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KNOWLEDGE-BASED ENTREPRENEURSHIP IN HUNGARY

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Abstract

According to rich and growing empirical literature, one of the main deficiencies of Hungarian SMEs is their low growth potential. Survey results underline the strong influence of cultural factors including behavioral features rooted in the socialist era among the main explanatory factors of entrepreneurs' reluctance to expand activity and drive the company ahead, along the usual growth path. As opposed to this gloomy general picture, my field investigations have supported the hypothesis that knowledge-based entrepreneurs and companies are different from average Hungarian entrepreneurs and SMEs in many respects.

Introduction

According to rich and growing empirical literature, one of the main deficiencies of Hungarian SMEs is their low growth potential. They are not growth oriented, unable and unwilling to move beyond stage one in their life cycle.[1] They adopt a traditional attitude of non-reinvesting but taking the profit out of their small, family managed ventures. *(Czako et al.* [1995]; *Laky* [1998]; *Laki*[1998]; *Major* [2003])

Survey results underline the strong influence of cultural factors *(Kuczi* [2000]; *Szerb-Ulbert* [2002]) including behavioral features rooted in the socialist era[2] among the main explanatory factors of entrepreneurs' reluctance to expand activity and drive the company ahead, along the usual growth path.

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[1] Following *Adizes* [2004] I refer to stage one of the corporate life cycle as infancy. In this stage the idea has already been translated into a product. The main challenge ahead is growth and market expansion. The organization is still entrepreneurial: the firm is directed by the owner and founder. Transition to professional management is still ahead. Self-financing is the main form of financing.

[2] Socialist entrepreneurs were in a sense similar to the Schumpeterian entrepreneurial ideals. A thick layer of citizens (according to estimates, in the early 1980s approximately two thirds of Hungarian families) earned at least some of their income in the second economy *(Galasi-Szirâczky* [1985]). These entrepreneurs have thus become capable to understand something about the functioning of the market, about autonomous decision-making and about risk-taking. They have

Alongside to their lack of dynamism in terms of sales, employment and productivity growth, Hungarian SMEs also feature various other deficiencies. They operate below minimum efficient size[1]; they are unable and unwilling to invest into and accumulate intangible assets and they are not innovative.
As opposed to this gloomy general picture, my field investigations have supported the hypothesis that knowledge-based entrepreneurs and companies (KBEs; KBCs) are different from average Hungarian entrepreneurs and SMEs in many respects.

Dissimilarity is first of all related to above-the-average knowledge intensity, i.e. to the fact that KBCs' most important asset is knowledge. This becomes manifest in above-the-average educational attainment of founders and in the above-the-average values of various R&D input and output indicators of the firms (R&D ratio; number of researchers employed, patents etc.). This is all the more conspicuous in the Hungarian setting, where domestic companies' innovative performance is meager. Few of them engage in any kind of R&D

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become capable to learn, adjust and innovate. Their mentality however differed from that of the Schumpeterian capitalist entrepreneurs. Second economy participants had a stable job in the state sector and they utilized the resources and the assets (raw material and production equipment) of their SOEs, which exempted them from the dominant part of the risk capitalist entrepreneurs take. Furthermore, their activity satisfied a huge existing demand the centrally planned sector could not meet. They thus faced little demand constraint, and little competition. The constraints they faced were of a different character: state regulations *aimed mainly at restricting expansion.* By relaxing some restrictions on private enterprises following 1982 the government aimed at increasing consumption and at reducing the gap between demand and supply. Private enterprises were thus considered as complementary and not contradictory to the socialist system *provided their expansion remains below a predetermined threshold.* It was thus acceptable to increase private consumption using the income raised from private entrepreneurship - market supply being the only limitation of this endeavor. On the other hand, corporate growth was restricted by several regulations, since it was considered contradictory to socialist principles. The mentality of increasing entrepreneurs' consumption rather than reinvesting profit has become deeply rooted and survived even after the change of the regime. All this is very much different form Schumpeterian entrepreneurs whose key feature is a relentless strive for growth.

[1] Although in advanced economies firms are frequently larger than their hypothetical efficient size (size being determined among others by the features of the production technology) SMEs of relatively underdeveloped economies often face the opposite problem: market constraints or rather their market acquiring deficiencies as well as capital market imperfections make them operate below the efficient size (See *Artner* [2005] about Hungary, *Surdej* [2000] about Poland). *According to textbook theses the likelihood of survival is minimal if the gap between the existing and the minimum efficient size is persistently large, many of the Hungarian micro and small enterprises contradict this thesis: they are dragging on, on the edge of bankruptcy and/or market exit for long years, unable to grow.* This gives rise to considerable policy concern, because the exit rate, i.e. enterprise death rate is also high (which has to be added to those, dragging on without growth and profit). Enterprise birth and death in industry was 4,262 and 6,647 respectively in 2003. The corresponding data for services was 47,589 and 50,127 respectively. Consider Portugal's respective data for comparison (a country of similar population size): 2,678 versus 2,327 in industry, 10,853 versus 7,545 in services. (Source: *European Business Facts and Figures 1995-2005.* Panorama of the European Union. European Commission, Eurostat, 2006, p. 20)

activities. According to Pitti's [2006] data taken from the Hungarian Tax Authority's database in 2004 there were altogether 434 companies undertaking R&D activity in Hungary, with altogether 4309 researchers (These data are much lower than the ones registered by the Central Statistical Office (669 and 6704 respectively) - though according to Pitti, more reliable. The average picture is however not really different: more than 99 % of Hungarian companies do not perform any R&D activity at all. Although the share of foreign companies (within R&D performers) is about 15 % (with 103 R&D-active actors out of 669) - they are the ones who finance the dominant part of total corporate R&D expenditures.

Difference between KBCs and average SMEs (ASMEs) is conspicuous also in terms of the former group's performance, capabilities and prospects. Most of KBCs are high-growth companies they belong to the emerging group of gazelles. KBCs usually internationalize quite early in their life-cycle,[1] and they are among the pioneer companies with outward foreign direct investment *(Antaloczy-Elteto* [2002]; *Inotai* [2005]).

Another apparent element of KBC-ASME difference can be identified in terms of KBCs' diversified portfolios of both domestic and international collaborations. Unlike ASMEs' networks, restricted mainly to vertical relationships (customers and suppliers) KBCs are characterized by a tight network of industry-university linkages including both research and educational institutions - partly because their founders have in most of the cases a strong academic background. They also possess diversified relations with domestic and international NGOs, research funds, business and scientific associations.

Although KBCs belong to the cream of the economy in every country, international comparisons have revealed that their degree of success differs a lot even among advanced economies *(OECD* [2006]). The highest aggregate returns related to KBCs' emergence and evolution (i.e. their highest impact on economic growth) can be observed in the United States while several European economies are seriously lagging behind. As for some post-transforming economies, many of the in principle high-growth, new-technology-based startups bounce off an invisible ceiling or at least lose energy because both in the early stage of their existence and in later stages of initial growth and rapid expansion they encounter insurmountable financing difficulties. KBCs' sector-specific features which increase investors' perceived risks (volatility in earnings, intangible assets, new types of products) are coupled with region-specific financing constraints (underdeveloped venture capital markets, unsophisticated public policy instruments and underfunded support programs).

[1] Note, that the theory of internationalization considers international entry as an incremental process, that begins relatively late in a firm's life cycle. In contrast, in dynamic and technology-intensive sectors early internationalization is a catalyst for growth.

This paper summarizes some of the first results of field investigations carried out at Hungarian KBCs[1] with special emphasis on (i) explanatory factors of their performance (section 2); (ii) the impact of diversification and internationalization on growth and competitiveness (section 3). Section 4 concludes and proposes some policy implications.

Explanatory factors of performance

One of the main explanatory factors of the surveyed firms' success stories was their founders' personality. KBCs in the biotechnology and space sectors were founded by scientists - which is sector-specific characteristic, while KBCs in the IT-industry were founded by entrepreneurial professionals. The main motivation of firm foundation was the recognition of commercial opportunity. The surveyed space research company for example - a spin-off of University of Miskolc was founded by university professors and researchers working at the Faculty of Materials Science and Engineering. In the 1980s - still within the Intercosmos[2] scheme - the Hungarian research team developed a universal multizone crystallizator (UMC). In 1991 during the first International Conference on Solidification and Gravity, held in Hungary NASA researchers learned about this equipment and worked out an agreement with the researchers according to which NASA would house the UMC and provide funding for Hungarian scientists to work with it in the United States. The equipment was delivered to NASA laboratory in 1994 and tested for three years. There, scientists proved, it could be used for semiconductor growth. As a result of extensive negotiations on further collaboration and the upgrading of the equipment, in 1998 NASA published a Research Announcement, soliciting proposals for flight experiments and for ground-based experimental and theoretical microgravity research in materials science. The researchers recognized that formal participation in NASA tenders requires the establishment of a private firm. The newly established firm has not only won NASA's tender but has also acquired many further large-scale contracts since then, from customers including the European Space Agency, as well as Hungarian manufacturing firms and research institutions that rely on the company's sophisticated equipment for testing the quality of their products or that order custom-made equipment for research purposes.

Another case for the recognized commercial potential is that of an IT company, whose founder got acquainted with IBM PCs already in the 1980s

[1] This paper draws on the results of surveys at ten and direct in-depth interviews at two Hungarian-owned KBCs (surveys and interviews targeted both science and engineering based technology ventures /see Autio [1997]/ including IT, and biotech firms as well as firms in the instruments and space industries.)

[2] The Intercosmos program was a program by the Soviet Union to allow military from allied Warsaw Pact and other Socialist nations to participate in space exploration.

during a fellowship in the United States. He studied informatics at Wisconsin University, and thereafter worked for various IT firms in New York. This was a good start to learn about frontier level technology as well as about IT-related business and enterprise resource planning systems (ERP) in practice. Furthermore, he earned a lot by Hungarian standards which allowed him to accumulate start-up finance for an own KBC. Following his return, he founded his IT company in 1986 - in an organizational form common that time in the socialist era, a so called economic work community (GMK), with the aim of developing an up-to-date enterprise information system. Development took two years and costs were financed both by the founder's savings and by income generated from hardware import, distribution and system integration. Market for ERP systems grew rapidly from the mid-1990s on, so both sales and employment increased substantially - maybe not as rapidly as in the case of the other surveyed IT-firm that was included as a "Rising Star" firm in Deloitte's Technology Fast 50[1] (the company achieved a 30-fold increase in sales between 2003 and 2006 with sales amounting to HUF 603 million /EUR 2.4 million/ in 2006). This latter company developed intelligent client management system and information terminals used by banks, telecommunication companies, public utility companies and public institutions (including healthcare institutions, registry offices, social services institutions).

As for the founders' personal features, it was interesting to note their strong business orientation (entrepreneurial drive) which is still not common in transforming economies. In the socialist era, company managers used to be engineers and good professionals rather than good managers: their R&D orientation was rather that of technological perfectionism than that of commercial opportunity. Similarly, researchers, working academic institutions were also basic research oriented, caring little for devising applications for new scientific concepts and turning these applications into viable products. The surveyed CEOs are highly talented people, and they could go abroad quite early in their careers - most of them still as university students. In this way they could experience the innovation and commercialization practice of advanced economies.

Following the establishment of their own companies, most of them had to change their core activity in which they were so talented: they have quickly turned from a talented professional into a business manager. They dedicated more and more time to tender application writing, network building, management and market acquiring activities instead of pure research. All in all the founders' personality: their creativity and their relentless strive for business and technological achievements, was always an important explanatory factor of success. The interviewed managers were visionary and risk taking, able to identify trends and emerging opportunities. A highly important success factor was in most

[1] Deloitte's Technology Fast 50 is an annual listing of the 50 fastest growing technology companies in the world.

cases that they managed to transfer their exceptional commitment to other members of the management team.

Their research mindedness was however sometimes in conflict with business mindedness. In some cases business considerations overcame the scientific ones, in others it was strive for technological perfectionism that defeated business considerations. Example for the first was the case the way some science-based biotech firms tried to solve the problem stemming from the ad hoc character of income. Biotech firms are usually tempted to solve this problem by engaging into less innovation-intensive activities (than the firm's core competence), trying to find contracts for their testing laboratories, engaging into routine analytical activities, clinical trials etc. This increases the predictability of business operations but reduces the innovation-intensity involving various related hazards (e.g. losing the skills to be at the frontier of the science, engaging into low value added activities in order to sustain the firm and/or employment etc.).

An example for the latter case was when the technological perfectionism of the founder of one of the surveyed IT companies and his insisting in offering only frontier-level solutions resulted in opportunity costs from business point of view. The surveyed company was the first (in Europe!) to switch from command-line (CLI), to graphical user interface (GUI) in 1994. They abandoned the outdated CLI technology, so they neglected the benefits to be drawn from a carefully managed endgame strategy (see e.g. *Ghemawat-Nalebuff* [1998]) which promised substantial income and a large customer base[1] for local competitors for at least half a decade thereafter!

Factors of growth - diversification and internationalization

KBCs usually target niche markets with their new knowledge-intensive products and services. IT firms usually target the domestic market first. In contrast, the surveyed biotech and space firms were internationalized at the outset mainly because of the sector-specific characteristics of the two scientific disciplines (companies in these sectors are "born global"). In the early stage of KBCs' life cycles even niche markets offer splendid growth opportunities. *High growth means return on capital in excess of the costs of capital.* This is possible in the increasing returns setting of the knowledge economy in general and the high-growth IT-industry in particular. Consider the textbook example for increasing returns: Development of the first copy of a new software solution amounts to a

[1] Note that implementing an ERP system is to some extent deterministic i.e. the technology has substantial lock-in effects. It makes the switching to another system (to another software infrastructure) prohibitively expensive since the implementing firms have to carry out organizational changes: adjust their organizational structure and their business process so that they match with the logic of the system.

couple of millions of dollars. The costs of the second and additional copies are no more than one or two dollars a copy, comprising the costs of the CD ROM and of packaging. However, domestic market oriented IT firms' markets will, irrespective of market size become sooner of later saturated. Furthermore, their niche is usually contested by newly emerging technological startups and/or by diversifying large multinational companies that enter their segments.

Diversification, both in terms of new products and in terms of new markets i.e. the acquiring of foreign markets or public sector contracts alongside to private ones, seems a good way to sustain growth. Public procurement contracts could offer huge growth opportunity for IT firms. Winning public contracts however, proved more difficult for the surveyed firms than expected, even if compared to the solutions of the key multinational actors, KBCs' systems are usually highly price competitive and implementation time is also much shorter. Nevertheless, the 'costs per economic value' reasoning that applies in the private sector has to be complemented with a multitude of other factors to make the products persuasive under public sector conditions. As opposed to private sector companies' unambiguous profit maximization drive, public sector decision-makers are guided by two (often conflicting) motivations: cost minimization and risk avoidance. The latter factor makes them opt for MNCs' much more expensive solutions.

The two surveyed IT firms adopted two different strategies to overcome this problem: one of them tries to avoid applying for public sector contracts and tries to expand its activity internationally instead. The other firm invested in customer relationship management and tried to accumulate a substantial stock of social capital. Accumulating so called "relational assets" in this industry facilitates the acquiring of both new private customers and contracts from the public sector. As for private customers, note, that ERP systems process confidential enterprise data. Trust is crucial also because the benefit an ERP system can yield to the company is not securely predictable. The usefulness of the product can be verified only with a substantial delay following its purchase. Consumers have limited information on most of relevant product details, and the whole process involves considerable risks *{Scott-Vessey* [2002]), which all make transactions more trust-based than in the case of pure market-transactions. As far as public contracts are concerned, transactions are to an even larger extent trust-based than in the case of private customers.

Meanwhile this firm also makes substantial efforts to expand through internationalization, since above and beyond a certain revenue threshold internationalization is a prerequisite for business success also in the software industry.

The surveyed space industry firm offers good example for diversification in terms of products. During its startup phase, the founder concentrated on the specific business opportunity NASA's Research Announcement meant for them.

Previously, researchers at the university performed mainly academic, pre-competitive research. In contrast, NASA's research announcement was a business proposal of a value amounting to approximately hundred thousand dollars. It ensured workload during more than a year for the newly established company. Over time, based on the original concept, a whole family of UMC furnaces was developed.

However, demand for multizone furnaces and single crystal growth techniques suddenly experienced a setback with the shift in Bush administration's space related priorities. In January, 2004 "A Renewed Spirit of Discovery" was published by president Bush, in which he formulated America's new "Vision for Space
Exploration". The new strategy envisaged the return to the moon as top priority (http://www.whitehouse.gov/space/renewed_spirit.html). According to the Vision, the main future focus of American space-related research should be astronauts' health. The main target of public investment in space-related research should be the elaboration of ways to protect the crews from the space environment during long-duration voyages. The new program involved a complete restructuring of NASA activities. NASA had to stop certain research programs, including most microgravity and material science research.

This had painful consequences for international representatives of research and industry that specialized in this field, forcing many of the players to change the core activity or at least to diversify it. This was the time when the surveyed company laid increasing emphasis on another research direction: metal foam research and the development of materials science related technologies. Its customer orientation has also changed. Originally, NASA was the main customer. From the second half of the 2000s on, ESA became the most important customer. Furthermore, the company made increased efforts to gain some *commercial* market share alongside to the *institutional* one. They tried to increase the sales share of services, they provide with the help of their high-tech laboratory equipment. This strategy is in line with Christensen's [1997] concept of "disruptive innovation": the number of consumers can be increased if a high-tech company starts to use its technology also at the lower end of the market. As an example, recently they acquired two high-value infrared cameras, bought in the frame of an EU project, and provide infrared services related to biological applications, thermal conductivity measurement in buildings, diagnostics of electric systems and various other applications. Infrared cameras are used to prepare the thermal map of estates in partnership with a real estate developer.

In sum, the company - similarly to all other international actors in the space industry - makes huge efforts to increase the importance of ground-related (as opposed to space-related) activities. They target universities with the offer of

designing and creating specific research equipment.[1] They make business partnership proposals for joint technology development, and target Hungarian manufacturing companies.

Conclusions and policy implications

The surveyed cases demonstrate the validity of the otherwise consensus view, that KBCs are highly important in terms of new member states' necessary transition from their present investment-driven to an innovation-driven growth. Policy requirements go however beyond the objective of contributing to the maximization of the number of knowledge-intensive startups with instruments including direct financial and indirect technical assistance (e.g. funding of feasibility studies, commercialization assistance, training etc.). KBCs themselves, especially university spin-offs have to undergo a transition: from a status of living off research grants and subsidies to that of a business oriented company with commercialization capability and a dense network of linkages to companies interested in using their research results.

Much institutional development (e.g. in the field of support agencies,[2] venture capital market etc.) is necessary to support KBCs, once they enter a high-growth phase (with or without internationalization). Since the most valuable part of KBCs' assets is intangible which limits the opportunity of collateral-based lending, KBCs' financing constraints are even more pressing than those of ASMEs. KBCs should in fact be considered as a special case, featuring special qualities, constraints and requirements. As it was powerfully demonstrated by Storey and Tether [1998], where policies have been focused exclusively upon KBCs (as in Germany, the United Kingdom, or later in Ireland[3]) they have proved quite successful in closing the huge performance gap in this respect, between the U.S. and the European Union.

[1] One example is the laser-detector developed for the University of Miskolc that surveys the properties of foams.

[2] Researchers work in a non-commercial environment. However, in advanced economies universities usually have technology transfer offices that support commercialization. In contrast to transforming economies, the term "technology transfer" has a different meaning in advanced economies. In transforming economies this term denotes the transfer of technology and know-how by multinational companies to their local subsidiaries and in a broader sense also the spillover effects of multinationals' investments. In contrast, in advanced economies technology transfer denotes commercialization, i.e. the turning of scientific concepts into viable products by selling the technology of the concept's elaborated commercial application to private companies.

[3] See Szalavetz [2007.a, b] about KBC promotion in Ireland.

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