

THE RANGE OF LEGITIMATIZATION STRATEGY AND REGIONAL ENTREPRENEURSHIP (EVIDENCE FROM THE CASES OF THE ACADEMIC SPIN-OFF PROCESS IN JAPAN)

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1. Introduction

Scientific technology as a source of innovation has become increasingly important in regional and industrial development. Many research universities, both domestic and overseas, have started engaging in technology transfers, appointing experts and actively managing inventions created by faculty members and students, protecting inventions by intellectual property rights, and licensing them to private companies with a view to commercialising the inventions. University-originated ventures (or academic spin-off ventures) refer to “new companies established on the basis of intellectual properties developed in universities” (Shane, 2004). Domestically, a growing number of university ventures have been launched after the government implemented “the 1000 University-originated Ventures Policy”, and greater importance is now placed on the quality of commercialisation of new technologies.

Strategic tasks of spin-offs include not only possessing superior new technologies but also achieving environmental and institutional legitimacy for the technologies (Aldrich and Fiol, 1994). At the initial stage of operation, entrepreneurial activities require strategies for dealing with uncertain factors and entrepreneurs need to demonstrate their capability and credibility to stakeholders. The legitimization activities of each spin-off venture can be defined as a strategic action to achieve a certain level of superiority by complying with, selecting, and controlling various sources of legitimization (regulations, norms, recognition, etc.) for the survival of the business (Zimmerman and Zeitz, 2002; Delmar and Shane, 2004). Although legitimacy cannot easily be controlled by an individual entrepreneur, there are various ways for him to influence the legitimacy so that his activities can be recognised in a social context.

Although the necessity of legitimization strategies (achievement of legitimacy) in the process of establishing academic spin-off ventures has

been pointed out, the effective range of the achieved legitimacy has not been sufficiently discussed. The roles of researchers in universities which experience a radical institutional reform have also been widely reviewed. The question is, in addition to the discovery/development and spread of basic new technologies and knowledge, what roles university researchers should play in commercialising such technologies and knowledge.

2. Previous Studies and Research Context

2.1 Regional entrepreneurship from the multi-dimensional view

For a long time, with a few and fairly exceptions (Saxenian, 1994; Aldrich, 1999), academics have largely avoided investigating entrepreneurship as a fundamentally local and regional process, born of individual, potential entrepreneurs taking regional advantage and resources both in order to identify opportunities for new business creation. Freshly, there has been considerable interest in what would be indispensable for entrepreneurship to prosper in a country, and even within specific regions of a country.

The idea that environments are critical is not new and many theorists have acclaimed mainly this environmental condition as influence on the rise of new organisations and flourish of the specific regions (Jacobs, 1969; Hannan and Freeman, 1989). These studies regard the social infrastructure and learning environment in a region as the determinants of the competitiveness of firms and innovation, suggesting the proximity effect of ventures, R&D, and industry-university linkage and the sharing of implicit knowledge among them.

While greater emphasis has been placed on the one-sided, self-interested aspect of entrepreneurship, researchers particularly in Britain and the U.S. have been focusing on the view of entrepreneurship based on expansive, social motives (Kanai and Ishida, 2000). For industry-university-government linkage as the foundation for regional economic revitalization, this multidimensional view of entrepreneurship which includes its civic, social, and cultural aspects in their broad sense must be positively rooted in the region (Yamada, 2004). One of the reasons why this process is stagnant is because society's stance toward to the domains of entrepreneurial activities tends to be resource-based, and also firm boundaries are drawn between the activities of economic, public, and industry sectors.

Entrepreneurship is a creative, and at the same time, destructive activity to develop new domains through knowledge creation and achieve measurable success. However, there are various approaches and motives to establish domains. Although somewhat deviating from the main discussion, Florida and Cohen (1999) assume that intellectual workers are motivated

not so much by material or financial incentive as by honour, involvement, social meaning, or other attractive incentives. This assumption is also suggestive of the view of regional entrepreneurial activities at the start-up stage.

2.2. University-industry relationship in Japan

Attention is being focused upon the roles of local universities as well as the functions of links between university and industry to encourage the startup of business and improve the innovation ability of the locality itself (Branscomb, Kodama, and Florida, 1999). Universities must inevitably play a role to enhance the flow of knowledge beyond the walls among organizations. However, there have been few basic, theoretical studies on the concepts of universities (Merton, 1973; Rosenberg and Nelson, 1994).

The university-industry linkage represents a structure coupled with various aspects such as education and researches conducted by a university in collaboration with an industry. The linkage, which also includes a series of various trials, is now recognized as one of the most important issues to be considered in support measures to revitalize industries in each country. In the first place, the university-industry linkage system is greatly affected by the historical process of each country. For instance, the positive contribution by universities to industrial growth is not a recent phenomenon seen in the United States.

However, in the 1980's, both the Japanese government and industrial world were forced to change their policies drastically because of the Japan-US trade friction, technological friction, and the criticism of "free riding on basic research". Regarding enhancement of technological innovation, the Japan Federation of Economic Organizations in 1980 pointed out the necessity of the university-industry linkage to encourage innovative engineering developments. Also, the Industrial Structure Council of the Ministry of International Trade and Industry proposed the so-called "Technopolis Concept" to gather high-tech industries and institutions and provide support such as by establishing a university and research laboratories at certain places. The concept long played an important role in the Japanese regional expansion policy to improve the originality of local knowledge-intensive industry as well as housing conditions due to the advantages of having industry, university, and housing in one place (Suzuki, 2001).

The necessity to improve the structures for producing good, appropriate basic research through mutual utilization of knowledge in the university-industry linkage was widely recognized, in order for Japanese industry to develop its own technology instead of simply importing and applying technology from the United States and Europe, which was commonplace after the war (Hashimoto, 1999). Then, the significant consequence of this

controversy after the long stagnation period in 1990s was the fact that all national university was quasi-privatized in 2003. The influence of this national institutions' reform encourage all Japanese university to entrepreneurial.

2.3. Academic spin-off ventures and roles of university researchers

What motivates university researchers to commercialise a particular scientific technology¹? Shane (2004) identifies three psychological attributes in the process of creating a spin-off venture: 1) desire for the practical application of technologies; 2) desire for wealth, and 3) desire for independence. Domestic and overseas surveys of the founders of academic spin-off ventures show that most of them established their own ventures out of a desire to apply their technologies in practice instead of pursuing wealth as a career goal (McQueen and Wallmark, 1982; Shinya and Kikumoto, 2006).

When university-originated inventions generate business opportunities, most of them are at the early stages of technological development, or implicit knowledge, and so the inventors play a key role in creating spin-off ventures. However, university researchers as inventors do not necessarily play a central role in launching academic spin-off ventures. In most cases, academic spin-off ventures are launched by 1) the inventors themselves, 2) external entrepreneurs who obtain the license of university-originated inventions through, for instance, the technological license office, in order to establish a company, and 3) investors who connect the inventions and entrepreneurs (Roberts and Malone, 1996). It has also been pointed out that potential business opportunities generated by university-originated inventions cannot be assessed by technological information itself but are largely influenced by preliminary knowledge and information (Shane, 2000).

Both inventors and entrepreneurs require core collaborators to share the intention of commercialisation. According to Shane (2004), inventor-led spin-offs are mostly found in industries where protection by intellectual property rights is not so effective due to the weakness of patents, while external entrepreneur-led spin-offs tend to be derived from universities which have previously produced a larger number of spin-offs. However, few studies have attempted to examine the tasks of entrepreneurs in a micro-level organisation process from the perspective of the interaction between inventors and (external) entrepreneurs.

University researchers as inventors must first establish a vision for com-

¹ According to a survey of entrepreneurial activities in the field of life science, scientists in industry tend to spin off from their organisations to create ventures at earlier stages than university researchers (Audretsch and Stephan, 1998).

mercialising the technologies, then define their roles in that context and explore how to share the vision with the parties involved. They must also clarify their attitudes and roles, and demonstrate their initiatives to officials of the TLO in which investors, the local government, relevant universities, and companies are involved.

When each inventor or entrepreneur decides to launch a spin-off venture, the technology is still in its infancy, requiring continuous development. Therefore, whether spillover-types involvement in the commercialisation of the technology or direct involvement as a founder of the organisation, the researcher as an inventor usually invests enormous time and energy into developing the technology further together with his collaborators around the time of foundation (Roberts and Malone, 1996).

2.4. Uncertain factors accompanied by commercialisation and legitimization

At the initial stage of a spin-off venture, legitimization activities are required inside and outside the organisation for various reasons including reducing risk, minimising uncertain factors, and mobilising resources. Most of the academic spin-offs around the time of foundation are at their "minus two stage" of commercial development as ventures, requiring further large-scale technological development in the long term (Nelsen, 1991). Entrepreneurs at the initial stage of operation are more likely to implement legitimization strategies to cope with uncertain factors and convince the stakeholders of their capability and credibility. Suchman (1995) defines this legitimacy as "behaviours of the actor that are generally recognised and assumed as desirable, right, and appropriate within a socially built system of norms, values, creeds, and definitions". Zimmerman and Zeitz (2002) point out the importance of conducting legitimization activities more than a specific level, or a legitimacy threshold in order for a venture to survive.

Corporate venturing practiced by large companies is similar to the commercialisation of a university-developed technology in that legitimization activities are necessary to mobilise resources for uncertain business opportunities. In both cases, new technologies and ideas are accepted and utilised within each organisation, and agreements are made to obtain and allocate necessary resources² (Burgelman, 1983). It should be noted that, given environmental uncertainties such as competition and regulation, entrepre-

² As an example of resource mobilisation for legitimisation, the case of a medical venture which commercialised its artificial inner ear technology is known, where the venture disputed technical evaluation indexes through presentations at medical conventions and won favourable evaluation from the US Food and Drug Administration which authorises business operations (Van de Ven and Garud, 1989).

neurs are likely to adjust their technologies to the existing institutional environment. Earlier studies examined the interaction between organisations which create new businesses and the environment from an institutional viewpoint, and clarified the process by which the actors succeed in reducing uncertain factors by utilising various sources of legitimacy such as academic circles (Van de Ven and Garud, 1989). Furthermore, entrepreneurs need to gain not only the acceptance of external actors including potential customers and investors but also the consensus of internal actors such as immediate members of the relevant organisations through persuasion and influence in order to overcome the scepticism and opposition of those who wish to maintain the status quo (Dees and Starr, 1992; Yamada, 2006).

2.5. Actors in legitimization of commercialisation and their roles: Necessity of new viewpoints

While an academic spin-off venture legitimizes itself, connection with academic groups and the reputation of the relevant university may not remain constant throughout the stages of commercialisation (Yamada, 2006). However, there have been few studies on the roles of university researchers as a source of legitimization itself who play a leading role in applying basic technologies .

The course of legitimization has not been fully discussed in terms of the commercialisation of new technologies and innovation (Takeishi, Aoshima, and Karube, 2006). Takeishi et al. (2006) argue that actors who expect some positive results from their new technologies must take the decision to invest resources with a risk of loss, realising that business achievements cannot previously be assessed by economic rationality alone, and have strategic perspectives and means to change the course of their legitimization along with legitimate reasons to support their own logic. Although this change in the course of legitimization strategies is clearly important in corporate venturing practiced by large companies where organisational inertia is dominant, it is also a challenging promotional and operational task for universities or academic spin-off ventures at their initial stage of operation.

Although both the government and local economic groups have high expectations for academic spin-off ventures and there are also favourable changes in social climate³, the business environment and system itself by which various actors are related have yet to be developed (Shinya and Ki-

³ Technology seeds and human resources possessed by universities and companies are greatly influenced by changes in policies and regulations imposed by the government of the country. Particularly in America's biotechnology and pharmaceutical industries, the number of academic spin-off ventures established during one year rapidly increased from slightly less than 90 in the 1980s to more than 500 in 2000 after the Bayh-Dole Act was enacted in 1980 (Shane, 2004).

kumoto, 2006). Various actors (specific individuals, internal and external stakeholders, etc.) are involved in the commercialisation of burgeoning new technologies. In order to reap economic benefits from such technologies despite many uncertainties, in addition to the mobilisation of resources and concerted efforts of all those involved, it is necessary to legitimize the commercialisation for peripheral stakeholders. The legitimization itself, which includes not only technological and economic factors but also social and political factors of the location, can be a double-edged sword at various stages of commercialisation. Therefore, the roles of university researchers as key actors in the legitimization of commercialisation are an important research topic.

3. Methodology and Case Summary

3.1. Methodology

This paper is empirically grounded in a study of the academic spin-offs, the career of academic researcher, and economic-social worlds of the Japanese university-industry linkage. Using the case method, this paper will analyse the range of legitimization in academic spin-off ventures while relating it with contextual characteristics of core researchers and the spin-offs.

Firstly, the cases were chosen for representing a critical case (Yin, 1994) of a process of legitimacy whereby the effectiveness for shaping a unique resource resided in regional universities in the institutional change. Then, we sought comparative analysis of claims of research authenticity (Eisenhardt, 1989) from the focal actors (i.e. the academic researchers) with those from their collaborators, investors etc.

The cases include two spin-off ventures based on technology seeds at Kagawa University and one based on technology seeds at Ehime University. The reason why regional university-originated spin-offs were selected for this study is because it is not easy for them to secure managerial resources, and therefore the effectiveness of legitimization strategies can be critical to the survival of the business. Data used for this study was obtained through published references and interviews with people from various sectors including industry, academia, and government who were involved in the spin-off cases.

3.2. Case Summary

The first case is Professor Ken Izumori, a central figure in research conducted by the Rare Sugar Production Technology Research Centre (Consolidated Company). The rare sugar research was designated as a Cluster Creation Project⁴ promoted by the Ministry of Education, Culture, Sports, Science and Technology, where various studies had been conducted for the establishment of production methods, clarification of physiological activities, and the application of rare sugars to drugs, foods, and agrichemicals in collaboration with industry, academia and government, with Kagawa University as a core of the project. The consolidated company was established in July 2006 as a spin-off from such research activities.

The second case is GalPharma Co., Ltd., a university-originated bio-venture, and its leading figure of Professor Mitsuomi Hirashima. Founded in Tokyo in 2000 on the basis of Hirashima's research achievements, GalPharma has developed cancer metastasis diagnostic kits, utilising galectin. The company was subsequently relocated to Kagawa Prefecture where its research centre is located, and is now aiming for an initial public offering (IPO).

The third case is CellFree Science Co., Ltd. established in Yokohama in 2002 on the basis of the cell-free protein synthesis technology developed by Professor Yaeta Endo at Ehime University. The company was established by financial contributions mainly from faculty members of Ehime University, with another research centre set up within the university, and later Ehime University held some of its stocks. Thus, the company is characterised by its strong relationship with the university.

Although different in technology seeds, all three cases originated in regional universities and are involved in the biotechnology industry. While the three university researchers play a core role in the commercialisation of new technologies after spinning off from their universities, each of them has his own stance, building a unique relationship with the venture.

⁴ CLUSTER "Cooperative link of unique science and technology to economy revitalization" policy was promoted to create a regional base, agglomerating universities, public institutions which accumulate wisdom, relevant institutions, and R&D companies, and planned by local governments since 2002.

4. Case and Findings

4.1. Rare Sugar Production Technology Research Centre (Consolidated Company) and Professor Izumori

The Rare Sugar Production Technology Research Centre (Representative: Yoshio Tsujisaka, Capital: 7.3 million yen) is a Kagawa University-originated venture established on 13th July 2006. Rare sugars are monosaccharides that are rare in nature, and so there have been few studies on this type of sugar. After years of research, Professor Izumori at the Faculty of Agriculture, Kagawa University succeeded in building what he calls "Izumoring," a blueprint for sugar production, paving the way for the production of theoretically all rare sugars and clarification of their functions.

This research on rare sugars was subsequently designated as an Intellectual Cluster Creation Project, and both basic and applied researches have been conducted in collaboration with industry, academia and government, in addition to many other university researchers and companies inside and outside Kagawa Prefecture. The Kagawa prefectural government has supported the research within the framework of the "Glyco-Biocluster Plan," while the university has improved the research environment by putting the research centre under ministerial regulations, extending the professor's retirement age, introducing production facilities, and setting up a research specialty course for the graduate school.

Eight people (including corporate bodies) participated in setting up the new company, including Koji Kondo, Former Provost of Kagawa University who also served as Vice President of the Intellectual Cluster Creation Project and Tsujisaka who served as Director of the Project. The capital of 7.3 million yen was funded by the founding members including Tsujisaka, Former Provost Kondo, Fushimi Pharmaceutical Co., Ltd. which produces and sells reagents, the first rare sugar-related products, and Matsutani Chemical Industry Co., Ltd., a total starch manufacturer which focuses on the application of rare sugars to foods, and its internal researchers.

The Rare Sugar Production Technology Research Centre (Consolidated Company) aims to, in collaboration with Professor Izumori, improve the rare sugar production technology, and research and develop technology for producing new sugar-related substances and technology for separating related microorganisms. Specifically, its scope of business includes: R&D of technology for producing rare sugars and their derivatives; R&D of technology for separating related microorganisms; production and sales of rare sugars and their derivatives; education and training on biotechnology; bio-science/life science-related publishing; and all related businesses.

Based on the Regional Revitalisation Law, the new company is to utilise the land of a closed school in a mountainous area of Miki Town where

the Faculty of Agriculture, Kagawa University is located, and to reuse the production facilities by signing a joint research contract with the university which were improved using subsidies for Intellectual Cluster Creation Projects and then transferred to the university without charge through a core support organisation.

Professor Izumori's future vision is to create a global centre of basic research and education, and so he has played a central role in establishing the International Society of Rare Sugars. The consolidated company was established by those who share the same vision, and intends to continue wide-ranging research beyond the borders of academic research activities and to spread the achievements with a view to a post-intellectual cluster, making the company a contact organisation for rare sugar research.

Because Professor Izumori is an active university researcher, he himself was not directly involved in setting up the company to avert a potential conflict of interest, but continues his research through a joint research contract while keeping a distance from the company. This joint research has already led to three joint patents pending.

4.2. GalPharma Co., Ltd. and Professor Hirashima

GalPharma Co., Ltd. (President & CEO: Susumu Sakata, Capital: 877.5 million yen) is a bio-venture established on 1st November 2000 by spinning off from Kagawa Medical School⁵ based on the achievements of research led by Professor Hirashima on galectin, a physiologically active substance within the living body. Its two main businesses are the diagnosis of cancer metastasis along with the development of diagnostic kits and the development of treatment methods utilising galectin 9.

"Curing tens of millions of patients all at once" by creating new medicines through research had been his vision since his youth, and so he participated in setting up a bio-venture together with joint researchers of Tokyo University in 1999. However, he started to explore ways to launch a venture on his own due to differences in business policy. With sizable cuts in research budgets for regional universities as part of the government's administrative and fiscal reform, raising research funds was a serious issue in those days. Professor Hirashima therefore decided to launch a venture together with his collaborators who shared the same belief: "Although there are superior technology seeds in regional universities, it is hard to collect money. To change this situation, we need an example showing that even regional universities can be successful."

The initial set-up costs were covered by financial contributions from

⁵ Because Kagawa Medical School has been consolidated into Kagawa University, the venture is now positioned as a Kagawa University-originated spin-off.

Professor Hirashima, the leader of the venture, and Okazaki (anonym), a former venture capitalist and co-founder who later became CEO, and other research partners. The venture was based at an incubation centre located in Tokyo, for the convenience of subsequent fund-raising.

However, they were still novices in business and soon faced cash-flow problems and difficulties in business development after using up the initial funds in March 2001. Upon learning that the Kagawa prefectural government offers subsidy programs to nurture high-tech ventures, they relocated the head office to Miki Town in August 2001 where Kagawa Medical School, the centre of their research activities, was located. In April 2002, aided by the Kagawa Industry Support Foundation and others, the head office was again relocated to the Kagawa Prefecture New Industry Creation Support Centre (Next Kagawa) in Takamatsu City.

Professor Hirashima initially led both research activities and management of the venture including fund-raising. After Sakata, who had worked at a trading company, became the third president in April 2002, he started to lead business activities including negotiations with venture-capital companies (VCs), while Professor Hirashima concentrated on the research, thus achieving division of labour. Another important move in this period is that, with a VC serving as an intermediary, a partnership was forged with Fuso Pharmaceutical Industries, Ltd.

In October 2002, GalPharma established the endowed course of “Cellular Regulation Medicine Course” within the Faculty of Medicine to contribute to R&D in the field of the formation analysis and cellular regulation function of galectin. Kiyooki Yamauchi, who serves as a director from a clinical standpoint, took up the post of guest professor.

Research on galectin was later positioned as an integral part of the Functional Sugar Chain Project in the Glyco-Biocluster Plan sponsored by the Kagawa prefectural government. With another endowed course established within the Faculty of Medicine by the prefectural government in 2003, GalPharma received successive support from the entire community.

GalPharma completed its third allocation of new stocks to third parties in 2004 to raise funds worth nearly 800 million yen, allowing the company to continue its business without cash-flow problems at least until August 2007. GalPharma is now preparing to list on an emerging equity market. The company now utilises public funds from a variety of sources by participating in the Consortium R&D Project for Regional Revitalisation (for small- and medium-sized businesses), Kagawa Prefecture Creation Technology R&D Cost Support Project, Hyogo Prefecture COE Program Promotion Project, and various other projects. GalPharma is also proceeding with joint research with Kumamoto University and Harvard University on autoimmune diseases, and has hosted the International Galectin Conference in Takamatsu City since 2005.

4.3. CellFree Science Co., Ltd. and Professor Endo

CellFree Science Co., Ltd. (President: Satoshi Ozawa, Capital: 670 million yen) was established in Yokohama City in July 2002, based on the “wheat germ cell-free protein synthesis technology” developed by Yaeta Endo (now director), then professor at the Faculty of Engineering, Ehime University. This technology overcomes many limitations of the conventional method in which specific genes are implanted in *E. coli* for proliferation, making it possible to synthesise more than 90% (about 400 kinds) of the proteins composing human genes in a short period of time and at low cost.

The turning point for Professor Endo is the strengthening of intellectual property policies accompanied by national universities’ transformation into independent administrative institutions. Recognising the research led by Professor Endo, then chief clerk at the Faculty of Engineering, approached the professor who hoped to license his research achievements, suggesting their application and utilisation in the form of patents belonging to the university rather than the professor himself.

CellFree Science Co., Ltd., which mainly focuses on the management of internal and external patents, development and spread of technologies, and consultation, was established in 2002, with the Matsuyama Research Centre also set up within Ehime University. With 83% of its stocks owned by the provost and faculty members of Ehime University, the company is characterised as a venture that originated in Ehime University.

Ehime University embarked on improving the internal research environment, establishing the Cell-Free Science and Technology Research Centre in 2003 and calling on top-class researchers from inside and outside the university. In addition, following deregulation as part of the Koizumi Cabinet’s structural reform, the Ehime prefectural government applied for designation as a special bio-zone, and set up the Bio-industry Creation Support Project after approval. The Matsuyama municipal government sent its personnel to the research centre, and Iyogin Capital Co., Ltd., a subsidiary of Iyo Bank, Ltd., made its first venture fund investment worth 90 million yen in CellFree Science. Thus, Ehime Prefecture, Matsuyama City, the Chamber of Commerce and Industry, and Ehime University all made a concerted effort to support this new venture.

CellFree Science has remained profitable since its establishment in the core businesses of protein extraction liquid, equipment development, and licensing. The company considered it would be difficult to spread its technology due to its complexity, as there are more than 70 development processes. Therefore, it developed GenDecoder, an automatic synthesiser capable of easily producing proteins, and delivered it to the University of Wisconsin in America in 2004. By promoting joint research using the automatic synthesiser with the Eucaryotic Cell Structure Genomics Centre

(University of Wisconsin) and signing the research agreement with the Wisconsin Alumni Research Foundation (intellectual property management organisation), CellFree Science has strengthened the foundation for future commercial use of its technologies.

CellFree Science expects that top scientists who use the company's high-tech equipment will demonstrate the reliability of its technology and raise awareness in international academic societies as well as the pharmaceutical industry. In response to increased inquiries from academia and pharmaceutical companies, CellFree Science strengthened its sales and technological support system by establishing a fully funded subsidiary, ENDEXT Corporation, in the American market in 2005. Foreseeing success in America, the company has already started to enter the European and Asian markets.

In the same year, Ehime University was donated 2,400 unlisted stocks by board members, the first case for a national university to hold stocks⁶. This Ehime University-originated spin-off is also expected to induce a chain of regional spin-offs. In addition, Ehime University is planning to use the returns on its capital participation (stock dividends) to fund interest-free scholarships for students who participate in the Super Scientist Course offered by the university.

4.4. Findings

Our findings from the comparative case study are as follows:

1) University researchers' vision and their regional entrepreneurship: University researchers have the similar final vision of contributing the local/regional economic growth through the commercializing of their technology. They chose not licensing but establishing academic spin-offs to keep close relationship with their university and regional government. In this sense, they are the central figures of the regional entrepreneurship. But the difference of their role definition as academics led to the difference of the type of their scenarios, commitment and relationship with the spin-offs.

2) Creation of academic spin-offs and strategies of universities: In one case, to cope with the radical institutional changes, a university strategically created an academic spin-off through accelerating research activities. The university held stocks of the spin-off and recognized it as a part of their competitive advantage. In another case, researches founded a start-up company independently of the university strategy, but the company endowed a chair and kept good relationship with the university.

3) Reciprocal legitimatization strategy: Academic spin-offs use their uni-

⁶This stockholding was realised on condition that Ehime University would not exercise voting rights, following the instructions of the Ministry of Education, Culture, Sports, Science and Technology.

versities' reputations as a legitimatization strategy for building trust with the market, investors, and consumers. Universities use academic spin-offs as evidence of their active university-industry linkage and usefulness of their research output. Both parties use each other to legitimize their activities.

4) Advantage and disadvantage of universities' commitment to academic spin-offs: For universities, a commitment to an academic spin-off leads to risks when the company fails in business. For academic spin-offs, a strong relationship with the university is effective for legitimizing their activities. However, it sometimes limits their autonomy and free hand. To keep autonomy and free hand, academic spin-offs maintain a weak relationship with the university.

5) Expansion of researchers' roles and commitment to the management of the company: Researchers want to keep their identity as a research professional. However, the lack of managerial personnel requires them to expand their role and to commit more to the managerial tasks. It sometimes leads to an over commitment to business activities. The partners who have been supporting researchers are businessperson, secretaries, and ex-researchers. Building a trust and sharing roles with their partners reduce the expansion of the researches' roles and commitment to the managerial jobs.

6) The changing environment and universities: The radical institutional changes, such as the transformation of the national universities, push the creation of academic spin-offs directly or indirectly. These changes create new strategic problems for universities, such as management of technology, partnership with spin-offs, and personnel assessment of researchers playing expanded roles. Universities and researchers are not affected by these changes only one-sidedly; they sometimes affect the institutional arrangement to legitimize their activities.

5. Analysis and Discussion

5.1. Legitimization and roles of university researchers

In the establishment and growth processes of an academic spin-off venture, it is necessary to achieve legitimacy from both outside and inside the organisation and in diverse ways. One of the characteristics of academic spin-off ventures is that the involvement of university researchers per se can be a source of legitimacy. The roles of university researchers in their spin-off ventures are defined to achieve greater legitimacy, and the way they are involved in their spin-offs influences the targets and quality of the legitimacy to be achieved. Table 1 summarises the roles of the three university researchers in the formation of their spin-offs in terms of their involvements in establishment and business operations.

Tab. 1- Roles of core spin-off researchers and legitimization activities

	Rare Sugar Production Technology Research Centre (Consolidated Company)	GalPharma Co., Ltd.	CellFree Science Co.,Ltd.
Involvement in establishment	– Presentation of vision – Joint research Contract	– Presentation of vision – Financial contribution and recruitment	– Giving up licensing and understanding venture establishment – Financial contribution (including faculty members)
Involvement In operation	– No commitment	– President – Direct commitment	– External directors – No commitment
Relationship with management team	– Complete separation – Sharing Professor Izumori’s vision	– Incomplete separation – Separation achieved by recruiting management staff	– Complete separation – An administrative official as a buffer
Relationship with spin-off	– Joint research – Deal-making	– Joint research – Endowed course	– Joint research – Stock dividends (to be used for scholarships)
Source of legitimization	– Aversion of conflict of interest – Involvement in cluster policies	– Deep involvement in operation – Leadership in consensus-building	– University-wide commitment – Aversion of conflict of interest

In the case of the Rare Sugar Production Technology Research Centre which was established mainly by business managers who shared the vision of Professor Izumori, a source of legitimacy for the company was the aversion of a potential conflict of interest. Therefore, the roles of Professor Izumori were limited to those of a joint research partner in the contractual relationship, which instead guaranteed him freedom in his research.

As for GalPharma, Professor Hirashima as a researcher succeeded in obtaining support from the business world including VCs and partner companies by demonstrating his commitment to the management of the company through his direct involvement in fund-raising and recruitment. However, the company went on to take various risks, including a conflict of interest, resulting from the integration of a researcher’s roles into business activities and the resulting diversification of roles.

In CellFree Science, Professor Endo managed to avert a conflict of interest by completely separating himself from the business, and won the trust of the business world, universities, and the community by playing the symbolic role of a founder.

As discussed above, each university researcher is a source of legitimacy for his spin-off venture. However, regardless of how they were determined, the roles of researchers as actors in legitimization tend to be more complex and difficult to control than previously assumed, in response to the growing dependency on resources and expectations of various stakeholders.

5.2. Dilemma in the course of legitimization

The range of legitimization by each academic spin-off inevitably includes activities inside and outside the relevant organisation. Although this legitimization serves to support the activities of spin-off ventures in gaining reputation and utilising resources, there exist several dilemmas in its course.

Although the Rare Sugar Production Technology Research Centre sought to separate itself from the university while maintaining its collaborative relationships by excluding faculty members of the university from its management team, the company was to depend heavily on the university and community members for its equipment, leading them to expect social and economic spillover effects of the company.

GalPharma succeeded in winning various support from administrative organisations and financial groups by relocating its head office to Kagawa Prefecture. However, by doing this, the company carried the burden of community expectations of economic spillover effects as a flagship of the Glyco-Biocluster Plan. In addition, the company had to deal with criticism from university faculty members concerning a conflict of interest by setting up an endowed course within the university and employing one of the founding members as a guest professor, thus drawing a line between academic research activities and corporate research activities.

The full-scale support from Ehime University and the Ehime prefectural government at the initial stage of operation was a source of confidence for CellFree Science, which in turn led community members to expect spillover effects on the economy of Ehime Prefecture. In addition, when the university took over some of the stocks and became a stockholder, this boosted confidence in the academic spin-off venture, and also strengthened the presence of the university, contributing to nurturing new industries in the community. While such a relationship with the community may bring regional and economic benefits, the university is more likely to take inherent risks in the long term⁷.

Hence, the activities of academic spin-off ventures may be restricted by building a resource dependency relationship with their stakeholders which embeds them in the regional and institutional contexts, or they may be placed under the pressure of expectations greater than the resources utilised. It is also assumed that they break away from the rules or resource dependency relationships they have established through their own legitimization strategies, and therefore cannot proceed to the next step in business development.

There are two factors behind these problems. The first factor is the di-

⁷ For example, greater transparency is required for the operation of spin-offs, or a large shift in strategy may cause restrictions on their activities.

lemma between partial (or local) rationality and total (or global) rationality. As the number of actors involved in each academic spin-off venture increases as commercialisation progresses, potential stakeholders become apparent, making their expectations more diverse and complex. In other words, this dilemma arises from the gap in evaluation index resulting from domain differences between actors involved in the spin-off.

The second factor is the dilemma between pre-rationality and post-rationality. This dilemma arises from the passage of time, or the advance of stages involving the commercialisation of new technologies, going public, etc., and changes in the socioeconomic environment surrounding each spin-off. Changes in evaluation index resulting from the passage of time and environmental changes are thought to affect this factor.

Since academic spin-off ventures are originated in universities, they have various targets of legitimization including not only business organisations but also administrative, regional, and intra-university organisations and academic societies. Although this legitimization originally intends to minimise uncertain factors in the operation of ventures, materialise the visions of core university researchers who wish to commercialise new technologies, and avert potential conflicts of interest as well as diversification of their roles under the restrictions of limited resources and undeveloped institutional infrastructure, it tends to cause new risks and uncertainties at later stages.

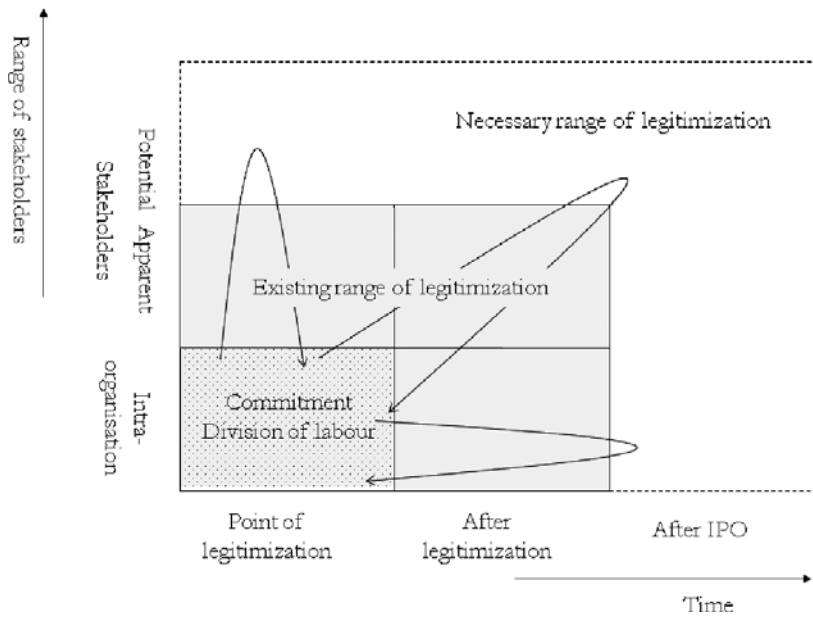
Tab. 2- Course of legitimization and resulting dilemmas

	Dilemma types of legitimization			
	Partial and total rationalities		Pre- and post-rationalities	
	Partial	Total	Pre	Post
Rare Sugar Production Technology Research Centre (Consolidated Company)	Separation of core scientists from management	Regulatory costs accompanied by joint research, commercialisation, managerial procedures, etc.	Provision of equipment by community members and university	Expectations toward spillover effects on local economy and community
GalPharma Co., Ltd.	Integration of research and management by core researchers	Expectations inside and outside spin-off toward diversified roles of core researchers	Support form community members	Expectations toward spillover effects on local economy and community
CellFree Science Co., Ltd.	Separation of core scientists from management	Expectations inside and outside university toward diversified roles of core researchers	Trust-building through support from community members and stockholding by university	Expectations toward spillover effects on local economy and community Decision-making problems in stock trading

5.3. Range of legitimization: expansion of stakeholders and advance of stages

In the legitimization of academic spin-off ventures, the accumulation and spread of technologies are based on expectations of their effects such as spill-over of knowledge which indirectly contributes to the regional economy by nurturing new technologies in the long and medium terms, and the direct effect of chain-reaction establishment of spin-offs. As each spin-off venture solidifies its organisational foundation and proceeds with legitimization, the range of both apparent and potential stakeholders including investors, supporters, business partners, and customers rapidly expands, accompanied by the commercialisation of new technologies and mobilisation of necessary resources. With the passage of time, not only the stages of commercialisation but also the range of the relationships of university researchers with stakeholders and their characteristics are likely to change as a result of the influence of legitimization itself and its interaction with the commercialisation activities.

Tab. 2- Range of legitimization



⁸ It is necessary to examine in future studies the relationship between the discussion of earlier studies in which founding managers can be an entrenchment at the stage of establishing and institutionalising the business, and the roles of university researchers involved not only as core scientists but also as a source of legitimisation.

Most spin-off ventures tend to reach major turning points while strengthening their operations, such as business expansion through an initial public offering. In such cases, the method of building consensus among the parties involved using the existing legitimization strategies does not always function. Since consensus-building among various stakeholders in the existing legitimization activities leads the university as a public entity to be bound by the existing relationships, it is difficult for university researchers to individually break free from such an institutional deadlock⁸.

The issue here is whether legitimization activities are conducted by each academic spin-off venture in a truly effective way so that its social rationality as a local entity and the involvement of university researchers can be linked to its subsequent global economic rationality in the long and medium terms by institutional logic⁹. It has been pointed out that innovation is essential to the management of legitimization, but its effectiveness is limited (Suchman, 1995). In order to pass the initial stages of operation successfully, it is necessary to maximise the effectiveness of legitimization activities, but it is also more important for university researchers, regional academic organisations and management teams involved in academic spin-off ventures to develop legitimization strategies while foreseeing the occurrence of dilemma in the course of legitimization¹⁰.

6. Concluding Remarks

This study contributes to a nascent research stream interested in the paradoxical concept of regional academic entrepreneurship which is brought about from the interaction between the several institutional logics that have been prevailing and competing for dominance for several decades in the university-industry relationship, respectively the professorship's, the university's and the industry's logics, and we focus on their legitimization strategy that provoke the contradictory situations for their original identities in order to fit the current institutional change. In the sense, the regional institutionalization is seen more as a multi-level, multi-dimensional and multi-actor endogenous development (Windeler and Sydow, 2001).

The challenge facing entrepreneurial pioneers in the region differ from the challenges facing new ventures that are either part of or sheltered by

⁹ Refer to Yamada and Matsuoka (2007) for the involvement of university researchers as cores of spin-off ventures and their career alternatives.

¹⁰ Since the targets of legitimisation strategies are extensive and, in most cases, multiple legitimisation activities are conducted in parallel, the consistency of such activities conducted at each point in time and in each situation should also be discussed, in addition to the range of individual legitimisation activities.

sponsoring organisations such as university. Because the system itself for connecting the environment and each actor is not sufficiently developed, academic spin-off ventures need to legitimize themselves especially at the initial stage of operation in order to minimise risks and uncertainties and to mobilise resources. In earlier studies, Zimmerman and Zeitz (2002) assume in their studies on the threshold of legitimization that a certain level of legitimization according to each stage is essential.

A diverse range of actors (specific individuals, stakeholders inside and outside the organisation, etc.) are involved in new technologies. The legitimization strategies of academic spin-off ventures include not only technological and economic factors but also social and political factors in the region. This is likely to cause dilemma related to 1) the passage of time and 2) the complexity of the relationships between actors in the course of legitimization. Entrepreneurial behaviour at the initial stages of operation is based on legitimization strategies inside and outside the organisation, and dilemma accompanied by the legitimization are assumed to be inevitable phenomena caused by changes in both the stage and characteristics of each actor.

By comparing three cases, this paper suggested that due to the involvement of multiple actors and stage changes, university researchers are more likely to face dilemma in the course of legitimization strategies implemented by their academic spin-offs. The theoretical implications of this study are the new research agenda which we propose; in order to build the foundation of the regional entrepreneurship research to date has focused on a relatively narrow portion of this rich domain.

One of the important contributions of this study is the presentation of a framework that clarifies the range of legitimization, based on which both the growth stages of academic spin-off ventures and various actors involved were discussed. The insight into the roles of core researchers involved in the commercialisation of new technologies as well as legitimization includes issues common to corporate venture theory.

However, this study also has limitations since only academic spin-off ventures at their initial stage of operation were selected for analysis. In future studies, it will be necessary to refine the case study and examine how legitimization strategies are changed or rebuilt after the stage of initial public offering. There are still many issues remaining, including the roles of the regional entrepreneurs in the institutional change to guarantee long-term growth and the analysis of strategic legitimacy in a comparison between spontaneous entrepreneurial activities in different background regions.

Bibliography

- Aldrich, H. E. (1999) *Organizations Evolving*, Sage Publications.
- Aldrich H. E. and Fiol, C. M. (1994) Fools Rush In? The Institutional Context of Industry Creation, *Academy of Management Review*, Vol.19, No.4, pp.645-670.
- Audretsch, D. and Stephen, P. (1998) How and Why does Knowledge Spill Over? The Case of Biotechnology, Working paper, University of Indiana.
- Burgelman R. A. (1983) A Process Model of Internal Corporate Venturing in the Diversified Major Firm, *Administrative Science Quarterly*, Vol.28, No.2, pp.223-244.
- Branscomb, L. M., Kodama, F. and Florida R. (1999) *Industrializing Knowledge: University-Industry Linkage in Japan and the United States*, The MIT Press.
- Delmar F. and Shane, S. (2004) Legitimizing First: Organizing Activities and the Survival of New Ventures, *Journal of Business Venturing*, Vol.19, pp.385-410.
- Dees, J.G., and Starr, J.A. (1992) Entrepreneurship Through an Ethical Lens, In Sexton, D. L. and Kasarda, J. D. (eds.), *The State of the Art of Entrepreneurship*, PWS-Kent.
- Eisenhardt, K.M. (1989) Building theories from case study research, *Academy of Management Review*, 14, 4, 532-50.
- Florida, R. and Cohen W. M. (1999) Engine or Infrastructure? The University Role in Economic Development. In *Industrializing Knowledge: University-Industry Linkage in Japan and the United States*, edited by L. M. Branscomb, F. Kodama, and R. Florida, The MIT Press.
- Hannan, M. T., and Freeman J. (1989) *Organizational Ecology*, Harvard University Press.
- Hasimoto, T. (1999) The Hesitant Relationship Reconsidered: University-Industry Cooperation in Postwar Japan, In *Industrializing Knowledge: University-Industry Linkage in Japan and the United States*, edited by L. M. Branscomb, F. Kodama, and R. Florida, The MIT Press.
- Herenkson, M., and Rosenberg, N. Incentive for Academic Entrepreneurship and Economic Performance: Sweden and the United States. In *The Wealth of Knowledge*, edited by S. Sorlin and G. Tornqvist, March 8, 2000.
- Jacobs, J. 1969. *The Economy of Cities*. Random House.
- Kanai, K., and S. Ishida (2000) Accumulation Process of Regional Industry and Entrepreneurship: Case Study of Sapporo Valley, *Entrepreneurship on the Technology Frontier in the USA, the UK and Japan Working Paper*, International Conference in Vanderbilt University, 14 October 2000.
- McQueen, D. and Wallmark, J. (1982) Spin-off Companies from Chalmers University of Technology, *Technovation*, Vol.1, pp.305-315.
- Merton, R. (1973) *The Sociology of Science*, University of Chicago Press.
- Nelsen, L. (1991) The Lifeblood of Biotechnology: University-industry Technology Transfer. In R. Ono (ed.), *The Business of Biotechnology*, Butterworth-Heinemann.
- Roberts, E. and Malone, R. (1996) Policies and Structures for Spinning Off New Companies from Research and Development Organizations, *R&D Management*, Vol.26, No.1, pp.17-48.
- Rosenberg, N. and Nelson, R. (1994) American Universities and Technical Advance in Industry, *Research Policy*, Vol.23, pp. 323-348.
- Saxenian, A. (1994) *Regional Advantage*, Harvard University Press.
- Shane, S. (2000) Prior Knowledge and the Discovery of Entrepreneurial Opportunities, *Organization Science*, Vol.11, No.4, pp.448-469.
- Shane, S. (2004) *Academic Entrepreneurship: University Spinoffs and Wealth Creation*, Edward Elgar.
- Shinya, Y and Kikumoto, H (2006) *The Preliminary Study on the Present Status and Problems of University Spin-Off Companies*, a model project of the Ministry of Education, Culture, Sports, Science and Technology for constructing 21st century linkages between business and academia (in Japanese).
- Suchman, M. (1995) Managing Legitimacy: Strategic and Institutional Approaches, *Academy of Management Review*, Vol.20, No.3, pp.571-610.
- Suzuki, S. (2001) *The Study of High-Technology Oriented Development Policy in Japan*,

Minerva Shobou. (in Japanese)

Takeishi, A. , Aoshima, Y. and Karube, M. (2006) The Account for Innovation: Legitimizing processes of mobilizing resources in the case of Okochi memorial prize toward innovation. (in Japanese)

Van de Ven, A.H. and Garud, R. (1989) A Framework for Understanding the Emergence of New Industries in R.S. Rosenbloom (Ed. by) *Research on Technological Innovation, Management Policy*, JAI, pp.195-225.

Windeler, A. and Sydow, J. (2001) Project Networks and Changing Industry Practices: Collaborative Content Production in the German Television Industry, *Organization Studies*, Vol. 22 Issue 6, p1035-1061.

Yamada, J. (2004) Entrepreneurship as Knowledge and Social Capital Creation in Benton, C. et al. Eds. *Meso-Organization and Knowledge Creation*, pp.12-46, Quorum Greenwood Publishing.

Yamada, J. 2006 Legitimizing Activity of Entrepreneurial Team against Uncertainties: Organization Emergence Process and Strategic Sociability in Regional Academic Spin-off, *Venture's Review*, No.8, pp.23-32. (in Japanese)

Yamada, J. and Matsuoka, K 2007 Academic Entrepreneur and regional business creation: comparative case studies of career, role and intention of university researchers, National Institute of Advanced Industrial Science and Technology Discussion Paper Series #07-08 (in Japanese)

Yin, R.K. (1994) *Case Study Research: Design and Methods. 2nd edition*. Applied Social Research Methods Series, vol. 5. Sage.

Zimmerman, M.A. and Zeitz, G.J. (2002) Beyond Survival: Achieving New Venture Growth by Building Legitimacy, *Academy of Management Review*, Vo.27, No.3, pp.411-431.

Abstract

This paper focuses on the roles of regional entrepreneurship, especially university researchers and the effectiveness of their legitimization in the process of establishing academic spin-off ventures for the commercialisation of new technologies. Using regional university-originated spin-off cases, we compare and analyse processes by which various dilemma arise in the course of legitimization to derive the viewpoint of “the range of legitimization”.

Interweaving the theoretical arguments and our findings based on the comparative case studies, the regional entrepreneur in academic spin-off faces the two problems with deploying the legitimizing strategy. The first is the dilemma between partial (or local) rationality and total (or global) rationality. The second is the dilemma between pre-rationality and post-rationality. Hence, both the increase of various actors involved and the speed of growth stages of academic spin-off ventures constrain the effectiveness of their initial legitimization. We call it “the range of legitimization” as the new analytical framework to clarify those issues.

This study contributes to a nascent research stream interested in the dilemmaical concept of regional academic entrepreneurship which is brought about from the interaction between the various stakeholders that have been prevailing and competing for dominance for several decades in the university-industry relationship in order to fit the current institutional change.

As for practical implications, the dilemma of legitimizing and the consensus building taking account of the fragile and contingent nature of legitimacy are two significant issues for the management of relationships between entrepreneurs and various interested parties. It is essential for university researchers to utilise various sources of legitimacy necessary at each stage of the commercialisation of new technologies. Regional entrepreneurs strategically call for foreseeing sources of legitimacy necessary in the future according to environmental changes inside and outside the spin-offs.

Sommario

Il presente articolo è incentrato sul ruolo dell'imprenditorialità regionale, in particolare quella rappresentata dai ricercatori universitari, e sull'efficacia della loro legittimazione nel processo di creazione di spin-off accademici per la commercializzazione di nuove tecnologie. Utilizzando casi di spin-off accademici regionali, gli autori confrontano e analizzano i processi che danno origine ai vari dilemmi da affrontare nel corso del processo di legittimazione per definire una “gamma di strategie di legittimazione”.

Intrecciando le argomentazioni teoriche e i risultati basati su studi di casi comparati, l'imprenditoria regionale all'interno dello spin-off accademico affronta due problemi, mettendo in atto la strategia di legittimazione. Il primo problema concerne il dilemma tra razionalità parziale (o locale) e razionalità totale (o globale). Il secondo problema concerne il dilemma tra pre-razionalità e post-razionalità. Quindi, sia l'incremento dei vari attori coinvolti, sia la rapidità delle fasi di crescita di spin-off accademico vincolano l'efficacia della loro legittimazione iniziale. Definiamo “gamma di strategie di legittimazione” il nuovo quadro analitico necessario per chiarire questi aspetti.

Il presente studio contribuisce a un filone di ricerca emergente interessato al concetto “dilemmatico” di imprenditorialità accademica regionale, determinato dall'interazione tra i vari attori che negli ultimi decenni stanno prevalendo e competono per il dominio all'interno del rapporto tra mondo accademico e mondo industriale al fine di adattarsi agli attuali cambiamenti istituzionali.

Per quanto attiene le implicazioni pratiche, il dilemma della legittimazione e la costruzione del consenso - che tiene conto della natura fragile e casuale della legittimazione - rappresentano due aspetti significativi per la gestione delle relazioni tra imprenditori e le varie parti interessate. E' essenziale che i ricercatori universitari usino le varie fonti di legit-

timazione necessarie in ogni fase della commercializzazione delle nuove tecnologie. Gli imprenditori regionali strategicamente richiedono di poter prevedere le fonti di legittimazione che saranno necessarie in futuro tenendo conto dei cambiamenti ambientali all'interno e all'esterno degli spin-off.

Classificazione Jel: M 13.

Parole chiave (Key Words): Legittimizzazione, imprenditorialità regionale, spinn - off universitari (Legitimatization, regional entrepreneurship, University spin-off)