

## Executive Summary

# Vienna as a Region of Knowledge: Increasing the Generation of University Spin-offs

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In the globalized, knowledge-based economy of the 21<sup>st</sup> century, the long-term economic competitiveness and social well-being of cities and regions will depend upon their ability to generate and nurture innovative businesses and organizations. Innovative activity can occur in different types of organizations, including SMEs, large national and multinational corporations, and in entrepreneurial start-ups. One of the most important set of actors in generating innovative activity is universities. Universities can stimulate and support regional economic development in a number of ways, including through the provision of the skills and training of the future highly skilled labor force. But the knowledge produced through both basic and applied research within universities has the potential to lead to innovative activity through knowledge commercialization. Knowledge commercialization can occur in the form of patenting and licensing, or through the generation of new businesses ‘spun-off’ from university research projects. This study focuses on the generation of university spin-off businesses in the Vienna region. The study seeks to provide answers to two key questions: (1) what has been the incidence of university spin-offs in the Vienna region; and (2) what are the most important barriers and obstacles that have prevented the incidence of spin-offs from being higher?

The definition of a university spin-off used in this study is a new business in which the science or technology which is the basis for the new product or process was developed at a university by one or more university staff member (professor, doctoral student, other researcher). It is neither necessary that the technology be patented or have other forms of intellectual property protection, nor that the university researcher/entrepreneur has a continuing relationship with the business after it has been created.

Our study has been informed by a review of two bodies of research literature. First, university spin-offs are *entrepreneurial actions*. The literature on entrepreneurship is quite extensive. Much of it focuses on the reasons or motivations for someone to become an

entrepreneur, while another strand focuses on examining the success factors of start-up businesses along different stages in a life cycle. The second body of relevant literature is concerned with the internal culture, norms, governance, and resources of universities as potential parent organizations of spin-offs. The most relevant lessons from the intersection of these two literatures are: (1) that the generation of university spinoffs is highly complex, involving many different actors operating within a diverse set of institutions, processes, and rules; (2) there is a high degree of heterogeneity among university spin-offs in terms of the 'paths' and outcomes in their respective life cycles, including, most notably, the barriers and obstacles they have to confront; (3) the high rate of failure of new business start-ups in general, extends to university spin-offs.

The potential barriers and obstacles to the generation of spin-offs, despite their heterogeneity, can be grouped into factors related to (i) the attributes, attitudes, and experiences of the individual faculty researcher/entrepreneur; (ii) culture, institutional conditions, and resources in the university and department/institute; (iii) conditions and resources in the regional milieu conducive to the creation of spin-offs; and (iv) policies and programs at the federal and EU levels that may support (or not) the generation of spin-offs.

The primary methods used in this study, in addition to the review of the relevant literature, include an extensive internet search (to identify and confirm cases of university spin-offs), data bases of new businesses procured from several support organizations, face-to-face interviews with a variety of actors, including faculty entrepreneurs, university officials, leaders of support, funding, and other intermediary organizations, policy officials in federal ministries and other governmental organizations, and other experts. A questionnaire has been used to obtain standardized responses from interviewed actors concerning which factors are perceived to be most important as obstacles to the generation of university spin-offs. Our count of university spin-offs in Vienna covers the six year period of 2007-2012, and is inclusive of all sectors and technologies. Our investigation of the obstacles and barriers to the formation of spin-offs is focused on two sectors – the life sciences and information technology – as those two sectors comprise the large majority of spin-off activities in the Vienna region. To assess how well the Vienna region has performed in the generation of university spin-offs, we use the Munich region as a benchmark, where we have estimated the number of university spin-offs over the same six year period.

The Vienna region has considerable knowledge assets for potential knowledge commercialization generally and the generation of spinoffs from university-based research specifically. Six research universities, i.e. those that award doctoral degrees and have substantial expenditures for research, are located in Vienna. Together they had 777 million Euro in research expenditures 2007 (Stadt Wien 2011). Roughly, basic research accounts for about half (48 percent) of research expenditures. We have calculated several indicators of the research intensity of Vienna's university sector compared to the research universities in

Munich and Berlin. Research expenditures as a percentage of total university budgets are slightly higher in Vienna than in Munich. However, R&D spending per academic staff is less than one half of the figure for Munich, and R&D spending per student enrollment in Vienna's universities is also less than half of Munich's. In addition to the university sector, private companies represent significant regional R&D assets, as they employ more than half (56 percent) of all R&D workers in the region.

Although there are a number of R&D strengths in the Vienna region, there are three technology areas that stand out in terms of concentration of talent and competitiveness. The pre-eminent area is the life sciences (including biotechnology). There are more than 400 life science companies in the region employing about 9,000 persons, and 22 research institutions concentrating in the life sciences including five research universities. Total annual average third party funding for research in the life sciences has been estimated to be about 200 million Euro. Other areas of competitive strength, though not at the level of the life sciences, are information technology and environment/energy.

Our best estimate of the number of university spin-offs in the Vienna region, between 2008 and 2012, using the definition above, is 113. Of these, more than one-half have come from the TU Vienna. Because this was a time of severe economic crisis with many financial organizations withdrawing from making any risky investments, this estimate is not representative of the rate of university spin-offs over a longer time span. We have made an estimate of the number of spin-offs from universities in the Munich region, using the same definition and the same time period, in order to have a meaningful comparison for assessing the Vienna region's performance. Our best estimate for the number of spin-offs in the Munich region is between 100 and 150. The results indicate that Vienna has performed rather well in comparison to its benchmark of Munich, which has had a well-deserved reputation as a high tech center, with two of the best universities in Europe and a milieu conducive to the generation of spin-offs, particularly in the life sciences.

Not surprisingly, different actors have different perceptions of the obstacles to the generation of university spin-offs in Vienna. There is broad agreement, however, across a range of actors about the importance of some of the most important factors. In terms of the individual attributes of faculty entrepreneurs, the lack of business and entrepreneurial skills of researchers, a low tolerance for risk and for failure, and the lack of sufficient rewards or incentives by their universities for work that leads to commercialization are cited often. In terms of institutional (university) factors, the universities' lack of space and facilities for new spin-off businesses, an insufficient supply of seed funding to help the faculty entrepreneur take the research to the 'next step', and the lack of training opportunities for researchers to learn business skills were cited most. At the level of the *regional milieu*, the lack of sources of angel investors and venture capital within Vienna, the paucity of role models of successful entrepreneurs, and a culture of risk avoidance and

shame of failure imbedded in the culture were mentioned across the full range of actors. Finally, inadequate early-stage and late-stage funding from federal government organizations were widely cited as inhibitors of the generation of spin-offs and their eventual success.

The report provides a lengthy list of actions that can potentially increase the incidence of university spin-offs. They are grouped in terms of policies or strategies that can be taken at the institutional (university) level, city or regional level, and federal government level. Some of these can be implemented and their effects seen in the short- or medium-term, such as accessible provision of business and entrepreneurial skills to university faculty and doctoral students, and increased coordination among universities in sharing resources, information, and support, to realize economies of scale. Others, such as changing the culture of risk avoidance and the shame of failure, are longer-term efforts that need to be aimed at the primary and secondary educational curricular levels.