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Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **01-Oct-2008**

English - Or. English

DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY
COMMITTEE ON INDUSTRY, INNOVATION AND ENTREPRENEURSHIP

DSTI/EAS/IND/WPIA(2008)2
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Working Party on Industry Analysis

"ENTREPRENEURSHIP" AND YOUNG FIRMS' DEVELOPMENT MICRODATA ANALYSIS

27-29 October 2008
Paris, OECD Headquarters

This document is presented under Item 4.1 of the Agenda for discussion and decision.

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English - Or. English

"ENTREPRENEURSHIP" AND YOUNG FIRMS' DEVELOPMENT – MICRODATA ANALYSIS

An OECD proposal to WPIA

Summary

The projects presented in this document address some factors that favour or impede entrepreneurship and the development of new firms, notably in terms of innovation and of finance. They will consist in implementing similar statistical exercises in the participating countries, co-ordinated by the OECD, using microdata, resulting in cross-country comparable statistics and analysis.

Three projects are proposed, to be discussed on the basis of their policy interest and of data availability:

1. The inventive activity of new ventures:

The work will describe new firms' inventive performance through patenting information and, when available, R&D, with the aim of analysing the connection between inventive profile and economic development of young firms.

This would appear to be the least demanding in terms of data requirements, and may therefore be more attractive to countries.

2. The relationships between financial conditions and entrepreneurship (firm creation and entrepreneurial innovation):

Are credit constraints a strong barrier to entrepreneurship?

The work will compare and synthesize the results obtained in various countries for various targeted policy devices (such as public financing of R&D projects specifically targeted at SMEs, soft-credit, loan guarantees, venture capital intervention, etc.).

3. Analysis of the conditions of firms' birth (how do businesses form?) and early development:

This work will address issues like the transition between employer and non-employer status or the fate of young firms (*e.g.* mergers and acquisitions). It is highly demanding in terms of data (matched employees-employers databases etc.)

1. Background

1. Entrepreneurship and entrepreneurs are important drivers of economic growth, employment, innovation and productivity (*e.g.* Schumpeter, 1934; Aghion and Howitt, 2006). Successful new enterprises create new jobs, provide new competition to existing businesses, help improve product quality and add new goods and services. New businesses maintain a competitive pressure on the market, hence boosting innovation and play the role of testing ground for breakthrough inventions which rarely come from established firms. The creation of new firms is at the core of selection pressures that determine successful and unsuccessful inventions. Hence, new firms contribute to the renewal of industry, with new sectors and new technologies superseding established ones – the process of "creative destruction". Half of business R&D in the US in the mid-2000s was done by firms which did not exist in 1980 (Hunt and Nakamura 2007): these new firms have been the vector of entirely new industries such as software or biotechnology, which also shows that providing conditions fostering the creation of new firms is only part of the equation, while allowing them to grow is at least as important[1] . This focus on new businesses has policy implications, as many government policies are directed towards aiding new and small businesses.

2. However, there is very limited empirical evidence about the factors that favour or impede entrepreneurship, that favour or hamper the growth or stagnation of new firms[2] . This is in particular due to the fact that there is very limited information about these young and small firms in the standard firm level datasets. In particular, young firms are rarely included in the most well-known surveys (such as the CIS surveys) because it is very difficult to take them into account in the sampling schemes, and to reach them subsequently. Furthermore, analysing the growth and development of young firms requires longitudinal data that are even more difficult to assemble than cross sections. As a consequence, most of the existing analyses have been performed at the industry level, therefore limiting the scope of the topics that have been covered.

3. On the basis on the interest shown by several countries and on data availability, it is proposed to investigate two particular aspects of entrepreneurship and young firms' development: first the inventive and patenting activities of start-ups and new firms (how it compares with established firms, how it impacts the trajectory and performance of firms), second the financial aspects (how are new ventures funded, how stringent are financial constraints). Depending on data availability, an additional third direction of analysis could focus on the conditions of firms' birth and early development

4. This draft proposal aims at providing a harmonised core regarding the topics covered by countries. However, certain countries have access to much richer data sources than those required for this core: it could therefore be envisaged that, in addition to the harmonised project, a series of country-specific studies be conducted (or projects involving a small number of countries which have similar data available). Countries will be encouraged to share the methodologies and results: this exchange of experience will allow participating countries to benefit from each others' progress. It must also be noted that the definition of "new" or "young" firms below has still to be defined precisely, depending (in particular) on the information available in the various participating countries.

1. Junge and Hoffmann (2006) argue that European firms do not grow as fast as US firms. The authors suggest that Europe should focus on getting more firms to grow by improving the business environment for high-growth firms.

2. Most of the existing empirical work is country specific and essentially descriptive. The evidence relies most often on small scale surveys or case studies. See the Annex to document CFE/SME(2007)16 for an extensive literature review.

2. Entrepreneurship and innovation

2.1. Questions addressed

5. The first part of the project will focus on the inventive and patenting activity of start-ups and young businesses. Researchers and practitioners generally suggest that new firms are the source of new goods and services, and that they even *should* exploit more radical technologies than incumbents (with *e.g.* broad scope patents) in order to compete with established firms which dominate existing technologies. For example, Uhlaner *et al*. (2007) emphasise the importance of knowledge absorption and knowledge creation to the success of small firm's innovative efforts. The main source of information referred to in this proposal is patent data, whose merits and limits are well known (see the *OECD Patents Statistics Manual*, 2008): their main advantage in the context of this project is their availability and accessibility across countries. However, *countries could also use other invention-related data, like R&D expenditure, as a complement to patent data*.

6. The proposed project would provide new empirical evidence on these aspects in an internationally harmonised framework:

1. Description of new firms' innovations through patent information:

   To what extent do new firms hold patents (as compared with established firms)? Are the patents held by new ventures different (*e.g.* scope, radicalness, etc.) from those held by well-established firms?

2. The connection between inventive and economic profiles of development of young firms:

   - What are the determinants of young firms' (early) involvement in innovative activity? How do patent holding young firms differ from non patent holding young firms?
   - What is the timing of a young firm's inventive activity and its apparent impact on the trajectory (expansion v. levelling-off or death) of the firm?
   - Does the inventive performance of young firms impact on their economic performance (productivity)?

3. Assessing the efficiency of Venture Capital in fostering new firms' development and innovative performances

   How important is Venture Capital for start-up based inventions? Do VC backed firms have different inventive characteristics or performance from other start-ups?

2.2. Empirical approach

7. This project will address the inventive activity of new firms as reflected in patent filings and, when possible, R&D expenditures or R&D personnel. Indicators will be compiled and regressions performed in a comparable setting across countries.

a) The inventive performance of start-ups as compared with other businesses

8. A series of descriptive, patent-based indicators will be compiled for start-ups and other firms with the view to assess the contribution of start-ups to invention (by industry). Possible indicators include:

- The number of patent filings by age of the firm and by industry.

- The characteristics (size, growth, survival etc.) of patenting v. non patenting firms, by age.
- The characteristics of the inventions: quality (as measured *e.g.* by forward citations), radicalness, scope, etc. (see *e.g.* Nerkar and Shane, 2003).

9. In addition, a regression analysis[3] will be conducted with the view to describe the specific impact of a firm's age on various features of its inventive activity, after controlling for other characteristics such as size, industry, ownership status, etc.

b) The timing of inventive activities and its impact on the life cycle of the firm

10. Indicators will be compiled, and further regression analysis will be performed, to describe and analyse the determinants of the inventive activities of firms in relation with their age (*e.g.* time after birth for the first patent to be filed or for the first R&D expenditures, etc.).

11. The relation between the timing of inventions and the subsequent fate of firms will be further scrutinised through duration analysis (following *e.g.* Audretsch and Mahmood, 1995, Nerkar and Shane, 2003 or Jensen, Webster and Buddelmeyer, 2006): does early invention improve the firm's subsequent chances of survival or expansion? Is the connection between the firm's inventive performance and productivity influenced by its age?

OPTIONAL (Depending on data availability):

c) The impact of Venture Capital intervention on young firms' inventive activity[4]

How important is VC for start-up based inventions? Have firms backed by a VC different inventive characteristics than other start-ups? Information about the status of the firm (backed or not by a VC) will be introduced in the empirical analysis mentioned above (see Kortum and Lerner, 2000 and Da Rin and Penas, 2007 or OECD 2008 for a literature review).

2.3. Data requirement

12. All of the previous analyses require the matching of a patent dataset to a longitudinal database including start-ups (new firms) since their birth, and control firms. Ideally exhaustive business registers will be used (see Andersson and Lööf, 2008). The OECD will make available to countries requesting it its dataset of patents, which includes harmonised patent holders' names for various types of patents: PCT, EPO, JPO, USPTO.

13. Complementary accounting information and information about the R&D expenditures of firms (or alternatively on their R&D personnel / high-skill employment?) would be extremely useful.

Alternatively, any data source containing firm-level information (in particular: R&D expenditures or patent applications, etc.) together with information about firm age could be used as useful alternatives to business registers… provided the population of young firms is covered in the sampling scheme.

3. An attempt could be made to take account of potential selection effects (due to the fact that this analysis can only be performed among innovative and even patenting firms), *e.g.* with heckman-type models.

4. For countries having access to firm level data about VCs (or at least industry level data).

***OPTIONAL*:** Firm level information about VC intervention (see also below).

Notes:

- Due to the use of patent and R&D information, the analysis will mainly focus **on manufacturing industries.**
- The analysis would be performed on "employer" firms only (due to the difficulty of tracking the non-employer businesses, see Davis *et al.,* 2007).

3. The financing of new firms

3.1 Questions addressed

14. The second part of the project will focus on the analysis of the relationships between financial conditions and entrepreneurship, more specifically firm creation and entrepreneurial innovation. Credit constraints are often seen as a strong barrier to entrepreneurship, and also to firms' innovative efforts, and may arise for various reasons (lack of collateral, risk, uncertainty about the profitability of new projects and on the efforts provided by new entrepreneurs…). However, empirical evidence on this topic remains scarce, since the literature has so far mainly relied on industry data, following the seminal work of Rajan and Zingales (1998). Analysis performed on firm-level data would enable firm level heterogeneity to be taken into account in a more satisfactory way, and may therefore be extremely useful in providing evidence on the potential impact of financial constraints on firm creation, growth and innovation.

15. The proposed project will provide indicators describing the various sources of (internal, external) financing of new ventures and young firms. Cassar and Holmes (2003) show that Australian firms with higher growth rates have a greater tendency to look outside the firm for financing and they have a higher leverage ratio (ratio of debt to assets). The project could test whether these findings are common to several countries.

16. As a possible extension, the project may also include a synthesis of various (possibly country specific) policy evaluations enabling assessment of the magnitude of credit constraints faced by young firms.

3.2. Empirical approach

The financing structure of new ventures and young firms

17. Indicators will be compiled (when available) describing the financing structure of firms in relation to their **age** and **main activity**:

- Private equity, among which (if the information can be obtained):
  - Venture capital.
  - Share holding by a larger enterprise group.
- Financial debt, among which:
  - Financing by group companies.
  - Bank loans broken down by long-term (more than 1 year) and short-term (less than 1 year) loans.
  - Trade credit[5] .

5. Trade credit exists when one firm provides goods or services to a customer with an agreement to bill them later, or receive a shipment or service from a supplier under an agreement to pay them later. It can be viewed as an essential element of capitalisation in an operating business because it can reduce the required capital investment to operate the business if it is managed properly. Trade credit is the largest use of capital for a majority of business-to-business (B2B) sellers in the United States and is a critical source of capital for a majority of all businesses. For example, Wal-Mart, the largest retailer in the world, has used trade

18. These descriptive statistics may be broken down by firms' age band and main industry (in particular high-tech versus low-tech manufacturing industries; Knowledge Intensive Services). They will be crossed with the trajectory of the firms (survival/death, employment growth, productivity) in order to identify a connection between financial conditions and economic performance.

OPTIONAL EXTENSION (depending on data availability):
Assessing the magnitude of financial constraints faced by new ventures and young firms

Several countries have access to very detailed information about firms subsidised by various public agencies, *e.g.*:

- Spain: analysis of the impact of **soft-credits** and participation in the framework programme.
- US: analysis of **Venture Capital** as in Kortum and Lerner (2000) but at the firm level.
- Italy: Colombo and Grilli (2006) compare various measures of public support specifically targeted at new technology based firms.

OECD (Davis and Lunati, 2008) provides a careful literature review of existing country-level evidence, although many of the quoted articles do not focus on small or young firms.)

Using such rich financial firm-level information and assessing whether the subsidised firms have higher subsequent performances has several advantages:

- This financial information is often more reliable and detailed (for very small and young firms) than what is available in standard datasets (*e.g.* business registers, etc.)
- It enables to same extent to circumvent the traditional Kaplan and Zingales (1997) critique, which rules out the direct use of standard indicators sourced from the firms' balance sheets as indicators of financing constraints. Indeed, it is natural to consider that subsidised firms face less severe financial constraints than comparable non-subsidised firms[6], such that the subsidy may be considered as a direct indicator of more favourable financing conditions.
- Lastly, exogenous policy changes ("shocks") affecting these policy devices may be used to assess the magnitude of financial constraints, by investigating the effect they had on the targeted population. For example, Kortum and Lerner (2000) exploit the clarification of the Employee Retirement Security Act, which occurred in 1979 and led to a sharp increase in the funds committed to venture capital. Quoting the authors, "this type of exogenous change should identify the role of venture capital, because it is unlikely to be related to the arrival of entrepreneurial opportunities".

Comparing and synthesising the results obtained in various countries for various targeted devices (such as public financing of R&D projects specifically targeted at SMEs, soft-credit, loan guarantees, venture capital intervention, etc.) would enable a broad picture of both the importance of financial constraints faced by young firms, and the most efficient policies to alleviate them. Indeed, Sheikh (2000) shows that Austrian firms which received research funding experienced higher performances in terms of employment, turnover and export growth than their non-subsidised counterparts.

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credit as a larger source of capital than bank borrowing; trade credit for Wal-Mart is eight times the amount of capital invested by shareholders.

6 Neglecting selection biases… see the comment below.

3.3. Data requirements

19. The data mainly required for the descriptive statistics are:

- Balance sheets of young firms.
- Detailed firm-level financial information.
- Information about firm age.

Information required for the optional extensions:

The information required is specific to the programme considered. As far as VCs are concerned, countries could rely on several micro-level "private" datasets that are available on the market:

- *Capital IQ database (Standard and Poors, Mc GrawHill) – see Davis, Haltiwanger, Jarmin, Lerner and Miranda 2008.*
- *Venture Xpert (Thomson) – see Da Rin and Penas 2007.*
- *Venture One / Venture Source (Dow Jones).*

4. Further topics

20. Depending on data availability in participating countries [see the survey of data sources, DSTI/EAS/IND/WPIA(2008)5], an alternative project could focus more precisely on "entrepreneurship", *i.e.* the conditions of firms' birth (how do businesses form?) and early development.

21. Since a new venture is often embodied in an individual or small group of individuals with an idea, this would require an analysis of the transitions between employer and non-employer status (based on linked employer-employee data). Furthermore, Merger and Acquisition (M&A) activity plays an important role in firm outcomes (success for an entrepreneur might be being acquired by a large firm). From a measurement perspective, analysing the development and outcomes of young ventures would therefore require high quality longitudinal information taking account of such events. This approach is explored in Davis *et al.* (2007).

Questions to delegates:

1. Are the topics proposed relevant? Should some topics be prioritised?

2. Which empirical strategy would best address the question? To what extent should international harmonisation vs. exploitation of richer, but country specific information be emphasised? The latter applies especially if countries have already started investigating particular issues with their own data and would be willing to continue doing it, in connection with the OECD common framework.

Inventive and patenting activity of start-ups and young businesses

3. Are the proposed analyses relevant? How could they be improved (*e.g*. supplementary explanatory variables, etc.)? Please provide detailed comments about each paragraph of section 3.2.

4. Are all the required data sources available in your country?
If yes:
- 5a. Do you have direct access to them or is there a delay?
- 6a. What additional information do you think would be useful?

If not:
- 5b. Are there alternatives?
- 6b. Do you think some of the proposed analyses could nevertheless be performed?

Financial environment and entrepreneurship

7. Do you agree with the proposed approach? If not, what do you suggest as an alternative?

8. Are you currently involved in the same kind of analysis as described above, or do you plan to make such an analysis in the near future?

9. Do you have access to firm-level information on venture capital? On specific government schemes (subsidies targeted at new ventures or SMEs, lending programme, etc.)?

Further topics / Conditions of firms' birth

10. Do you think these aspects are relevant? Would their analysis be feasible in your country?

11. Do you have more precise suggestions to define a project proposal on these aspects?

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