technological portfolio diversification is useful to identify successful technologies.

"Picking winners" when developing clean technologies, as in other forms of government support, is fraught with dangers, as the information to make appropriate choices is not available. Promoting general support technologies avoids the pitfall of making specific technological choices while providing flexibility. Clean technologies are a very broad concept and potential solutions may come from many different areas of sciences. From this point of view, policies that would support very concrete technologies cannot be efficient. Instead of this, policies should be horizontal, rely on incentives and make more general technology bets.

An R&D effort is necessary not only to develop new technologies but also to make existing ones more affordable. Climate change mitigation policies and, more generally, the drive towards more environmentally friendly solutions, are prompting technological change in areas with traditionally low technological content, such as utilities. This increases the scope for technological innovation and the areas where R&D initiatives could yield positive results.

The debate on energy and clean technologies in general should not be limited to the merits of the different sources of energy in isolation from the ways in which energy is produced and distributed. Work should also be devoted to identify the ways in which conventional forms of energy could be utilized in a cleaner, more efficient way. Energy distribution is an important dimension of overall efficiency and should be an important element in devising innovative solutions to energy challenges.

In both developed and emerging markets, supply-side, technological-push solutions are insufficient to bring about the desired outcomes – technologically superior solutions that are widely used. Supply-side measures, such as R&D tax credits or subsidies, need to be accompanied by initiatives that increase the demand for eco-innovative products.

Changes in relative prices can raise the demand by the private sector of clean technologies. Environmental needs are strongly influenced by policy and regulatory processes. These can provide a critical input for innovative activities, thus clarifying the desired results of this process. The articulation of credible demand through the regulatory process is an essential requirement for the success of innovative activities and standards can play an important role in this regard.

Green public procurement, in particular, in construction, where the public sector has a large presence, is a powerful policy lever in encouraging innovation, if it goes beyond conventional specifications to allow innovative solutions to reach commercial size.

The provision of new infrastructure is required to avoid the lock-in of existing patterns of demand. A good example is the need for electric cars charging points. A long-term vision for the future is necessary to shape appropriate investment policies.

Removing barriers to trade is also important to facilitate the development of clean technologies, as the size of the market is an important determinant of the development of eco-innovative solutions. This suggests that appropriate support should be given to initiatives to encourage the internationalization of small and medium-sized enterprises (SMEs), as these can make an important contribution in developing new environmental technologies.

The role of governments to promote clean technologies concerns not only new regulatory or economic instruments but also facilitating partnerships and encouraging cooperation. Cooperation is important at the national level, due to the existing challenges and the multi-sectoral character of the necessary policy interventions. Different stakeholders need to be involved and an institutional space needs to be created for private-public cooperation.

Collaboration between the public and private sectors serves to overcome barriers to innovation. Some large projects with significant costs and large risks can only be taken through joint efforts. A good example are the pilot projects on carbon capture and storage technologies, which are able to reconcile projected increases in energy consumption and coal use with the achievement of low emission targets.

The cooperation between the public and private sectors can serve to overcome weak market incentives for the emergence of new technologies. Public involvement may be a pre-condition for the development of some risky commercial projects. Public initiatives can work as a catalyst of links between established companies and academic institutes to set up and implement research projects that can result in commercial technologies.

Bringing together different partners, including researchers, facilitates the thinking on new ways of doing business and innovative concepts for products and services, which are attentive to lifetime considerations and help to reduce environmental pressure to a minimum.

A life-cycle approach in the conception and design of public policies promoting clean technologies appears most fruitful, as it provides a framework to integrate a large set of interventions in different areas under appropriate time frames to assess fully their implications.

Chain-oriented policies aim to bring together economic agents and encourage them to achieve a reduction of environmental pressures beyond what is required by legislation. Policymakers should focus their efforts on chains with the highest environmental pressures, which may be different from country to country. The acceptance of wide ranging eco-innovation initiatives depends on the support of users and this can be boosted through collaboration.

In order to successfully address sustainability issues, it is important to consider the design, production and manufacturing of a product across its entire life cycle. The use of a holistic life cycle perspective helps manufacturers and policymakers to identify improvements that could be made at any stage.

Information through the whole life cycle of a product should be collected to identify possible actions. The data need to be shared and exchanged between many different organizations. This complex web of collaboration can only be managed through standards to facilitate communication. The usefulness of standards depends on how widely disseminated they are. From a more general point of view, standardization is important to facilitate innovation and can be developed more efficiently through the collaboration between different stakeholders.

National programmes have to be implemented to integrate all relevant stakeholders in a particular sector or project, which provides also the basis for successful international cooperation, building on the linkages developed at the national level. Collaboration is necessary to accelerate the implementation of solutions that have been proven in a certain context, facilitating the necessary adaptation.

Given the nature of the challenges involved and their enduring character, innovation concerning the development of clean technologies requires a long-term vision that involves different stakeholders and provides an institutional space for public-private cooperation. Wide stakeholder consultations are necessary to achieve consensus on long-term priority directions to support eco-innovation.

This is similar to the technology foresight exercises underpinning the formulation of innovation policies in many countries, thus providing a broad roadmap for technological change that reconciles both demand and supply considerations. Environmental aspects should therefore be included in these broader technology foresight exercises. Technology foresight centres can facilitate the development of common views on a green growth strategy that provides guidance and reassurance to relevant parties.

The impact of new environmental technologies depends on the extent of their diffusion and wide acceptance. This is related to absorptive capabilities, namely, skills but also to the existence of open markets, which is also the result of continued collaboration across borders.

From a broad policy perspective, it is important that the focus is not only to achieve particular technological breakthroughs but to facilitate the dissemination, both within and across countries. Multilateral cooperation should also involve developing countries, emphasizing capacity-building activities that facilitate technology transfer. This needs to be supported by appropriate funding arrangements.

The diffusion of clean technologies is to a large extent a process driven by market forces. As these new technologies have substitutes, there is a competition with conventional sources with a larger environmental impact. Therefore, policies to facilitate diffusion should ensure the increased competitiveness of eco-innovative solutions.

Technology transfer is critical to ensure that environmentally sound technologies are widely used, thus contributing to the solution of global problems. This stresses the importance of global cooperation. Low-carbon, energy-saving technologies should flow to the developing world where energy efficiency is lower. However, the adoption of a technology (and its diffusion through the economy), including in areas relevant for climate change mitigation and other environmental purposes, requires a number of supportive conditions. Financing and technological availability are not a guarantee of successful and efficient outcomes.

A primary policy target to ensure technological diffusion is the increase of the absorptive capacity, which is determined by factors, such as the existence of complementary infrastructure, the quality of human capital, and the linkages between the various actors of the national innovation system or the type of governance. Barriers to technology transfer may be related to intellectual property rights or trade systems and have to be addressed as part of the overall country development policies. Initiatives to increase the absorptive capacity of an economy take time to deliver results and therefore should be undertaken early as part of wider innovation strategies.

International cooperation is necessary to avoid the disincentives to innovation that emerge when the outcome of national efforts cannot be fully appropriated at the national level. International trade raises a number of questions that need to be addressed, including the diversity of environmental standards and the different policy importance attached to environmental targets.

The question of patents is also problematic. Intellectual property rights (IPRs) provide innovators with a degree of protection over the results of their efforts and are thus a basic component of the incentive system to encourage innovation. However, there is a need to reach a suitable balance between the creation of conditions for the rapid diffusion of climate change technologies and the incentives for innovation through the protection of IPRs.

Patents serve to protect inventions but also to disseminate information about technology, which otherwise would remain unknown. Therefore, they also provide a basis for collaboration. There are also "green patents" which have been made available by businesses free of charge to facilitate technological diffusion. In particular, the needs of technology transfer to developing countries may require special arrangements, similar to those observed in the pharmaceutical industry, to make technologies available to developing countries at lower costs.

Entrepreneurship is the key driver for change, including regarding the development of clean technologies, so policies need also to pay attention to the removal of barriers to entry and exit of enterprises while addressing problems of access to finance, which are particularly acute for small and medium-sized enterprises. Younger firms tend to be greener innovators and should be the object of special policy attention as part of the effort to encourage the transition towards a more resource-efficient, eco-innovative economy. More generally, this shift would also be facilitated by firm-level support to upgrade the skills and production processes of companies, so they can adapt to new market conditions and actively promote change.

The development of clean technologies and, more broadly, eco-innovation are influenced by a wide portfolio of policies. It is therefore important that appropriate institutional mechanisms of collaboration are put in place to ensure the consistency of different initiatives. More and better information on support instruments is required to facilitate coordination of national policies, to identify best practices in an international context and create channels to sharing them.

3.3 Financing Innovation

The strong projected demand for environmental innovations and clean technologies represents a source of business opportunities. Environmental innovations or clean-tech include new technologies that are able to compete on price and performance, while reducing environmental impact. This implies a wide range of potential sectors for investment, encompassing energy, transportation, industrial processes, production of materials, and recycling and waste, among many others.

As is the case with other innovative technologies, there is a financing gap that needs to be covered so promising ideas can become fully-fledged commercial proposals. Environmental innovations need to overcome the "valley of death" - the period during which significant development resources are required that cannot yet be offset by revenues. The size of this gap and the possibilities to finance it depend on perceived risk, capital intensity and the time required for commercialization and scaling up. Potential investors have only an imperfect

knowledge of business opportunities, so market mechanisms may lead to insufficient funding of ideas which are socially relevant and with the potential to be commercially successful.

There are a number of characteristics of clean technologies which make raising finance particularly difficult. Business opportunities are largely linked to regulation and government policies, which determine to what extent new technologies face competition from existing ones. As regulations and policies can change, this creates a source of uncertainty. When opportunities are driven by subsidies, markets may collapse if this form of support is abruptly removed.

Clean technologies and, more generally, eco-innovations often require new business models and involve changes along the complete value-chain, resulting in the transformation of whole sectors. This goes well beyond the adoption of end-of-pipe solutions to encompass more comprehensive changes with a larger transformative potential. Given these characteristics, which impose significant coordination requirements and require costly and time-consuming infrastructure investments, financing problems are particularly acute.

The need for life-cycle assessments increases uncertainty and the difficulties of estimating the cost of new clean technologies. Unintended consequences resulting from the impact of eco-innovations on other environmental dimensions (for example, the introduction of biofuels) cause problematic effects on other aspects of sustainability, which may affect the ability to raise finance.

Scale issues also complicate efforts to obtain financing. Some projects, especially in renewable energy, are small, which implies that transaction costs are high. At the same time, in comparison with other early-stage high-growth areas typically targeted by venture capital (for example, information and communication technologies), the scale of many clean technologies projects is far larger and more capital intensive. Scaling up projects from the demonstration phase to commercial operations requires significant resources. This implies that the financing gap is a particularly strong constraint in some innovative environmental technologies that require significant upfront capital investments.

Conventional financial intermediaries, such as banks, tend to avoid early-stage activities where risks are high, cash flows uncertain and there is little collateral available to back up requests for financing. This is also observed in relation to new environmental technologies. However, even at a later stage when bank lending may come into play, environmental technologies are at disadvantage because of the lack of specialized expertise in financial institutions to assess associated risks.

As in other sectors, venture capital financing (both formal and informal) provides access to capital and managerial guidance in the early stages of development of innovative enterprises when other sources of financing are not yet available. An increasing share of global venture capital is targeting the development of clean technologies as investors seek to take advantage of a growing (existing and anticipated) demand for green technologies. This concerns a wide range of areas, including energy, waste treatment and water but also industrial processes and product design.

Venture capital backed companies can play an important role in generating disruptive technologies, which are unlikely to originate in established firms. Public support can serve to encourage the development of venture capital financing. In particular, public-private funds can improve the risk-return profile of investments, making opportunities more attractive to

would-be private investors and thus increasing the amount of private financing available for new clean technologies.

However, venture capital financing can only be seen as a partial solution to the problems of financing eco-innovation, which should be dealt with in a more comprehensive fashion, paying attention to the different stages in the development of clean technologies and the changing levels of risk and financing needs.

Other financial intermediaries need also to be engaged in these efforts. Established companies are unlikely to be a source of capital in the way, unlike the symbiotic relationship observed between large pharmaceutical companies and small biotechnology firms. Clean technologies can be associated to structural changes that undermine the market power of incumbents, resulting in a reluctance to change.

Clean-tech is not only about renewable energies, which have strong capital requirements. There are also other areas, which may face significant technology and commercial risks but where financing needs are smaller, thus opening the door for the involvement of business angels (informal venture capital investors).

Business angels can play an important role in exploring the potential of new ideas, as they are able to consider a number of small size investments which would not attract the attention of other investors. Investment clubs operating through syndication facilitate pooling financial resources and developing a specific investment focus backed by specialised expertise to source and select investment opportunities.

Grants and technology incubators help to develop new ideas so as to generate a deal flow that can be considered later by formal and informal venture capitalists. Tax credits and other forms of public support often have important implications for the profitability of the projects undertaken and the available choices regarding the financing structure.

Public support is important to address financing gaps. It is therefore critical that schemes are comprehensive enough so any bottlenecks are fully covered. Partial coverage is only a waste of resources. Specific forms of support, with a sectoral orientation, may be required to spearhead the interest of venture capital companies in areas where particular financing “bottlenecks” have been identified.

Financing support should not be provided in isolation but taking into account other needs of eco-innovators, which include the development of links with potential customers, collaboration agreements with holders of complementary technologies, among others.

On the demand side, there is a need to increase awareness and expertise among technology developers on the forms of support available and to enhance skills that help them to become “investment ready”.

Given the difficulties involved in different alternatives for the commercialization of technology, it is also important to target the creation of consortia between various types of companies to develop supply chains thus providing new possibilities for the development of small and medium-sized companies. The coordination role of the public sector, besides the direct provision of resources, can make an important contribution to address financing problems.

Strategic intelligence developed with the input and guidance of public initiatives can help to improve risk perceptions and therefore facilitate raising finance. Developing predictable policies with a long-term orientation is a major responsibility for the authorities who need to anticipate changes and encourage the private sector to take adaptive actions before sharp adjustments are imposed as a matter of necessity.

The development of clean technologies is a global opportunity and, therefore, it is important to facilitate international contacts to exchange knowledge and pool resources. While environmental challenges are global, a patchwork of regulations across multiple jurisdictions creates difficulties for eco-entrepreneurs, when trying to develop and commercialize new technologies. Facilitating cross-border investments is important to attract financing but also to gain access to associated expertise to develop and scale-up local innovations.

3.4 Main Conclusions and Policy Recommendations

Climate change and the environmental pressures resulting from economic growth imply that the importance of eco-innovation and the need to develop clean technologies are being increasingly recognized as mainstream policy concerns with multiple ramifications.

The financing and development of clean technologies requires policy efforts to coordinate initiatives across many different areas, involving multiple actors over a sustained period of time. The public sector is bound to play a crucial role not only in defining the regulatory and policy framework that drives change but also in designing and funding arrangements to overcome the market failures that hamper progress.

The introduction of new environmental technologies and their diffusion within and across countries on a massive scale requires specific interventions in a number of typical innovation-related areas, such as early-stage financing, R&D support and intellectual property rights.

Policy actions aiming to foster the financing and development of clean technologies should consider the following principles and recommendations:

- The promotion of eco-innovation requires a comprehensive strategy that pays attention to both supply and demand-side measures. Policies should target both the generation of innovation and the dissemination of existing technologies within and across countries.
- Effective policies require also the development of supportive framework conditions that enhance the impact of individual initiatives. In particular, obstacles to technology absorption and diffusion have a more general significance but should also be addressed when promoting the development of clean technologies.
- Changes in relative prices can increase the attraction of new clean technologies but these economic incentives may not be sufficient. Investment in infrastructure is necessary to break path dependency that blocks innovation. Regulatory measures may also be required to overcome market failures and to generate demand for environmentally friendly technologies.
- Policies should not attempt to "pick winners" when promoting the development of clean technologies. Policies should be horizontal, rely on incentives and make more general technology bets.

- Collaboration, in particular at the international level, is essential for the development of clean technologies and, more broadly, the advancement of eco-innovation. Such collaboration facilitates the exchange of policy experiences, the pooling of resources and the achievement of scale effects. It is important to establish the appropriate institutional, regulatory and policy frameworks that create a solid basis for this cooperation.
 - Life-cycle considerations and chain-oriented policies are important for devising effective solutions to environmental challenges that take into account the full impact of proposed interventions. Governments have an important role to play in facilitating partnerships and encouraging cooperation among all relevant parties, including through the development of appropriate standards and channels of communication.
 - Eco-innovation is increasingly perceived as a business opportunity, which could emerge in many different sectors. Predictability and stability of policies and regulations are essential to ensure the growing engagement of the private sector in financing and developing clean technologies.
 - Financing eco-innovation requires the combination of public and private efforts. Eco-innovative initiatives face particular difficulties in raising finance, given the characteristics of some environmental innovations, which makes public intervention necessary. The ultimate aim is not to replace private financing but to encourage it, lowering risks and providing strategic intelligence to reduce uncertainty; and
 - Strategies regarding the financing of clean technologies should be comprehensive, addressing any “bottlenecks” that may arise at different stages in the development of eco-innovative companies, so to avoid any gaps. Policy interventions are more effective, when financing support takes into account other needs of these companies.
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Financing and Innovative Entrepreneurship Good Practices and Policy Recommendations

This publication is part of an ongoing series highlighting some of the results of the UNECE Subprogramme on Economic Cooperation and Integration. The objective of the Subprogramme is to promote a policy, financial and regulatory environment conducive to economic growth, knowledge-based development and higher competitiveness in the UNECE region.

It covers different thematic areas related to this objective including innovation and competitiveness policies, entrepreneurship and enterprise development, financing innovative development, public-private partnerships for domestic and foreign investment, commercialization and protection of intellectual property rights.