Entrepreneurial decision for rural development under social network effect

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Acknowledgements

Upon finishing my doctoral research, I flash back to the past three years. It was a journey of independence, growth, devotion and perseverance. I came here with the objective of being a qualified researcher and to fulfill my longtime dream of living in Japan. Even though things don't always turn out the way I planned, or the way I think they should, and there are also periods when I lapsed into depression and lost my courage and confidence, I was lucky enough to be surrounded by so much kindness and they support me all the way through the hardships. Here I would like to express my sincere thanks to all of them.

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Executive Summary

Geographical marginalization refers to the process in which regions lose equal opportunity of development due to geographical disadvantages. A typical example is the widening gap between urban and rural, which has caused a series of problems such as depopulation and economic degradation in rural areas. The most challenging part is that this process usually turns out to be self-reinforcing and hampers the revitalization process. Given the situation, the necessity of capacity building is emphasized by more and more regions in pursuit of an escape from the vicious circle. Under this line of thought, entrepreneurship is no doubt the most crucial issue that has caught the attention. With the establishment of new firms and provision of new products, the following results can be anticipated. Firstly, job opportunities are to be created that enlarge employment and mitigate outmigration. Secondly, the increase in product diversity contributes to higher utility from consumption on local market. Last but not least, local capacity is going to be built up to ensure long term development.

While previous studies provide us with a framework of determinants of entrepreneurial behaviors and detailed examination of key factors, there are still questions in need of further exploration with respect to our topic. First of all, featuring unique demographic, economic and cultural background, mechanism behind entrepreneurship in marginal region should be different from that elsewhere. It is therefore meaningful to discuss this issue in combination with a deeper understanding of the characteristics of marginal region. Second, previous researches mostly base their works on case studies or give a too narrative discussion. A theoretical perspective with concrete analysis is necessary for a more general understanding of this issue.

This research would like to contribute to existing literature by fulfilling the following tasks:

- Highlight the features of entrepreneurial process in marginal regions by identifying the influential factors unique to local context in marginal region
- Explore the mechanism behind entrepreneurial behaviors with microeconomic analytical method from both macro and micro perspectives
- Discuss the actions of government and derive some implications for the effective implementation of policies

The dissertation consists of 6 chapters. The first two chapters serve as an introduction and clarify the motivation and logic of this research.

Chapter 3 takes a macro perspective. It is concerned with personal influential factor and focuses especially on possession of skill. Based on the model proposed by Schweinberger, we assume skill to be a prerequisite for entrepreneurship. We follow the changes in number of new enterprises and social welfare when the proportion of skilled labor increases, which we considered to be achieved through the implementation of skill training. The results highlight the importance of industrial structure and substitutability of products in the heterogeneous sector. In general, skill training generates a more positive influence on entrepreneurial behaviors when the newly-started businesses have higher intellectual content than the traditional segment. If this condition is not satisfied, it would be more preferable if local demand for heterogeneous products shows consistency with the general market. It is also pointed out that since skilled labor has to bear entrepreneurial cost, it has negative effect on their utility and counterbalances the benefits from market growth. Nevertheless, in marginal region where population is small and wage gap between skilled and unskilled labor is large enough, it is more likely to see a simultaneous increase in entrepreneurial activities and social welfare as skill of labor improves.

The next two chapters, on the contrary, adopt a micro perspective by focusing on individual decision making. In these two chapters, attention is paid to external factors which cannot be full controlled by decision makers.

Chapter 4 considers the role of social network. Following social network theory, we explore this issue from a utilitarian perspective. Our main argument is that social network influences individual utility by creating social capital, which serves as a productive factor and contributes to higher returns in economic production. The result shows that when there is complementary effect among people's productive efforts, socially central agents in the network have higher expectations from the network effect and they are more likely to become entrepreneurs in pursuit of higher marginal payoff. We then propose a way to evaluate social capital based on the number and quality of one's social ties and our finding supports the argument that when the average possession of social capital is higher, entrepreneurship rate will be higher while keeping other conditions the same. Additionally, a lower cost and more significant improvement in payoff also make entrepreneurial activities more attractive to the agents. In this chapter, we also give a detailed discussion over policy choice. We show how, by taking advantage of the network effect, government in marginal region can implement an entrepreneurship-oriented policy more cost-effectively.

Chapter 5 focuses on the institutional environment for entrepreneurship and touches upon the public participation issue. With expectation for greater product diversity and the consequent increase in consumption utility, local people have the motivation to invest to support microenterprises in the region. This chapter elaborates on the operation and function of within-community microfinance institution, which serves as the bridge between investors and microenterprises. By modeling the investment decision making process of households and entrepreneurial activities, it points out that the effectiveness of entrepreneurial cost reduction by microfinance service has major influence on the result of entrepreneurship. For the investors, their behaviors are affected by their income

gap, investment amount as well as elasticity of substitution between products. We also consider the case where income level is too low and spontaneous investment is impossible to achieve. Under this situation, we contend that it is meaningful for the government to subsidize initial investment only when local economic condition allows for a self-reinforcing process.

The last chapter concludes the work with its main findings and limitations, as well as some implications for future policy.

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Chapter 1

Introduction

1.1 Background

1.1.1 Geographical marginalization

Marginalize, literally means to relegate something to an unimportant or powerless position within a society or group[1], is frequently used in the field of sociology together with the concept of "social exclusion". Hilary (1994) identifies three paradigms, under which social marginalization occurs, fragmentation of social ties, discrimination and monopoly. Though different in their manifestations, the phenomenon of social marginalization is generally associated with the deprivation of equal opportunity in terms of personal development, which can be mainly attributed to disadvantageous social position.

Similar issues also exist in the field of economics, especially in terms of regional development. Each region is endowed with different amounts and types of resources based on their geographical locations. These resources lay the basis for their future development. Consequently, different regions face unequal development opportunities. While areas with favorable locations continue to consolidate their position in economic system by attracting even more resources, the disadvantageous ones are treated as insignificant and are deprived of the possibility of prosperity. This process, where regions with unfavorable locations lose their resources to more geographically advantageous areas and suffer from the consequent social, cultural and economic decline, could be captured as the 'geographical marginalization'.

[1] https://www.merriam-webster.com/dictionary/marginalize

The widening gap between urban and rural region is a typical example of this phenomenon. Triggered by the initial outmigration, the consequent shrink in local labor force and market size devitalizes local economy. In addition, ecological and cultural functions of these regions are also put at a minor position or even neglected. This phenomenon is anything but a specific task for some countries, it is a common issue found in both the developing and developed world (McManus et al., 2012). Such imbalanced development threatens the sustainable development of human society since geographical marginalization, in most cases, turns out to be self-reinforcing. Consequently, the attraction of these regions as investees is reduced and economic vitality continues to decline, accelerating the outmigration of local people even further.

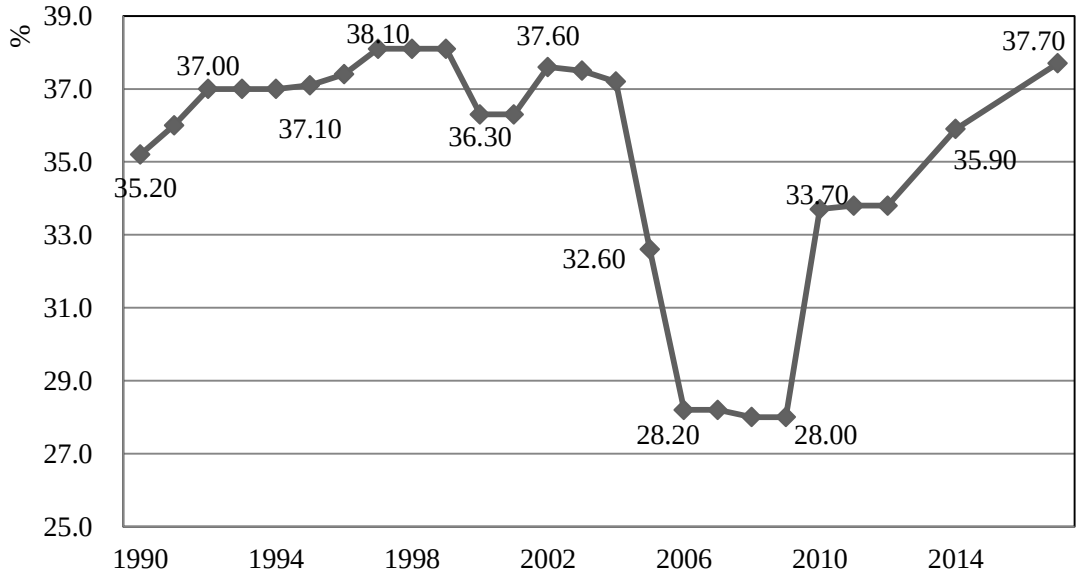

Figure 1.1 Ration of depopulated region in Japan

Japan, as the pioneer of Asian countries, is probably the first to take this problem seriously. Marginal region is referred to as “Kasochiiki” in Japanese, emphasizing the demographic feature of these regions as sparsely populated. In its neighbor country China, with a focus on land issue, the spatial attributes of marginal regions as “hollowing” is raising the attention of the public.

As is shown in Fig 1.1, ratio of depopulated regions shows an upward trend in Japan, except for 2003-2010, when the municipal merger movement caused the fluctuations in the number of villages and districts. Depopulated regions cover 59.7% of the territory in 2017, yet according to the national census carried out in 2015, population of these regions only accounts for 8.2% of the national total.[2]

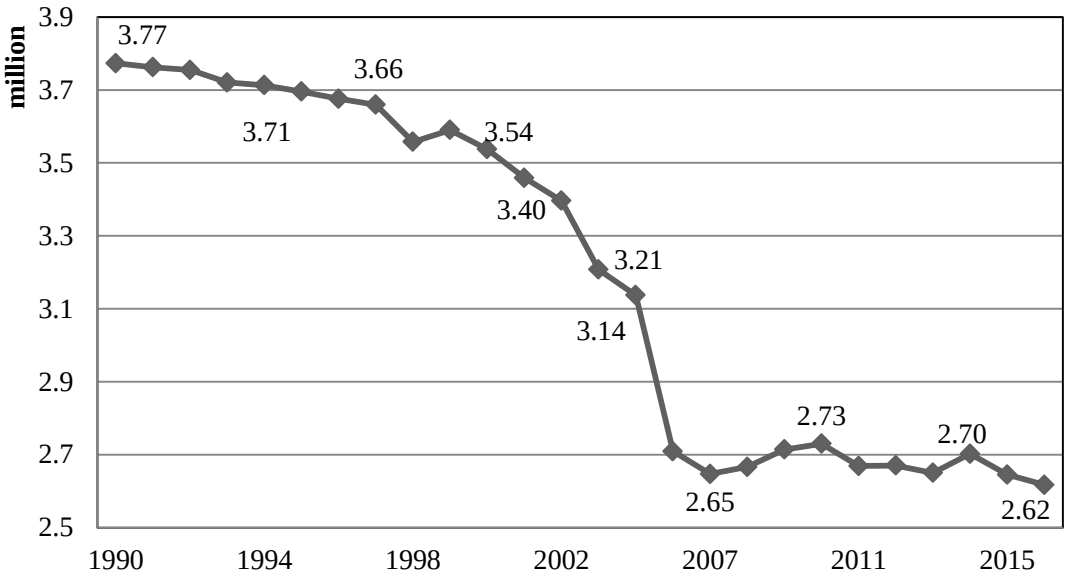

Figure 1.2 Number of villages in China

Different from Japan, where marginalization process is evaluated by the increase in the ratio of depopulated regions, in China, it is captured by the extinction of villages in rural areas. As is shown in Fig 1.2, from 1990 to 2016, the number of villages in China reduces from 3.8 million to 2.6 million. This is accompanied by large-scale temporary migratory activities, which can be explained by the low ratio of temporary population to registered permanent population (3.6% in 2016).[3]

[2] Data source: http://www.kaso-net.or.jp/kaso-db.htm#001

[3] Data source: China Urban-Rural Construction Statistical Yearbook, available on http://www.mohurd.gov.cn/xytj/tjzljsxytjgb/

Demographic changes are followed by the decline in economic development as well as the suspension of public service such as health care, transportation, etc., which greatly harms social welfare in the region by downgrading the life quality of local people. Therefore, it is necessary to take action to deal with the marginalization issue and regain the vitality of these regions.

1.1.2 Capacity building through entrepreneurship

It has been pointed out that one of the key points of improving economic condition is to increase the standards of living for individuals and growth of the economy as a whole (Szirmai, 2011). To achieve this, governments adopt policies under two main ideologies. The first one is concerned with the Keynesian economics. With this regard, approaches center on income redistribution and a welfare-oriented ideology dominates regional policy. It contributes to a relatively stable yet highly-dependent pattern of regional development, which is blamed for its incapacity in enhancing local productivity. The other way of thought, guided by the neoliberalism, emphasizes more on the independent and sustainable growth of these regions. But again, there is also criticism on its over-optimism on the potential of marginal regions in the increasingly intensified regional competition caused by globalization (Amin, 1999).

Although there are negative opinions, the pro-market approach becomes popular in recent decades, represented by the promotion and prevalence of grass-root development and local entrepreneurship. Different from a purely ‘market therapy’, these attempts are more of a combination of the “Keynesian economics” and “neoliberalism”, with government usually backing up spontaneous local efforts. In addition to the emphasis on long-term sustainability and independence, the bottom-up approach is also believed to give a full play of local strength by utilizing as much local resource as possible. Under this line of thought, entrepreneurship is no doubt the most crucial issue that has caught the attention.

Entrepreneurship is an elusive concept with fuzzy boundaries and wide-ranging elements (Anderson & Starnawska, 2008), making it difficult to give an explicit definition. Some scholars emphasize the innovative nature of entrepreneurship while others relate it to any type of new business start-up (Bruyat & Julien, 2001). For marginal regions, the activism of economy is of top priority and innovation should have less significant weight. Therefore, it is better to define entrepreneurship for these areas as 'the phenomenon associated to entrepreneurial activities' (Ahmad & Seymour, 2008), referring to new entry behaviors achieved either through launching a firm or providing a novel service or product. With the establishment of new firms and provision of new products, the following results can be anticipated. Firstly, job opportunities are to be created that enlarge employment and mitigate outmigration. Secondly, the increase in product diversity contributes to higher utility from consumption on local market. Last but not least, local capacity is going to be built up to ensure long term development.

1.1.3 Supportive policies and local involvement

In recent years, encouraging entrepreneurship in marginal regions has been paid more and more attention. Government, formal or informal institutions, organizations are actively taking actions to support entrepreneurial activities in these depleted regions. Generally, we can categorize them into three types.

The first one is concerned with individual capacity building. A typical example is entrepreneurship workshops, which cultivate potential entrepreneurs by enhancing their knowledge and skills. The second type aims to build up and consolidate the relational networks between stakeholders, such as promoting collaborations between local and external enterprises, as well as communications within local entrepreneurial groups in pursuit of information and knowledge sharing. With this regard, the function of social capital is much emphasized as being able to facilitate the active involvement in

economic activities. The last aspect is the improvement of the institutional environment. Given the special social and economic environment in marginal region, perceived feasibility of entrepreneurial plans is largely influenced by supportive institutions such as financial services and preferential tax policies. The construction of a better institutional environment is therefore crucial to the implementation of entrepreneurial activities.

Another important aspect to note during the entrepreneurship movement in marginal region is the active participation of local residents. They are privileged with closer within-community relationships and stronger attachment to the region, which help them to better mobilize local resources. The importance of community participation in local development has been emphasized for a long time. As is argued by Sewell and Coppock (1977), involvement of the public in development process legitimates their rights to voice their ideas and get informed, matches the plans better to public preferences and also facilitates the implementation by winning public support. Moreover, similar to its function in urban planning, community participation is also able to ensure the proper evaluation of local resources and sustainability (Amado et al., 2010). However, different from common public activities, entrepreneurship requires specialized knowledge and personal attributes. Despite the aforementioned efforts, only a few local people are qualified as potential entrepreneurs themselves. Nevertheless, the emergence of microfinance and other types of community-level organizations and institutions provides other opportunities for the rest of the population to get involved into the process.

1.1.4 The case of Amakusa

Amakusa is an island group about 60 kilometers southwest of Kumamoto City with hilly surface. Geographical isolation and low land productivity limit the development of agriculture and other traditional industries. Consequently, depopulation and aging issue

occur. According to the national census, population in Amakusa keeps declining while the proportion of aging population (age above 65 years old) continues to rise. These phenomena accelerate its marginalization and local economy lapses into recession.

To deal with these challenges, local authority focuses especially on expanding employment and cultivating local entrepreneurship. A local business supporting center Ama-biZ, is then formed, which offers free business consulting services to local businessmen and residents with business intentions in support of their careers. Additionally, it cooperates with government, local business and financial institutions, and also organizations outside the region to enhance its service and build up entrepreneurial environment. As an entrepreneurship facilitator, it actively involves in activities such as organizing entrepreneur workshop and bridging the relationships with financial institutions, as well as those within business stakeholders.

Ama-biZ gives a typical example of the kind of entrepreneurial support commonly conducted nowadays. From its operation, we see the necessity of extensive cooperation between organizations and institutions for the development of entrepreneurship in marginal region, which depends on the construction and consolidation of different types of networks.

1.2 Rationale of the research

In order to figure out how to achieve development of marginalized rural regions through entrepreneurship, it is necessary to identify the influential factors and understand how they functions to contribute to the process.

In the literature, fruitful results have been achieved with respect to the factors that influence entrepreneurial behaviors. However, seldom has touched upon the distinct background in marginal region. Additionally, previous researches either look at this

issue through purely qualitative lens with too narrative discussion. Or, they adopt an empirical method and base the work on case studies, the result of which is hardly applicable on a general basis.

This research aims to contribute to the existing literature by offering a more general understanding of entrepreneurship through microeconomic analysis and providing an elaborative examination of local context in marginal region. The identification of crucial factors and clarification of their relationships are expected to support the design of more effective policies in the revitalization of marginal regions.

1.3 Objective of the research

Theories on entrepreneurial behavior are dominated by the opinion that entrepreneurship is directly resulted from entrepreneurial intention. It is even argued that intention is the single best predictor and other factors are only able to indirectly affect entrepreneurship by altering one's intention (Krueger et al. 2000). The formation of intention is dependent on exogenous factors categorized into two dimensions, the personal dimension and the external dimension. The personal part is associated with one's individual capability to fulfill the tasks as an entrepreneur. The external part, on the contrary, is not under the full control of the agent. It is related to his or her relationships with other agents within the same social network, as well as the institutional environment that either supports or hampers the progress of entrepreneurial activities. Following this idea, we structure the framework of this research combining factors from the two dimensions. On the personal level, we consider one's qualification as a potential entrepreneur to be fundamental since it determines whether one can work out a feasible business plan and perform the necessary missions during the process. As for the external ones, they affect the implementation of entrepreneurial activities by changing the expected outcomes, feasibility, costs etc..

This research is organized to explore how entrepreneurial activities are shaped by personal and external factors in marginal region. Firstly, we focus on the personal aspect by examining the role of skill in facilitating entrepreneurial activities, which helps us to derive some implications for the promotion of entrepreneur cultivation programs that gain popularity in recent years. We would like to see whether an increase in skill brings more active involvement in entrepreneurship and whether there will be a consequent improvement in social welfare. Then, we turn to the external aspect. In this part, we are interested in the relational network and the institutional environment. Instead of stressing the cognitive influences as many previous studies do, we elaborate on the role of social capital. We would like to find out how social capital is formed and how it functions to facilitate entrepreneurship in marginal region. Additionally, we are also interested in the reason behind the richness of social capital in marginal, as is pointed out by many scholars, and how government can take advantage of this unique resource in its policy design. Finally, with regard to the institutional environment, attention is paid to microfinance service. By targeting local households as potential investors, the operation of microfinance institution is able to involve the public in support of local entrepreneurs. We intend to explain the operation and function of this type of institution in marginal region. Particularly, we hope to clarify the relationship between household investment and entrepreneurial activities and the way it is shaped by regional context.

1.4 Structure of the dissertation

This dissertation consists of 6 chapters and the logic map is shown in Fig 1.3. The first chapter introduces the background, rationale and objective of this research. The framework and logic behind this research is explained in more details in chapter 2 through a review of related theories and literatures. These two chapters lay the foundation of the dissertation. Chapter 3, chapter 4 and chapter 5, explore the issue from a micro-economic perspective and chapter 6 concludes the work with its main findings, implications for future policy design and outlook for future research.

Chapter 2 starts with a summary of theories related to entrepreneurial behaviors. We introduce the perceived self-efficacy theory, the entrepreneurial intentionality model and the theory of planned behavior. A framework of mechanism behind entrepreneurial behavior is constructed by identifying the common ideas behind the theories. Then, important regional factors that might have significant influence on entrepreneurship in marginal region are explored under this framework through literature review.

Chapter 3 focuses on the individually-based factor, the possession of skill, which is assumed to be essential for entrepreneurship. When equipped with higher skill, agents are flexible between being an entrepreneur and an employee. We follow mobility of skilled labor between getting employed and self-employed by combining monopolistic competition model and the equilibrium in labor market under full employment. The results allow us to figure out the relationship between possession of skill by local labor and entrepreneurial activities. We deepen the discussion by analyzing how this relationship varies with local context and its influence on social welfare.

Chapter 4 and Chapter 5 turn to the external side. Chapter 4 considers the influence from the relational network. Following social network theory, we explore this issue from a utilitarian perspective. It assumes there to be complementary effects between agents in the same network, which creates social capital and facilitates economic production. A detailed analysis of the attributes of the network is made to explain how the results change under different social contexts. Based on the conclusions, we then discuss the policy choice of government. We show how, by taking advantage of the network effect, government in marginal regions can implement an entrepreneurship-oriented policy more cost-effectively. Chapter 5 talks about the institutional environment and touches upon the public participation issue. With expectation for greater product diversity and the consequent increase in consumption utility, local people have the motivation to invest to support microenterprises in the

region. This chapter elaborates on the operation and function of microfinance institution, which serves as the bridge between investors and microenterprises. By modeling the investment decision making process of households and entrepreneurial activities, it gives the equilibrium number of investors and microenterprises and identifies factors that influence the equilibrium state.

Chapter 6 summarizes the main findings we derive in the previous chapters and propose several suggestions for future policy. It also reflects on the limitation of this research and puts forward several topics that deserve further discussions.

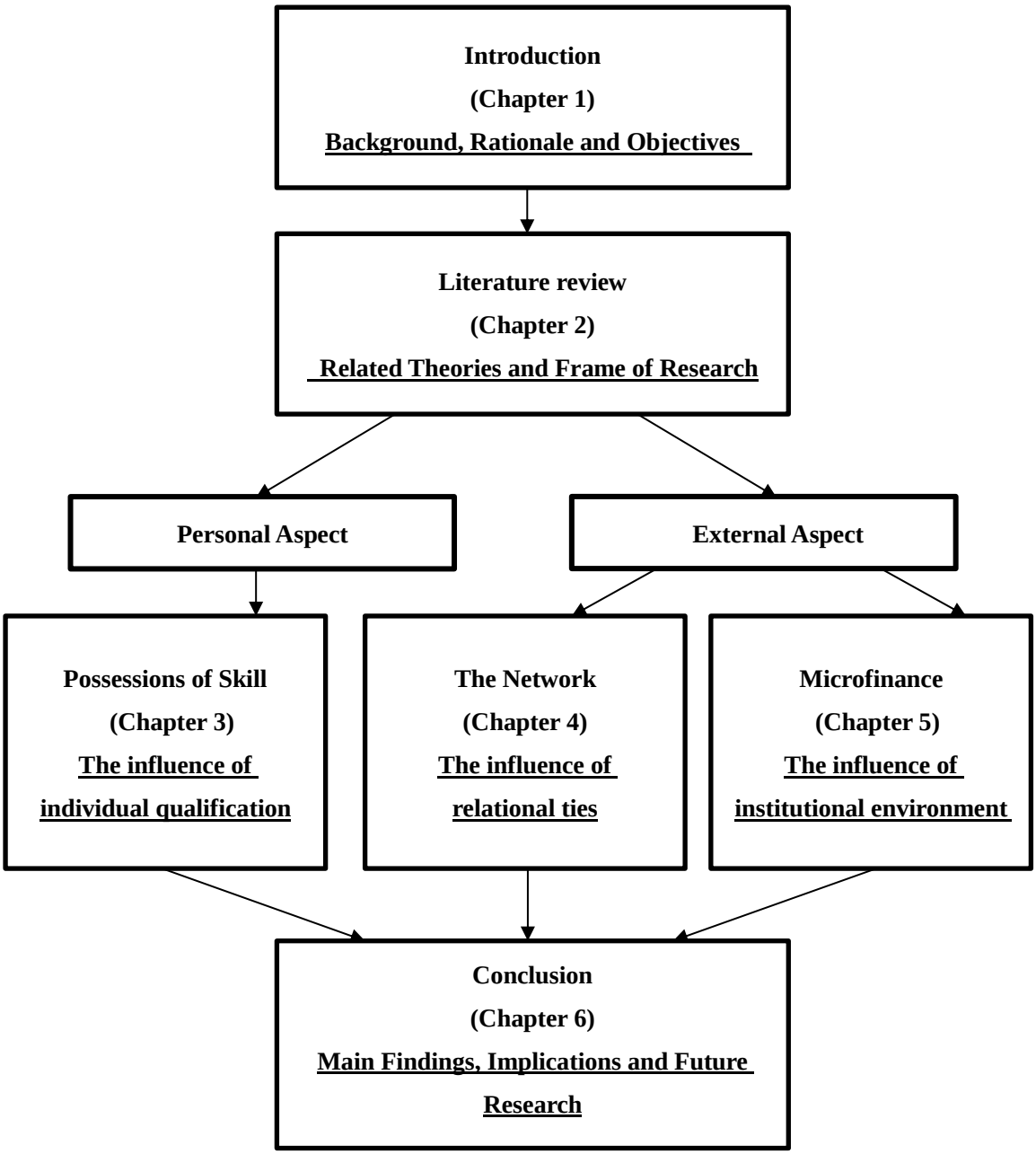

Figure 1.3 Structure of the dissertation

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Chapter 2

Related Theories and Literature Review

2.1 Introduction

Entrepreneurial behavior has been studied for a long time, especially after the entrepreneurship theory of Schumpeter. Fruitful results are achieved in this field. Some researches, following Schumpeter, emphasize the definition and attributes of entrepreneurship. Empirical researches also abound, which focus on the decision making of entrepreneurship and discuss the influential factors based on real cases.

In our research, we would like to explore the determinants of entrepreneurial activities particularly under the context of marginal regions. The contents of this chapter are organized as follows. In the second section, we review the literature on entrepreneurship in marginal region to develop a general image of this issue. Then in section three, we present the main arguments of three typical theories concerned with entrepreneurial behaviors, namely perceived self-efficacy (Bandura,1977; Shapero & Sokol, 1982), Bird's model of intentionality (Bird, 1988) and the theory of planned behavior (Ajzen & Fishbein, 1970; Ajzen, 1991,2002). Comparison is made to identify the similarities between these models, which enables us to approach the mechanism behind entrepreneurship. Based on this, in the fourth sector, we frame the structure of our research and identify key factors influencing entrepreneurship in marginal regions by reviewing related literatures. Finally, we conclude this chapter with a summary.

2.2 Entrepreneurship in marginal region

The motivation behind the encouragement of "home grown" enterprises in depleted

communities can be attributed to the expectation for job creation, embeddedness in locality, facilitation of communication with outside market, as well as enhancement of income level. Nevertheless, the realization of these objectives is hampered by the limitation of market size, poor resource availability, non-diversified industrial structure, lag in information distribution, lack of business support and education etc. (Lyons, 2002; Fieldsend & Nagy, 2006).

Given the challenging conditions, entrepreneurship in marginal regions is characterized with its unique features and therefore requires practices different from traditional ones. One of the most frequently mentioned factor is social capital. Many scholars hold the idea that social capital is likely to boost entrepreneurial success by promoting innovation, reducing uncertainty, consolidating social trust etc. (Leyden et al., 2014; Kwon et al., 2013). This is especially important for marginal regions since it is expected to compensate for the disadvantages in economic endowment. Another important feature to note is the local embeddedness. Facing poor resource accessibility and intense competition with other regions, entrepreneurs in marginal region are usually engaged in the exploration of handy local resources, including natural, financial, cultural ones, etc. (Kalantaridis & Bika, 2006). This process, referred to as entrepreneurial bricolage by Baker and Nelson (2005), mitigates the inadequacy of external support and provokes the formation of local identity (Berglund et al., 2016). In addition, the limitations also call for more supportive efforts from government and institutions. Policies designed particularly for marginal regions cover a diverse range, mainly concerned with entrepreneurial capacity building, potential entrepreneur identification and start-up assistance (North & Smallbone, 2006). And the necessity of tailoring these policies to the specific condition of the targeted region is strengthened (Baumgartner et al.,2013).

These characteristics distinguish entrepreneurial issues in marginal regions from those elsewhere, which necessitate a combination of classic theories with the unique context when studying entrepreneurial behaviors in these regions. In the following discussion,

we would start from some basic ideas about entrepreneurship and then elaborate on this issue considering the marginalization background.

2.3 Typical theories on entrepreneurial decision making

Traditional theories on entrepreneurship widely acknowledge the direct influence of entrepreneurial intention on the conduct of entrepreneurial behaviors. Here we present three models that explain the formation of entrepreneurial intention, based on which we are able to approach a general mechanism.

2.3.1 Perceived self-efficacy

In Bandura's (1977) research, initiation and persistence of action are considered to be influenced by one's expectations of personal efficacy, defined as one's conviction of successfully perform certain behavior. When situation is beyond the perceived capability, agent tends to avoid engagement. According to this model, the measurement of efficacy is based on four sources of information: performance accomplishment, vicarious experience, verbal persuasion and emotional arousal. Performance accomplishment and emotional arousal make up for the personal factor. They are related to one's past experience and psychological state. Vicarious experience and verbal persuasion are external factors mainly imposed by the social environment.

This theory is applied in entrepreneurship research by Shapero in the model of entrepreneurial event. Entrepreneurial event is defined as the decision of establishing a company, which is denoted by sequential actions including initiative-taking, consolidation of resources, management, relative autonomy and risk-taking. Shapero argues that decision making over entrepreneurship is based on its "credibility" in combination with "propensity to act". And "credibility" can be further measured by one's perception of desirability and feasibility (Krueger et al., 2000). This process is also shaped by groupings of social variables and the specific social and cultural

environment.

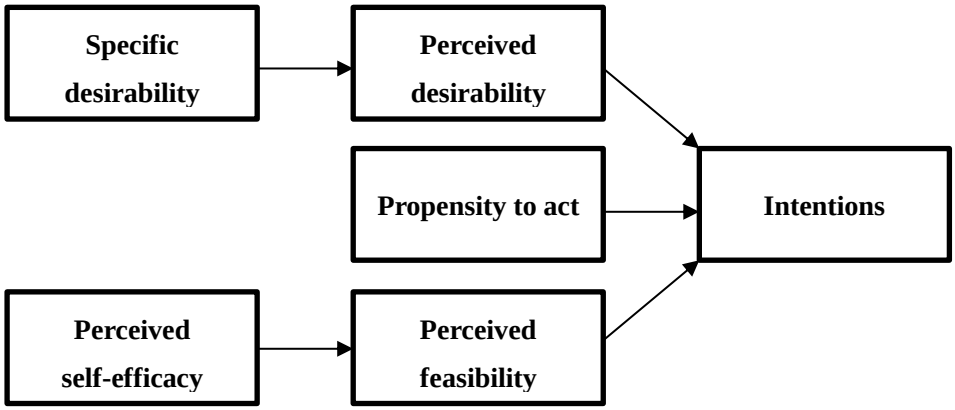

Figure 2.1 Shapero-Krueger Model[4]

2.3.2 Bird's model of entrepreneurial intentionality

Intentionality is a psychological state that associates one's attention and action with some kind of objective or expectation. Entrepreneurial behavior in Bird's research is defined as new venture creation and innovation in existing ventures, the implementation of which is guided by one's entrepreneurial intention. This model proposes two dimensions of entrepreneurial intention. The first aspect, the rationality, is mainly shaped by the social, political and economic context. It is concerned with one's analysis of the situational factors. The second aspect, the intuition, on the contrary, is personally based. It is dependent on past experience, personality and capability of the agent. The formulation of entrepreneurial intention is illustrated by the following figure under this theory.

[4] Krueger Jr, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. Journal of business venturing, 15(5-6), 411-432.

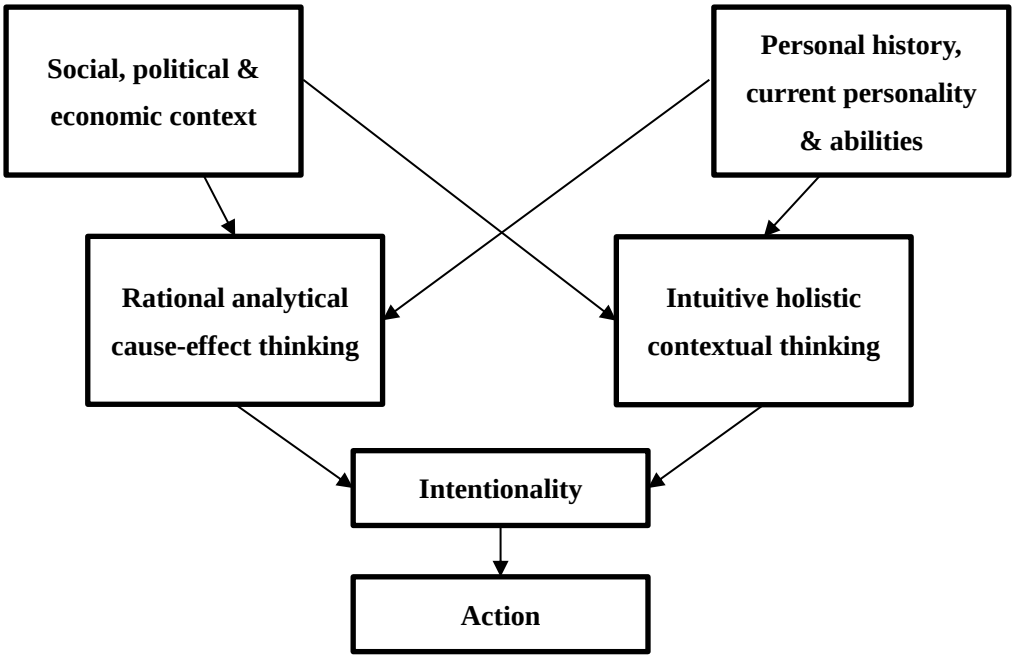

Figure 2.2 Contexts of intentionality[5]

2.3.3 Theory of planned behavior (TPB)

Similarly, the theory of planned behavior is also intention-based. In the research by Ajzen and Fishebein (1970), they propose the theory of reasoned action (TRA), arguing that human behavior can be predicted by their intention, which is determined by the person's attitude towards this behavior and his subjective norms. Subjective norm here refers to the social legitimacy of the behavior, that is how people around consider it to be appropriate or not. In other words, it is not only how the people judge the behavior, but also his perception of expectations from others that finally determine his behavioral intention.

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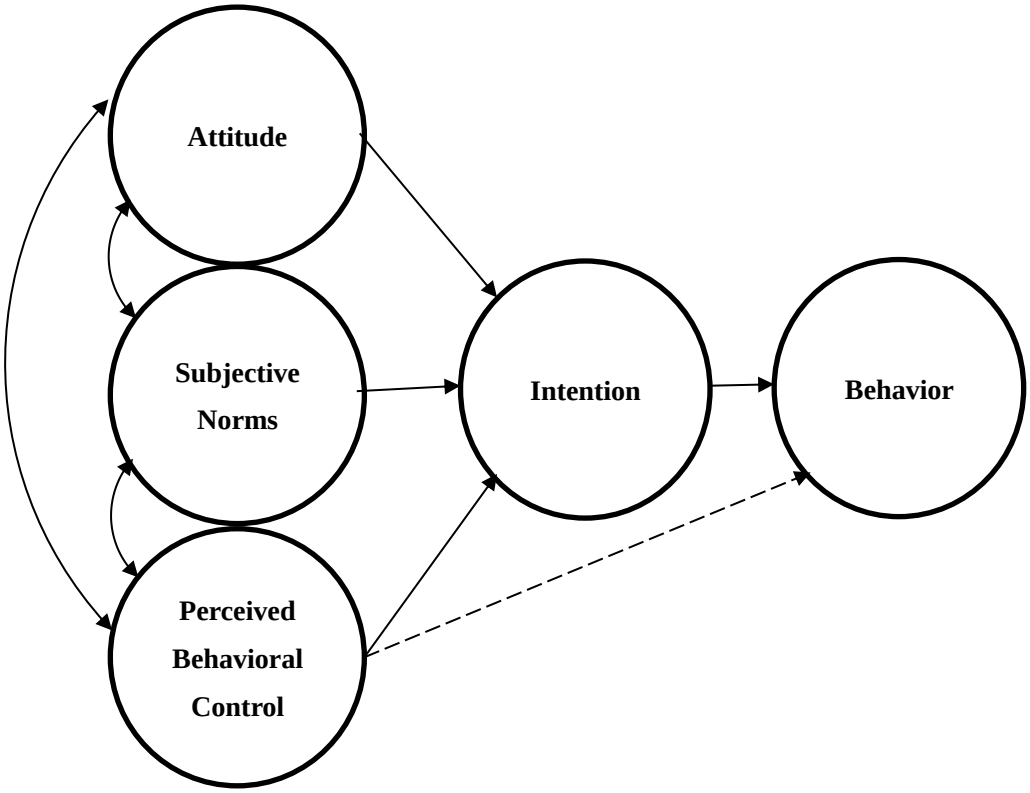

Figure 2.3 Theory of planned behavior[6]

This theory is later developed by Ajzen into the theory of planned behavior (TPB). He points out the importance of people's perception of behavior control to the formation of intention. With information about resources and opportunities, decision maker would develop an idea about the easiness to perform certain act given his own ability. And this perception is an indicator to predict the behavioral intention as well as behavior achievements (Ajzen,1991). Behavioral intention is therefore a weighted combination of personal attitude, subjective norm and perceived behavior control. Using a simple formula, the formation of intention is expressed as follows (Ajzen, 1991; Blackman & Kvaska,2010).

[6] Ajzen, I. (1991). The theory of planned behavior. Organizational behavior and human decision processes, 50(2), 179-211.

$$BI = (W_1)A\left[\sum_{i=1}^{k_1} b_i e_i\right] + (W_2)SN\left[\sum_{i=1}^{k_2} n_i m_i\right] + (W_3)PBC\left[\sum_{i=1}^{k_3} c_i p_i\right] \qquad (2.1)$$

$W_i = emprically\ derived\ weights$

$BI = behavioral\ intention$

$A = attitude\ toward\ behavior$

$(b) = strength\ of\ each\ belief$

$(e) = evaluation\ of\ the\ outcome\ or\ attribute$

$SN = subjective\ norms$

$(n) = strength\ of\ each\ normative\ belief$

$(m) = motivation\ to\ comply\ with\ the\ referent$

$PBC = perceived\ behavior\ control$

$(c) = strength\ of\ each\ control\ belief$

$(p) = perceived\ power\ of\ the\ control\ factor$

Respectively, these three factors are considered to be the weighted average of the sub-determinants and the weight assigned to each sub-determinant represents its relative strength. Personal attitude is a sum of people's belief with respect to the behavior's attributes. The weight assigned to each attribute depends on the person's expectation of its outcome. Subjective norm, as explained above, depends on the normative beliefs and people's tendency to comply with them. In terms of perceived behavior control, it is weighted average of perceived power of a set of control factors.

2.3.4 Mechanism behind entrepreneurial behavior

Despite their differences in structures, we are able to find some common ideas behind these theories.

Firstly, the aforementioned three theories all adopt a psychological perspective. The execution of entrepreneurial behavior is believed to be directly determined by the intention.

Secondly, though not explicitly pointed out, exogenous factors are the actual determinants of entrepreneurial behavior, yet in an indirect manner. This is also mentioned in the research of Krueger et al.(2000), stating that personal and contextual variables influence entrepreneurship indirectly by means of affecting key attitudes and general motivation to act. While intention seems to be an intrinsic and personal attribute, its evaluation and measurement is still externally-based. In the entrepreneurial intentionality model, the rational process entails exogenous information such as resource acquisition, opportunity etc.. Similarly, in TPB, the sub-determinants are also derived from the environment.

Thirdly, both personal and external factors are taken into account. External factor can be further divided into two dimensions. The first dimension is the relational ties. According to the self-efficacy model, agents are socially influenced by the behaviors (vicarious experience) and judgements (verbal persuasion) of their acquaintances. Similar issue is also considered in TPB by including subjective norms in the determination of intention. In Bird's theory, influence from relational network is more practical since it is associated with one's evaluation of cost-effectiveness. The second dimension deals with the general context, which is made up of the economic, cultural and political environment. These elements make a difference to entrepreneurial intention by altering one's emotional arousal, perception of rationality and behavior control. On the individual level, the cognitive process is concerned with preference for the behavior and one's perception of personal capability. These intuitions are probably shaped by past experience, education (Oosterbeek et al., 2010; Mueller, 2011) and personality (Awang et al., 2016) etc..

Table 2.1 Comparison of entrepreneurial intention theories

Theory	Determinants	Personal/External	Exogenous factors
Perceived Self-efficacy (Entrepreneurial Event Model)	Performance Accomplishment	P	Personal mastery experiences
	Vicarious Experience	E	Experiences of reference group
	Verbal Persuasion	E	Suggestions
	Emotional Arousal	P	Situations and circumstances
Model of Entrepreneurial Intentionality	Rationality	E	Social, political, economic context
	Intuition	P	Personal history, personality, ability
Theory of Planned Behavior	Attitude	P	Outcome or attributes
	Subjective Norm	E	Reference group
	Perceived Behavior Control	P	Resources and Opportunities

2.4 Identification of key influential factors in marginal region

In this research, instead of exploring the intention formation process, we are more interested in the function of the exogenous factors that indirectly affect entrepreneurial behaviors. It allows us to give a more elaborative examination on the regional context and also avoid a too narrative discussion over the psychological aspect. Nevertheless, we are still able to follow the common ideas behind the theories when constructing the frame of the research.

The most fundamental implication from these theories is that entrepreneurial process is more than individual decision making, but also the product of the environment. It is therefore necessary to emphasize both individual attributes and the contextual elements in the discussion of entrepreneurial activities. While the scope of achievement is

determined basically by personal ability, it is further restricted by the social legitimacy, availability of resources etc..

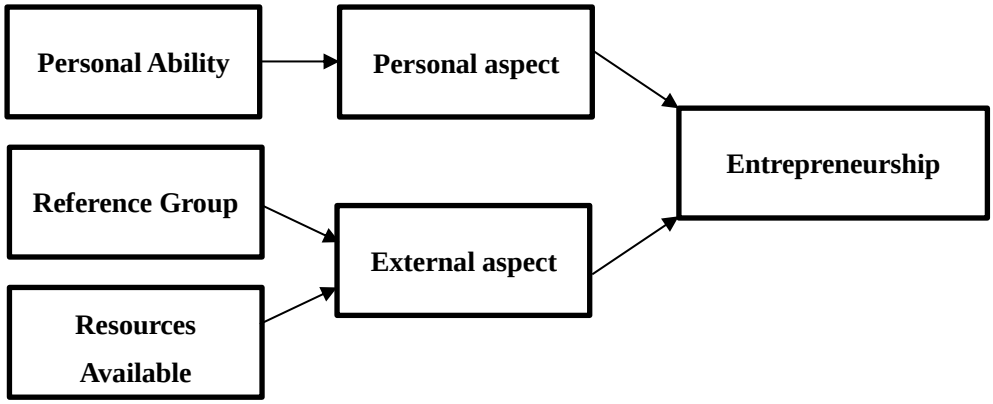

Figure 2.4 General mechanism behind entrepreneurship

2.4.1 Personal ability — entrepreneurial skill

Entrepreneurial ability refers to the capability of individual to perceive and exploit business opportunities, which is mainly acquired through education and past experience, and is influenced by personal characteristics such as gender, family background, etc. (Burke et al., 2000; 2002;). It is the basic criterion for the evaluation of feasibility. Higher level of entrepreneurial skill positively contributes to greater perceived behavior control, as well as more favorable attitudes and subjective norms (Linan, 2008). Meanwhile, it is also related to the outcome of entrepreneurship, influencing the expectation for potential gains (Van Praag & Cramer, 2001).

Given its significance to entrepreneurial intention formation and entrepreneurial outcome, enhancement of entrepreneurial skill is a major mission for marginal regions seeking economic prosperity, usually in the form of entrepreneur cultivation program. Many researches talk about the effectiveness of entrepreneurial education to actual entrepreneurial behavior based on empirical cases, but most of them still center on the psychological aspect and seldom associate it with the expectation of profitability. In marginal region where income is generally at low level, we contend that the profitability

aspect should have more significant impact on the decision making process. Within what we have found, the research of Van Pragg and Cramer (2001) pays special attention to the relationship between ability and expected rewards from entrepreneurship and regards it as the criterion for the career choice as an entrepreneur. Inspired by their research, a utilitarian perspective under the theory of rational choice is to be emphasized in the following analysis.

2.4.2 Reference group — social network and social capital

Generally, people choose the reference group from their acquaintance and they assign more weight to those who they consider to be important to them. The reference group is expected to affect one's behavior by means of setting examples, offering suggestions or the expression of attitudes according to the afore-mentioned theories. However, it is pointed out by some scholars that influence from reference group is not universal, which is supported by the fact that in collectivistic culture, such effect turns out to be more significant than in individualist culture (Begley et al., 2001; Moriano et al., 2012).

Liñán and Santos (2007) reformulate the theory of planned behavior with special attention on the social aspect. They contend that subjective norm in the original model can actually be captured as a special type of social capital. It enhances the desirability and feasibility of entrepreneurial behavior when positive values are generated during social interaction. Following this argument, the variations in the effectiveness can be explained by the difference in the level of social capital. In collectivistic culture where independence might facilitate social interaction, the accumulation of social capital is expected to be greater.

The exploration of social aspect is especially meaningful in the context of marginal region. As many researches point out, marginal regions are often characterized by a stronger social structure (Poon et al., 2012). There are abundant researches that focus

particularly on the influence of social capital and social network on entrepreneurship. These researches offer a more comprehensive understanding of how one's acquaintances, other than acting as reference group, are able to affect his behaviors. One of the most frequently mentioned point is their function to disseminate information and knowledge. As a result, payoff from entrepreneurial activities differs as one's relational network changes (Westlund & Bolton, 2003; Yli-Renko et al., 2001; Malecki, 2012). These findings enable us to adopt a microeconomic analytical method when exploring the mechanism behind.

2.4.3 Resources available — institutional environment

Ireland et al. (2001) define entrepreneurship as a social process dependent on the context, during which people explore business opportunities with packages of resources. This definition implies the fundamentality of resources accessibility to entrepreneurship. This explains the difficulties for entrepreneurial activities in marginal regions. Since enterprises there are often characterized by relative small sizes, they are faced up with growth issues as a result of inaccessibility to capital, lack of business training, poor facilities, resulting from the failure of free market (Grosh & Somolekae, 1996). To solve the problem, one possible way is through the redistribution of resources. And the mobilization of entrepreneurial resources is believed to be related to the institutional context, which refers to the economic, political and cultural environment (Welter & Smallbone, 2011).

Consensus has been reached with regard to the importance of institutions to the entry of enterprises as well as their future development (Manolova et al., 2008; Henrekson & Sanandaji, 2011). Particularly, the role of a supportive environment provided by the government and societal norms towards entrepreneurship is emphasized, which functions by eliminating entrepreneurial barriers (Bruton et al., 2010). In marginal region, institutional changes in pursuit of a favorable entrepreneurial environment are

taking place. From the policy design of regional development to the emergence of revolutionary institutions, these movements are sure to have significant impact on entrepreneurship in these regions. Therefore, it is meaningful to pay attention to these issues.

Based on the discussion, we build up the framework of this research as is shown in Fig. 2.5. This framework is in accordance with the one proposed by Baumgartner et al. (2013), which identifies innovation, social capital and institutional change as three main drivers of entrepreneurship in what they call 'non-core regions'. Even though our focus on entrepreneurial skill does not emphasize innovation as much, it is a positive contributor to creation of new ideas and products.

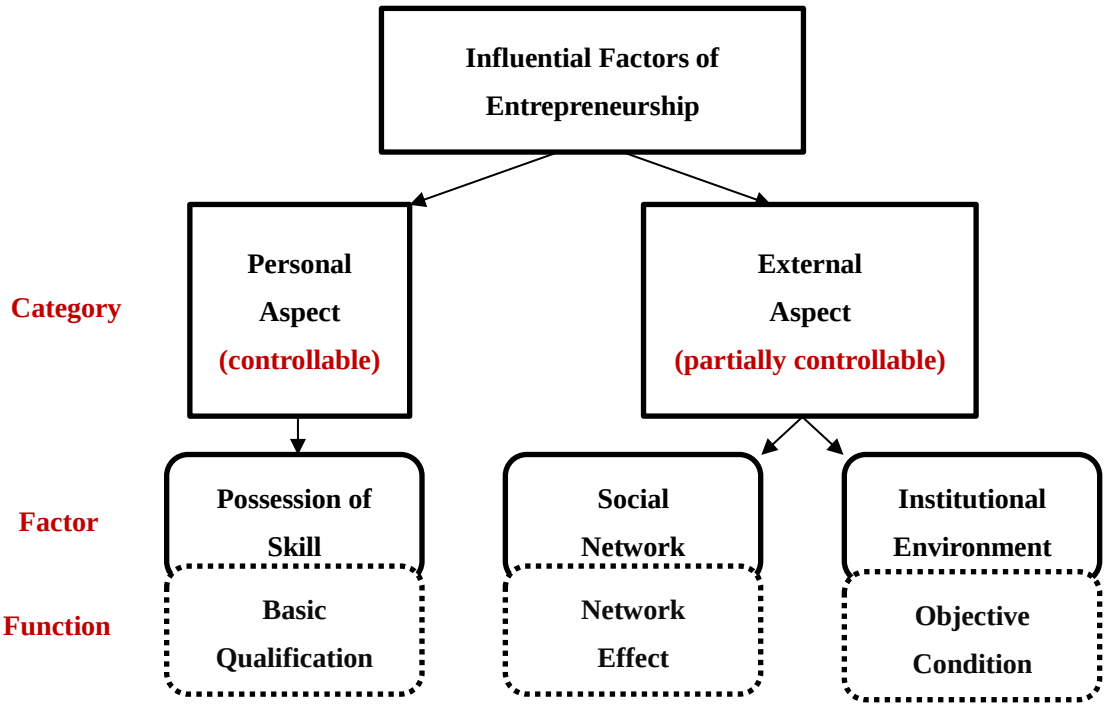

Figure 2.5 Framework of the research

2.5 Summary

In this chapter, we present typical theories concerning entrepreneurial behaviors. The perceived efficacy theory, the model of entrepreneurial intentionality and the theory of

planned behavior are compared and common ideas behind these theories are summarized. We propose two points that we consider to be crucial behind the mechanism of entrepreneurship, which calls for a combination of personal attributes with contextual factors.

We then give a review of literatures in the related fields and identify some key factors that are worth further exploration under the marginalization context. The first one is entrepreneurial skill. Capability not only influences one's consciousness of self-efficacy, but also directly determines the outcome of entrepreneurship. Given its importance and the emphasis put on entrepreneur cultivation in marginal region, we regard it as a crucial factor to consider. The second factor is social network and social capital given the strong social structure in marginal region. In addition to the cognitive influence mentioned in the typical theories, it is also pointed out that social context affects the material benefits of entrepreneurial activities. The third one is the institutional environment. With the ability of resource redistribution, improvement in institution is believed to facilitate entrepreneurship. It is therefore necessary to follow institutional changes in marginal regions. Based on the discussion, we construct the framework of this research, which serves as the guideline for the following studies.

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Chapter 3

Skill Improvement and Entrepreneurship

3.1 Introduction

Troubled by problems such as aging population, economic recession and brain drain, social welfare is expected to fall if the situation continues to deteriorate in marginal regions. It is widely acknowledged that one of the key issues is to inject vitality into local economy by building up local capacity for long-term sustainability. The initial 'top-down' strategy where government takes the control now gives way to the 'grass-root' movement. Following this movement, programs aimed to cultivate entrepreneurship by local residents gain popularity in recent years, which are usually achieved by skill training programs. It is expected that with the improvement in skill, more entrepreneurs will show up. As a result, more diverse products will be available on local market, which increases local consumers' utility and facilitates the recovery of local economic vigor.

However, this process is also under the influence of local context. This can be supported by the fact that entrepreneurial activities show great variations among different regions (Liñán et al., 2011; Bosma & Schutjens, 2011). This has aroused our interests on several questions. First, is it meaningful to organize entrepreneurial skill training in marginal region and under what condition will these efforts truly contribute to entrepreneurship? Second, how the local context makes a difference. What regional attributes are pertinent to the results? Third, does entrepreneurship necessarily contribute to overall improvement in social welfare? Answers to these questions will be helpful for improving the efficiency of related policies and programs.

This chapter is going to explore these issues. We divide the labor according to possession of skill into skilled type and unskilled type and the implementation of skill training is followed by an increase in the proportion of skilled labor. Both types are necessary for production. Entrepreneurship, which demands extensive knowledge and skill, requires extra input of skilled labor. Therefore, while training program increases the number of potential entrepreneurs, not all of them actually engage in the start-up of new businesses. Demand for different labor types in the region makes a difference. Taking a macro perspective, we try to find out when an increase in the proportion of skilled labor comes together with more active entrepreneurship in the region by modeling the mobility of skilled labor between production and entrepreneurial activities. Moreover, we are also concerned with the consequent changes in social welfare, which is evaluated by the utility from consumption.

This chapter is structured as follows. The next section reviews past researches, based on which the basic model is constructed and explained in section 3. The fourth section analyses the influence of skill improvement on entrepreneurship and social welfare by deriving the equilibrium. Attention is paid to crucial regional attributes that influence the process, especially the typical situation in marginal region. Finally, conclusions and discussions are presented in section 5.

3.2 Literature review

The importance of skill to entrepreneurship is much discussed in literature, either from a practical perspective or cognitive stance. Gompers et al. (2006) testify the contribution of skill to the success of entrepreneurship based on empirical data and argue that past successes are helpful for future entrepreneurial achievements. It is also pointed out that diversity of skill is crucial. Individuals equipped with knowledge in multiple fields are more likely to be entrepreneurs (Wagner, 2003; Lazear, 2004). On the cognitive side, Liñán's (2008) paper shows that perception of self-skills has positive impact on the

antecedents of entrepreneurial intention, which works by enhancing the impression of feasibility of entrepreneurial activities. Similarly, Baum and Locke (2004) points out that higher level of skill inspires the motivation of entrepreneur, which predicts better performance. Treated as a personal attribute, most of these researches are organized on individual basis. Few works explore how the distribution of skill among workers influences entrepreneurship on a regional level.

Nevertheless, relevant discussions can be found in the studies on inter-sectoral labor mobility. In the model proposed by Heckman and Sedlacek (1985), skill endowment is considered as a requirement for performing sector-specific tasks, which then influences the allocation of different types of worker among sectors. Similarly, the work of Schweinberger and Woodland (2015) assumes possession of skill to be a prerequisite for entrepreneurship. Accordingly, skilled labor is mobile between production and entrepreneurship. They formulate a model in a small open economy under monopolistic competition, which considers entrepreneurial behaviors and the allocation of labor in production under full employment. Their analysis shows how fluctuations of product price on global market influence the number of firms and social welfare in the region.

In addition, our research is also related to the studies on the influence of local context to entrepreneurship. The research by Baker et al. (2005) proposes a framework to illustrate the impact of social context on entrepreneurial process. It is pointed out that discovery, evaluation and exploitation of entrepreneurial opportunities are dependent on the conditions of labor market, institutional and cultural environment, availability of resources etc.. Iyigun and Owen’s paper (1998; 1999) focuses more on the economic environment. Their model explains how people’s preference for entrepreneurship and professional employment changes along with the development of economy. The result shows that in countries with relatively lower income, people are more motivated to acquire entrepreneurial skills than professional skills, which is attributed to a lower opportunity cost of occupation change. This research implies the possible influence of

wage structure on entrepreneurial motivations. Since entrepreneurship is risky and costly at the initial stage, wage rate should also be a crucial determinant when potential entrepreneurs make their decision from a utilitarian viewpoint.

We base our model on the one proposed by Schweinberger and Woodland, in which possession of skill is essential for the establishment of new businesses. Under this assumption, we are able to follow how changes in the proportion of skilled labor in the region influence the distribution of labor between getting employed and self-employed. Given the influence from labor input, we contend that local industrial structure should be an important contextual factor to consider. It is also necessary to focus on the wage issue since it determines the disposable income for consumption, which should influence social welfare directly.

3.3 The model

3.3.1 Assumption

The model considers the situation in a marginal region with two production sectors and two types of labor. We do not consider any migration activities in this model. Products in both sectors are traded freely on the open market. Given the small economy scale in these regions, local entrepreneurs are not able to determine product price and take the global price as given.[7]

On the labor market, labor is divided according to the possession of skill. The first type

[7] Schweinberger and Woodland (2015) mention that there are also other ways to deal with the modeling of small open economy with monopolistic competition, such as the one proposed by Venables (1982), in which domestic and foreign varieties are treated differently. But since we adopt Schweinberger's model in the analysis and this condition is regarded as a crucial assumption for this model, we decide to follow it even though it seems to be contradictory to the basic assumption of being 'monopolistic', We would like to interpret as there being two parallel markets inside and outside the region. And the inside market 'imitates' the movements in the outside one and therefore symmetry exists in terms of product price.

is agents who have received training and therefore are equipped with higher skill, which we assume to be a prerequisite for entrepreneurship. We label this type as the skilled one. They are potential entrepreneurs and are mobile between starting a business and working as a normal employee. The second type, referred to as the unskilled labor, is only qualified as a normal employee. Income structure of skilled and unskilled labor differs. First of all, they receive unequal wages. Second, since skilled labor is also allocated to entrepreneurship, they also enjoy the profits from business operation.

Local economy consists of a homogeneous sector and a heterogeneous sector. In our model, we refer the homogeneous sector to traditional industries. Generally speaking, traditional industries such as agriculture, labor-intensive industries mainly provide necessity goods and are relatively developed and mature. In contrast to the newly established market, commodities produced in this sector are considered to be identical for the consumers and are perfectly competitive. In marginal region, inadequate supply and unsatisfied demand turn out to be the main problems that hamper the quality of living for local people. Therefore, we contend that potential entrepreneurs are usually encouraged to provide new goods and services to diversify local product structure. Consequently, we assume entrepreneurship to be concentrating in the heterogeneous sector, providing a horizontally differentiated collection of products that compete with each other in monopolistic market. Each enterprise provides only one single type of heterogeneous product.

Labor is the only necessary factor for production and both skilled and unskilled labor are essential. Nevertheless, in the heterogeneous sector, entrepreneurial activities require additional input of skilled labor. The distribution of labor in economy is described by the following figure.

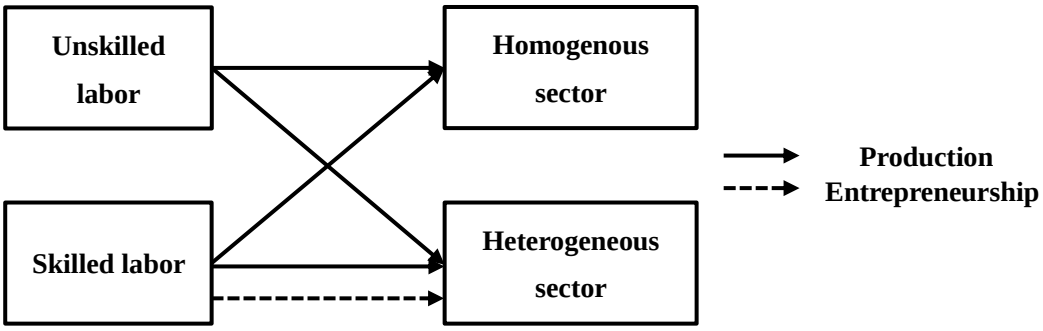

Figure 3.1 Distribution of labor

3.3.2 The production

A symmetric condition is applied to the production in heterogeneous sector, which means all enterprises use the same level of labor input and face common product price and profits. As we have previously assumed, product price is determined exogenously in global market at p_1, p_2 for homogeneous product and heterogeneous products respectively. Variable costs for production are denoted by $c_1(w_u, w_s), c_2(w_u, w_s)$ as functions of the wages of unskilled labor (w_u) and skilled labor (w_s). The input-output functions denoting per unit production cost of labor type j for homogeneous enterprise and heterogeneous enterprise being $a_{j1} \equiv \partial c_1(w_u, w_s)/\partial w_j$ *and* $a_{j2} \equiv \partial c_2(w_u, w_s)/\partial w_j$ ($j = u$ for unskilled labor and $j = s$ for skilled labor), which are exogenously given, dependent on the attributes of local industry. Higher value of a indicates more intensive use of the labor. V_u, V_s are the endowments of unskilled and skilled labor in this region.

Equilibrium condition for a perfect competitive market requires that variable cost equals price. Therefore, all enterprises in homogeneous sector face a profit maximization condition entailing $c_1(w_u, w_s) = p_1$. For the monopolistically competitive enterprises, denoting marginal profits by $mr_2(p_2)$, profit maximization condition asks for the variable cost to equal marginal profits, which is given by $c_2(w_u, w_s) = mr_2(p_2)$. Since we consider the case that production only entails the labor factor and no exchange or mobilization of labor with the outside world is allowed, equilibrium conditions in

production are summarized as follows.

$$c_1(w_u, w_s) = p_1 \qquad (3.1)$$

$$c_2(w_u, w_s) = mr_2(p_2) \qquad (3.2)$$

$$a_{u1}X_1 + a_{u2}X_2 = V_u \qquad (3.3)$$

$$a_{s1}X_1 + a_{s2}X_2 = V_s - bn \qquad (3.4)$$

X_1 and X_2 are the outputs of the products and n is the number of heterogeneous enterprises. Equation (3.1)-(3.2) determines the wage level, which is dependent on the price of products. We reduce this result to a function written as $w_j = w_j(p_1, p_2)$. This result together with equation (3.3)-(3.4) gives the output of product X_l ($l = 1$ for homogeneous sector and $l = 2$ for heterogeneous sector), which is a function of product price, labor endowment in the region and the number of enterprises. We write this using $X_l = X_l(p_1, p_2, V_u, V_s, n)$.

The profit function in the heterogeneous sector as a whole is expressed as follows:

$$max \ \ \Pi = [p_2 - c_2(w_u, w_s)]X_2 - w_s bn \qquad (3.5)$$

In the short term, there are a fixed small number of new enterprises in the heterogeneous sector. These enterprises are able to earn a certain amount of profits as competition is not intensive. The profitability in heterogeneous sector then attracts new entries, each providing a slightly differentiated type of product compared with the existing market. In the long term, as more and more new enterprises enter the market, intensified competition gradually reduces profitability. Until it equals zero and no more new entry shows up, the number of heterogeneous firms stabilizes. In the following analysis, we focus on this long term situation. The equilibrium number of enterprises should be given by the condition that equation (3.5) equals to zero. In this case, price of heterogeneous products, production cost $c_2(w_u, w_s)$ and elasticity of substitution among products in

the heterogeneous sector should satisfy (3.6) as is well known. $\sigma(\sigma > 1)$ denotes the elasticity of substitution inside the sector of heterogeneous products. Combining with equations (3.1)-(3.4), we solve the equilibrium number of heterogeneous enterprises by (3.7).

$$p_2 = \frac{c_2(w_u, w_s)\sigma}{1-\sigma} = \frac{c_2(w_u, w_s)}{\rho} \qquad (3.6)$$

$$\sigma \equiv \frac{1}{1-\rho}$$

$$N = \frac{mr_2(p_2)\ (a_{s1}V_1 - a_{u1}V_2)}{(\sigma-1)(a_{s1}a_{u2} - a_{s2}a_{u1})w_s(p_1, p_2)b - mr_2(p_2)a_{u1}b} \qquad (3.7)$$

According to (3.1)-(3.2)

$$\frac{\partial w_j}{\partial p_1} = \frac{\partial w_j}{\partial c_1(w_u, w_s)} = \frac{1}{a_{j1}}$$

$$\frac{\partial w_j}{\partial p_2} = \frac{\partial w_j}{\partial mr_2(p_2)}\frac{\partial mr_j(p_2)}{\partial p_2} = \frac{\partial w_j}{\partial c_2(w_u, w_s)}\frac{\partial mr_2(p_2)}{\partial p_2} = \frac{\rho}{a_{j2}}$$

These functions show that the changes in wage with respect to fluctuation of product price are dependent on the intensiveness of labor input. For the heterogeneous sector, the elasticity of substitution between products also makes a difference. When labor type j is more intensively used (a_{jl} is higher), wage change will be less significant when product price fluctuates. This is due to the fact that when labor is intensively used, rise in wage corresponding to the lift in price is restricted by the necessity of cost control. A higher level of elasticity of substitution, on the contrary, contributes to the increase in wage when global price for heterogeneous products increases. This is attributed to a more notable consequent increase in marginal profits for the enterprises.

3.3.3 The consumption

Households receive utility from consuming products available on local market. We do not consider the varieties provided exclusively from outside market so that the types of heterogeneous products are identical to the number of heterogeneous enterprises n in the region. Under the theory of "love of variety", when an agent consumes more diverse products, he or she receives higher utility. We denote the consumption of homogeneous product for household k with q_1^k and that for heterogeneous product i $q_2^k(i)$. The indirect utility function from consumption for household k is given as follows:

$$u_k = {q_1^k}^{(1-\alpha)} \left[\left(\int_0^n q_2^k(i) \right)^{\rho} di \right]^{\frac{\alpha}{\rho}} \qquad (3.8)$$

$\alpha(0 < \alpha < 1)$ denotes the elasticity of substitution between homogeneous and heterogeneous products.

Since unskilled households involve exclusively in production, their income consists simply of their wage. For skilled households, in the short term, they also enjoy the profits from entrepreneurship. We assume that for each new business to be set up, b units of skilled labor are required. This becomes the opportunity cost of entrepreneurship for skilled households, which is evaluated by $w_s b$. Adding up the consumption for each household type, short term aggregate income budget for unskilled and skilled households can be described by the following equations.

$$\int_0^{V_u} \left[p_1 q_1^k + \int_0^n p_2(i) q_2^k(i) di \right] dk = w_u V_u \qquad (3.9)$$

$$\int_0^{V_s} \left[p_1 q_1^k + \int_0^n p_2(i) q_2^k(i) di \right] dk = w_s (V_s - bn) + \int_0^n \pi_i di \qquad (3.10)$$

$p_2(i)$ is the price of heterogeneous product i. i is a continuous variable that can take

any value between 0 and $n.\pi_i$ denotes the profit of heterogeneous enterprise i. Reflecting again to the symmetric condition, we should have $p_2(i)$ and π_i to be identical for all enterprises in the heterogeneous sector. The utility maximization condition for a single household is given by the following equations[8].

When household k is unskilled type,

$$\max_{q_1^k, q_2^k(1)\dots q_2^k(n)} u_k\left(q_1^k, q_2^k(1), \dots, q_2^k(n)\right) \qquad (3.11)$$

$$s.t.\ \ p_1 q_1^k + \int_0^n p_2(i) q_2^k(i) di = w_u \qquad (3.12)$$

When household k is skilled type,

$$\max_{q_1^k, q_2^k(1)\dots q_2^k(n)} u_k\left(q_1^k, q_2^k(1), \dots, q_2^k(n)\right) \qquad (3.11)$$

$$s.t.\ \ p_1 q_1^k + \int_0^n p_2(i) q_2^k(i) di = w_s\left(1 - \frac{bn}{V_s}\right) + \frac{\int_0^n \pi_i di}{V_s} \qquad (3.13)$$

Since $\forall\, i \in n, p_2(i) \equiv p_2$, solving this problem we get the total consumption of homogeneous and heterogeneous products for household k as follows.

When k is unskilled type,

$$q_1^k = \frac{(1-\alpha)w_u}{p_1}; \quad q_2^k(i) = \frac{\alpha w_u}{{p_2}^\sigma P^{1-\sigma}}$$

When k is skilled type,

[8] Equation (3.9) and (3.10) give the aggregate income budget for unskilled and skilled households as a hole. Since we also consider households of the same type behave identically, we derive equation (3.12) and (3.13) by dividing (3.9) and (3.10) by the number of unskilled and skilled households respectively.

$$q_1^k = \frac{(1-\alpha)\left[w_s(1-\frac{bn}{V_s}) + \frac{\int_0^n \pi_i di}{V_s}\right]}{p_1}; \quad q_2^k(i) = \frac{\alpha\left[w_s(1-\frac{bn}{V_s}) + \frac{\int_0^n \pi_i di}{V_s}\right]}{p_2{}^{\sigma} P^{1-\sigma}}$$

where P denotes the price index of heterogeneous products in this region.

$$P = \left[\int_0^n p_2(i)^{1-\sigma}\right]^{\frac{1}{1-\sigma}} = n^{\frac{1}{1-\sigma}} p_2 \qquad (3.14)$$

Adding up the demand, we have the total consumption of homogeneous products Q_1 and heterogeneous products Q_2.

$$Q_1 = \int_0^{V_u+V_s} q_1^k dk = \frac{(1-\alpha)w_u V_u + (1-\alpha)\left[w_s(V_s - bn) + \int_0^n \pi_i di\right]}{p_1} \qquad (3.15a)$$

$$Q_2 = \int_0^{V_u+V_s} \int_0^n q_2^k(i) di\, dk = \frac{(1-\alpha)w_u V_u + (1-\alpha)\left[w_s(V_s - bn) + \int_0^n \pi_i di\right]}{p_2} \qquad (3.15b)$$

Since we consider products are traded freely with the external market, we do not apply the market equilibrium in this research, in which local demand equals the output. Combing equation (3.8) with (3.15a) and (3.15b), we can derive the indirect utility of skilled and unskilled households represented by the following equations. And U is the total indirect utility from consumption of local products, which we later consider to be a good indicator of the level of social welfare in the region.

$$U_u = \int_0^{V_u} u_k dk = \frac{\alpha^{\alpha}(1-\alpha)^{1-\alpha} w_u V_u}{P^{\alpha}(p_1)^{1-\alpha}} \qquad (3.16a)$$

$$U_s = \int_0^{V_s} u_k dk = \frac{\alpha^{\alpha}(1-\alpha)^{1-\alpha}\left[w_s(V_s - bn) + \int_0^n \pi_i di\right]}{P^{\alpha}(p_1)^{1-\alpha}} \qquad (3.16b)$$

$$U = U_u + U_s = \frac{\alpha^{\alpha}(1-\alpha)^{1-\alpha} w_u V_u}{P^{\alpha}(p_1)^{1-\alpha}} + \frac{\alpha^{\alpha}(1-\alpha)^{1-\alpha}\left[w_s(V_s - bn) + \int_0^n \pi_i di\right]}{P^{\alpha}(p_1)^{1-\alpha}} \quad (3.16c)$$

Consistent with the Dixit-Stiglitz model, the results show that indirect utility from consumption depends on the income level, elasticity of substitution of the products and the price index. The result of our model differs from the classic one in that the number of heterogeneous enterprises would directly influence the overall utility of skilled households because the efforts they have to pay for entrepreneurship. The increase in the unit cost of entrepreneurial efforts would lower the utility for skilled households. Moreover, the increase in the number of heterogeneous enterprises is also negatively related to the indirect utility skilled households get from consumption since their disposable income is expected to decrease as a result of devotion to entrepreneurial activities.

3.3.4 The long term equilibrium

Since we do not consider the migration issue, the total labor endowment is invariable, which we denote it with L. Here we define a variable ω determined by the proportion of skilled labor to unskilled labor in the region. We expect an increase in ω after the implementation of training program. We rewrite V_{u}, V_{s} as equation (3.17) shows and plugging the result into equation (3.7), the equilibrium number of heterogeneous enterprises is given as follows.

$$\omega = \frac{V_{\mathrm{s}}}{V_{\mathrm{u}}}; \quad V_{\mathrm{u}} = \frac{1}{1+\omega} L; \quad V_s = \frac{\omega}{1+\omega} L; \quad (3.17)$$

$$N = \frac{mr_2(p_2)(a_{\mathrm{s1}} V_{\mathrm{u}} - a_{\mathrm{u1}} V_{\mathrm{s}})}{(\sigma-1)(a_{\mathrm{s1}} a_{\mathrm{u2}} - a_{\mathrm{s2}} a_{\mathrm{u1}}) w_s(p_1, p_2) b - mr_2(p_2) a_{\mathrm{u1}} b} = k\left(\frac{a_{\mathrm{s1}} - \omega a_{\mathrm{u1}}}{1+\omega}\right) \quad (3.18a)$$

$$k = \frac{mr_2(p_2)\,L}{(\sigma-1)(a_{s1}a_{u2} - a_{s2}a_{u1})w_s(p_1,p_2)b - mr_2(p_2)a_{u1}b} \qquad (3.18b)$$

We can see that the equilibrium number of heterogeneous enterprises N depends on the per unit input of labor in production a_{u1}, a_{u2}, a_{s1}, a_{s2}; price of homogeneous and heterogeneous products p_1, p_2; cost of entrepreneurship b, elasticity of substitution inside the heterogeneous sector σ, total labor available on market L, as well as proportion of skilled labor ω.

In the long term, as competition in the heterogeneous intensifies, profit is reduced to zero, which means $\forall i \in n, \pi_i \equiv 0$. Plugging equation (3.17) into (3.16a)-(3.16c), consumption utility for households can be rewritten as follows.

$$U_u = \frac{\alpha^\alpha(1-\alpha)^{1-\alpha}w_u(p_1,p_2)V_u\rho^\alpha}{mr_2(p_2)^\alpha(p_1)^{1-\alpha}} \qquad (3.19a)$$

$$U_s = \frac{\alpha^\alpha(1-\alpha)^{1-\alpha}w_s(p_1,p_2)\rho^\alpha(V_s - bN)}{mr_2(p_2)^\alpha(p_1)^{1-\alpha}} \qquad (3.19b)$$

$$U = U_u + U_s$$

$$= \frac{\alpha^\alpha(1-\alpha)^{1-\alpha}w_u(p_1,p_2)V_1\rho^\alpha}{mr_2(p_2)^\alpha(p_1)^{1-\alpha}} + \frac{\alpha^\alpha(1-\alpha)^{1-\alpha}w_s(p_1,p_2)\rho^\alpha(V_s - bN)}{mr_2(p_2)^\alpha(p_1)^{1-\alpha}} \qquad (3.19c)$$

3.4 Comparative statics analysis

The analysis above provides us with the general equilibrium model of monopolistic competition in the heterogeneous sector for the assumed marginal region, where there are two types of labor with different levels of skill and there is no labor mobilization with the outside. In this part, we intend to carry out comparative statics analysis based on these results to explore how skill improvement, represented by an increase in the value of ω, influences entrepreneurial behaviors and social welfare in the regional. Additionally, we also explore how the regional attributes make a difference to the result.

3.4.1 Influence of skill improvement on entrepreneurial activities

First, we focus on the entrepreneurial behaviors in the region. According to the assumption of the model, entrepreneurship is associated with the provision of heterogeneous products and each enterprise provides only one single type of variety. This means that we are able to measure entrepreneurial behaviors on a regional level through the number of heterogeneous firms.

Based on equations (3.18a),(3.18b), we differentiate N with respect to ω and get equation (3.20).

$$\frac{\partial N}{\partial \omega} = \frac{-(a_{u1} + a_{s1})k}{(1+\omega)^2} \qquad (3.20)$$

Since the unit input of labor a_{u1}, a_{s1} and the value of $(1+\omega)^2$ is always positive, the value of k determines the relationship between product diversity and proportion of skilled labor. In order for an increase in ω to result in an increase in N, k should be smaller than 0.

According to (3.18b), since the marginal profit $mr_2(p_2)$ and total labor L always take positive values, the sufficient condition for $k < 0$ is given below. We define the left side of the inequality with φ.

$$\varphi = (\sigma - 1)(a_{s1}a_{\mathrm{u}2} - a_{\mathrm{s}2}a_{\mathrm{u}1})w_{\mathrm{s}}(p_1, p_2)b - mr_2(p_2)a_{\mathrm{u}1}b < 0$$

We introduce a new variable τ_l to show the attribute of the production sector in the region. τ_l is described by equation (3.21) where l refers to the type of sector.

$$\tau_l = \frac{a_{sl}}{a_{\mathrm{u}l}} \qquad (3.21)$$

The value of τ_l is determined by the ratio of skilled labor to unskilled labor in sector l. An increase in the value of τ_l means skilled labor becomes more concentrated in the sector, which actually implies that production in this sector demands higher intellectual ability. Therefore, the relative value of τ_1 and τ_2 actually shows the attribute of industrial structure in the region. When $\tau_1 < \tau_2$, the heterogeneous sector should have a higher intellectual content and when $\tau_1 > \tau_2$, the opposite is true. Hence, we regard τ_l as a regional parameter related to local industrial structure.

When $(a_{s1}a_{u2} - a_{s2}a_{u1}) \leq 0$, $\varphi < 0$ is always satisfied (with $\sigma > 1$ and all the other variables in this equation taking positive values), which equals to $\tau_1 \leq \tau_2$. Otherwise, the following inequality needs to be satisfied.

$$(\sigma - 1)(a_{s1}a_{u2} - a_{s2}a_{u1})w_s(p_1, p_2)b - mr_2(p_2)a_{u1}b < 0 \quad (3.22)$$

Since the wage function $w_s(p_1, p_2)$ and marginal profit $mr_2(p_2)$ is inexplicit here, we simply look at the attributes of the left side of (3.21) to derive some implications. It is intuitive that the left side is an increasing function of p_1 so we focus the attention on the changes in price of heterogeneous products p_2. Define it with $\xi(p_2)$.

$$\xi(p_2) = (\sigma - 1)(a_{s1}a_{u2} - a_{s2}a_{u1})w_s(p_1, p_2) - mr_2(p_2)a_{u1}$$

$$\frac{\partial \xi}{\partial p_2} = \frac{\partial mr_2(p_2)}{\partial p_2}\left[(\sigma - 1)(a_{s1}a_{u2} - a_{s2}a_{u1})\frac{\partial w_s(p_1, p_2)}{\partial mr_2(p_2)} - a_{u1}\right]$$

$$= \frac{\partial mr_2(p_2)}{\partial p_2}\left[\frac{(\sigma - 1)(a_{s1}a_{u2} - a_{s2}a_{u1})}{a_{s2}} - a_{u1}\right]$$

It is intuitive that $\frac{\partial mr_2(p_2)}{\partial p_2} > 0$. Therefore, when $\frac{(\sigma-1)(a_{s1}a_{u2}-a_{s2}a_{u1})}{a_{s2}} < a_{u1}$, ξ is decreasing in p_2. Otherwise, ξ is an increasing function of p_2. Accordingly, we have

$$\frac{\sigma-1}{\sigma} < \frac{a_{s2}}{a_{u2}}\frac{a_{u1}}{a_{s1}} = \frac{\tau_2}{\tau_1}, \xi'(p_2) < 0$$
$$\frac{\sigma-1}{\sigma} > \frac{a_{s2}}{a_{u2}}\frac{a_{u1}}{a_{s1}} = \frac{\tau_2}{\tau_1}, \xi'(p_2) > 0$$

So when $\rho < \frac{\tau_2}{\tau_1} < 1$, $\xi(p_2)$ is a decreasing function of p_2. This means that when heterogeneous products are less substitutable (ρ is smaller) , an increase in p_2 is more likely to reduce the value of $\xi(p_2)$ and make it easier for inequality (3.21) to stand. On the contrary, when the elasticity of substitution is high and $\frac{\tau_2}{\tau_1} < \rho < 1$, $\xi(p_2)$ is increasing in p_2, then a decrease in price of heterogeneous product is more beneficial in order to satisfy (3.22).

Concluding the above situation, we find three factors to be crucial to the result, industrial structure in the region represented by τ_l, price of heterogeneous product p_2 and elasticity of substitution in the heterogeneous sector ρ. We summarize the conditions for skill improvement to facilitate entrepreneurship in the table below.

Table 3.1 Conditions for skill improvement to facilitate entrepreneurship

Case	Industrial Structure	Elasticity of substitution	Attributes of $\xi(p_2)$	Condition
1	$\tau_1 \leq \tau_2$	-	-	Always satisfied
2	$\tau_1 > \tau_2$	$\rho < \frac{\tau_2}{\tau_1} < 1$ **Low elasticity**	$\xi(p_2)$ **decreases** with respect to p_2	Easier to be satisfied with **higher p_2**
3		$\frac{\tau_2}{\tau_1} < \rho < 1$ **High elasticity**	$\xi(p_2)$ **increases** with respect to p_2	Easier to be satisfied with **lower p_2**

From the result, we could find that when the heterogeneous sector shows higher intellectual content as is case 1 demonstrates, skill improvement always contributes to entrepreneurship. When this condition is not satisfied, elasticity of substitution of heterogeneous products and its price makes a difference. According to case 2, when heterogeneous products are less substitutable, higher product price is more preferable. On the contrary, in case 3, high level of substitutability makes a lower product price more beneficial.

Now that we have product price determined on global market, it should be subject to global elasticity of substitution. Denote global elasticity of substitution with ρ^* and its relation with product price using function $p_2(\rho^*)$. We should have $\frac{\partial p_2}{\partial \rho^*} < 0$. Table 3.2 elaborates on local and global elasticity of substitution in case 2 and case 3. It shows that when homogeneous sector shows higher intellectual content, it is better to have local elasticity consistent with global one, which also indicates a similarity between local demand and global demand.

Table 3.2 Local elasticity and global elasticity ($\tau_1 > \tau_2$)

Local elasticity of substitution(ρ)	**Condition**	**Global elasticity of substitution(ρ^*)**
$\rho < \frac{\tau_2}{\tau_1} < 1$ **Low elasticity**	**Higher $p_2(\rho^*)$**	**Low**
$\frac{\tau_2}{\tau_1} < \rho < 1$ **High elasticity**	**Lower $p_2(\rho^*)$**	**High**

To conclude, it is more ideal for local government in marginal region to pursue more active entrepreneurship if they could ensure the newly started businesses are more skill-intensive than the traditional sector. Otherwise, it is better for new enterprises to

produce in industries where local demand shows consistency with global trend.

To give a more intuitive explanation for the results, we would like to refer to the development of tourist industry in marginal region, which turns out to be popular in most of the regions. Nevertheless, local demand for tourist product and service show disparity as a result of income gap. It is common to see a lower demand for tourist consumption in marginal region. Therefore, in order to encourage entrepreneurial activities in tourism industry through the improvement in skill, it is necessary to ensure its development show higher demand for knowledge and skill.

3.4.2 Influence of labor quality on social welfare

Then, we look at how social welfare in the region changes along with possession of skill. Formulate equations (3.19a)-(3.19c), we can get the following equations:

$$\frac{\partial U_u}{\partial \omega} = \frac{\partial U_u}{\partial V_u}\frac{\partial V_u}{\partial \omega} \qquad (3.23a)$$

$$\frac{\partial U_s}{\partial \omega} = \frac{\partial U_s}{\partial N}\frac{\partial N}{\partial \omega} \qquad (3.23b)$$

$$\frac{\partial U}{\partial \omega} = \frac{\partial (U_u + U_s)}{\partial \omega} = \gamma\varepsilon \qquad (3.23c)$$

$$\varepsilon = (a_{u1} + a_{s1})k + w_s(p_1, p_2) - w_u(p_1, p_2) \qquad (3.23d)$$

$$\gamma = \frac{\alpha^{\alpha}(1-\alpha)^{1-\alpha}\rho^{\alpha}}{mr_2(p_2)^{\alpha}(p_1)^{1-\alpha}(1+\omega)^2} > 0 \qquad (3.23e)$$

$\frac{\partial U_u}{\partial V_u} > 0$ and from (3.17) we know $\frac{\partial V_u}{\partial \omega} < 0$, giving that $\frac{\partial U_u}{\partial \omega} < 0$. This means that the indirect utility of consumption for unskilled households decreases with improvement in skill. It is also evident that $\frac{\partial U_s}{\partial N} < 0$. So the sign of $\frac{\partial U_s}{\partial \omega}$ is opposite to that of $\frac{\partial N}{\partial \omega}$. It indicates that the indirect utility of skilled households would change in the direction opposite to that of the number of heterogeneous firms. This is explained by the fact that

entrepreneurship induces the sunken cost of skilled labor input. Nevertheless, in the long term there is no profit as competition intensifies. Then based on the discussion in the previous section, we know that the influence of skill improvement on the utility of skilled households also depends on local industrial structure and elasticity of substitution in the heterogeneous sector.

Then we turn to changes in the total utility of local population determined by U. From equation (3.23c), we can find out that the value of $\frac{\partial U}{\partial \omega}$ depends on γ, ε. And further from equation (3.23e), we know that γ is always positive, which means the changes in total utility depends only on the value of ε. Here we assume that wage for skilled labor is higher than unskilled labor ($w_s > w_u$). We confess that since the wage is determined by product price given externally, this assumption may not always stand. However, in order to justify the motivation for skill improvement, we would like to base our analysis on this premise. Then, ε takes a positive value when $k > \frac{-(w_s - w_u)}{a_{u1} + a_{s1}}$. It means that when k takes a higher value, we could expect more positive changes in social welfare with skill improvement. We summarize the situations in table 3.3.

Table 3.3 Skill improvement, entrepreneurship and social welfare

Value of k	**Entrepreneurship**	**Social Welfare**
$k > 0$	Decrease	Increase
$\frac{-(w_s - w_u)}{a_{u1} + a_{s1}} < k < 0$	Increase	Increase
$k < \frac{-(w_s - w_u)}{a_{u1} + a_{s1}} < 0$	Increase	Decrease

It is interesting to see that when $k > 0$ or $k < \frac{-(w_s - w_u)}{a_{u1} + a_{s1}}$, the changes in entrepreneurship and social welfare goes in the opposite direction. This phenomenon is attributed to the existence of entrepreneurial cost. Even though an increase in the

number of enterprises enhances the utility people get from consumption, it is achieved at the sacrifice of the efforts of skilled labor. In other words, the expectation for social welfare improvement with more new entries is counterbalanced by the decrease in income when competition intensifies and profitability of entrepreneurship reduces. It is especially the case when entrepreneurial cost b or substitutability between heterogeneous products σ is too high. As a result, we perceive this conflict between entrepreneurship and social welfare improvement. However, when $\frac{-(w_s-w_u)}{a_{u1}+a_{s1}} < k < 0$, skill improvement enhances entrepreneurship and social welfare simultaneously, which is the most desirable case for regional vitalization.

Plugging (3.18b) into the inequality, we get the following formulation.

$$\left|\frac{(w_s - w_u)}{a_{u1} + a_{s1}}\right| > \left|\frac{mr_2(p_2)}{(\sigma-1)(a_{s1}a_{u2} - a_{s2}a_{u1})w_s(p_1,p_2)b - mr_2(p_2)a_{u1}b}\right| \cdot L$$

Straightforwardly, wider wage gap between skilled and unskilled labor and a smaller population size make it easier to satisfy the condition. This result actually indicates that it makes sense to offer entrepreneurial knowledge and skill training programs marginal regions. Since there regions are characterized by small population size, improvement in social welfare is more likely to come along with more active involvement in entrepreneurship after skill level of local people get improved.

3.5 Conclusion and implication

In this chapter, we discuss the possible influence of skill improvement on entrepreneurial behaviors and social welfare in marginal region. We formulate a general equilibrium under free trade condition with the outside. New enterprises are categorized into the heterogeneous sector while products in the traditional sector are considered to be under perfect competition and treated as homogeneous. It is assumed that labors are

divided according to their skills and their wages differ, which are determined by global product price. Only skilled labor is mobile between getting employed and self-employed. Under full employment, the equilibria give the wage, output of products, the number of enterprises and the utility from consumption.

The results of the analysis confirm the importance of industrial structure. In general, skill improvement generates a more positive influence on entrepreneurial behaviors when the newly-started businesses show higher demand for skilled labor. When this condition is not satisfied, local and global elasticity of substitution for heterogeneous products make a difference. When local demand show consistency with global trend, it is more likely to see skill improvement facilitating entrepreneurial behaviors. As for the overall social welfare, we find that improvement in social welfare brought about by entrepreneurship is cancelled out by the sunken cost of entrepreneurship in the long term. When entrepreneurial cost is too high or heterogeneous products are highly substitutable for local people, there would be a conflict between entrepreneurship and social welfare. Nevertheless, we could still expect a simultaneous improvement in entrepreneurship and social welfare through skill training under certain condition. We show that when the population size is small, it is more likely for improvement in social welfare and active entrepreneurship to show up simultaneously with skill improvement. Additionally, a wider wage gap between skilled and unskilled labor is beneficial to social welfare improvement.

Based on the results, we come up with several implications. Firstly, for local authority that aims to motivate entrepreneurship through skill training programs, it should be combined with guidance to potential entrepreneurs in terms of choice of business type. As is indicated by our discussion, entrepreneurial behavior is more likely to increase with skill improvement when the heterogeneous sector has a higher level of intellectual content than the homogeneous sector. It is especially important when local demand for heterogeneous products provided in the region differs from the general market, such as

in terms of the development of tourism. So in order to amplify the effect of entrepreneurship cultivation program in stimulating economic activities, entrepreneurship should concentrate in businesses which demand higher skill. In addition, attention needs to be paid to local wage structure. The skilled labor need to be rewarded with a wage that reflects their superiority and proficiency. This could motivate more people to get educated through these entrepreneurial programs in pursuit of higher income. It also contributes to improvement in social welfare since a more significant increase in income can be expected after receiving skill training.

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Chapter 4

Social Network and Entrepreneurship

4.1 Introduction

Last chapter takes a macro perspective and offers a static analysis of entrepreneurship in marginal region, focusing especially the distribution of skill among population. As a prerequisite of performing entrepreneurial activities, possession of skill determines who are qualified as entrepreneurs. In the next two chapters, we will turn to individual decision making process that actually results in the conduct of entrepreneurial behavior.

It is common to see researches on human behaviors follow the ration choice theory. Under a utilitarian perspective, utility from the behavior is often chosen as the criterion. In our case of entrepreneurship, local agents are expected to make their decisions based on the utility from performing economic activities. Consistent with what we have discussed in the previous chapter, income should have a major influence on the choice. Yet the recent interest on the role of social capital has directed our attention to another factor that determines the utility —— social network.

Human behavior, to a great extent, is attributed to a combination of individual decision making and the influence from one's social contacts. These contacts constitute the social network where everyone occupies his unique position and this position in turn, determines his possession of social capital. This might be true especially in our setting of a marginal region. As many researches point out, marginal regions are relatively rich in social capital since the social structure is much stronger (Poon et al., 2012). As a productive factor, it might complement the lack of other resources and facilitate local economic activities. This function of social capital makes it an important influential

factor to the utility of economic activities.

In this chapter, we are going to explore issues related to social network and social capital. Given the role network plays in the spread of information, facilitation of collaboration as well as knowledge sharing, agents' efforts should be complementary to each other. This means that agents in the network receive utility from the efforts of the rest. The more social contacts one have, the more motivated he is to devote to economic activities and the higher utility he would gain from economic production. We refer this phenomenon as network effect here and associate it with the existence of social capital.

To be more specific, we consider the community in the marginal region to be a social network of agents, who have different level of social contacts with others and therefore in possession of unequal levels of social capital. These agents currently work either as an employee or an entrepreneur with different payoff level. A higher payoff to entrepreneur highlights their superiority in productive knowledge and skill. However, entrepreneurs must pay for the acquisition of these abilities and they also need to cover setup fees and bear more frequent and higher risks, which are generalized in the model by some fixed amount of cost. These factors, namely possession of social capital, payoff level and the cost, together, determine the utility of the agent. Agents perform entrepreneurial activities only when the utility he or she gets as an entrepreneur is relatively higher.

The chapter is organized as follows. In section 2, we first give a general review of papers on social network theory and social capital, which, we consider as two main branches of researches that are closely related to our work. Then, we summarize and discuss the relationship between the two in an attempt to approach the mechanism behind the formation and function of social network. In section 3, we model a two-step decision making process of entrepreneurship, in which the agent first chooses whether to be an entrepreneur or remain employed and then determines his efforts devoted to

economic activities. This model is mainly based on the benchmark quadratic model of peer effect discussed in the work of Ballester et al. (2006), which is further developed by Helsley & Zenou (2014) and Verdier & Zenou,(2017). We polish the discussion by focusing on the uniqueness of social network in marginal regions and identify the restrictions of entrepreneurship in these places. We also compare the situations under different network structures, namely a leader-centered one and an indiscriminative one, to show how situation varies across different social contexts. In section 4, we turn to the policy choice of the government driven by different objectives. We consider two situations where an entrepreneurship-oriented government adopts a cost-reduction policy and a welfare-oriented government subsidizes production. Finally, we conclude the findings and offer some implications.

4.2 Literature review

4.2.1 Social network and network effect

Network is a type of social unit formed through the relationships and transactions among people. It is a totality of personal ties that either constrains or facilitates these bonds and is more than a simple sum of individual links (Zimmer, 1986). The existence of social ties correlates all the agents inside and creates what is called “network effect” (also referred to as peer effect or network externality), when “the actions of a reference group affect an individual’s utility” (Cabrales et al.,2011).

Research on social network starts in the field of sociology and gains increasing interest in economics recently. It is useful in explaining externalities perceived in economic activities when utility of an individual is determined not only by factors under his control, but also on the behaviors of others (Buchanan & Stubblebine,1962). Depending on whether group members’ behaviors increase or decrease one’s utility, we could generally divide network effect into two types, strategic complements and strategic substitutes. Complementarity is usually captured by the phenomenon that an agent

would be motivated to devote more efforts when other agents do, which is often accompanied by the existence of some kind of self-reinforcing process. A benchmark model can be found in the work of Ballester et al. (2006). They use a simple and tractable "linear-quadratic" setting to capture the complementarity and permit an explicit solution to the equilibrium. Wide applications of this model can be found exploring social, cultural and economic subjects such as the choice of cultural assimilation (Olcina et al., 2017; Verdier & Zenou, 2017) , education (Del Bello et al., 2014; Patacchini et al. 2017), behaviors concerning business operation (Larcker et al., 2013), labor market (Lindquist et al., 2015) and travel demand (Ohira & Otazawa, 2013). On the contrary, in the case of substitutive effect, one's behavior turns out to be contrary to his peer group. It is most frequently discussed in the provision of public goods and is often associated with "free-ride" issues (Bramoullé & Kranton, 2007; Bramoullé et al., 2014; Boncinelli & Pin,2012).

4.2.2 Social capital in economic life

The formation and function of social capital in economic activities have been much talked about in the literature. World Bank (1998) describes social capital as "the internal social and cultural coherence of society, the norms and values that govern interactions among people and the institutions in which they are embedded". There are a number of other ways to define this concept and we could find two key aspects commonly mentioned: social capital could not be created at the absence of social interaction and it is characterized by the ability to promote cooperation or collective action (Fukuyama, 2001; Adler & Kwon, 2002). Intangible in essence, social capital is the byproduct of its economic, social and cultural environment. Even though an explicit measurement of social capital is hard to make, it is accepted that richer stock of social network and associations contribute to the accumulation of social capital (Woolcock, 2001).

Social capital plays an important role in almost every corner of daily life, from social

issues to economic development. It is pointed out by Lin (2001) that the way it functions is similar to other types of capital, which could be captured as an investment of productive resource in pursuit of profits. It also manifests other common traits of capital such as being “appropriable”, “convertible” and capable of substituting and complementing other resources (Adler & Kwon, 2002). Many researches, from an empirical perspective, have testified its positive relationship with economic development (Callois & Aubert, 2007; Woodhouse, 2006; Sabatini, 2008; Knack & Keefer,1997; Guiso et al., 2004). There are also discussions over the mechanism behind its function from a theoretical point of view. Lin (2001) gives a general explanation for the way social capital work, which involves four elements, namely information, influence, social credentials and reinforcement. In the field of economy, one school of thought follows the network view and emphasizes vertical and horizontal social interactions (Woolcock & Narayan, 2000). The former, which generates “bridging social capital”, facilitates linkage to external resources while the latter, responsible for “bonding social capital”, exists inside a network and undergirds intra-group reciprocity (Putnam,2000).

4.2.3 Summary and discussion

Based on previous studies on social network and social capital, we regard the latter as assets created in and maintained by the former, which also accords with the descriptions in the work of Lin (2017) and Burt (2000). In this sense, we could come up with the following implications.

First, there is a causal relationship between social network and social capital so that the formation of the latter should depend on the attributes of the former. Social networks consist of two elements, the nodes (agents) and the links (social contacts). In terms of the first element, the most fundamental attribute is quantity. It is quite straightforward that the more nodes an agent is connected to, the higher social capital he should have.

Additionally, quality of the node matters. For example, in our setting, one is sure to get more information or other input related to entrepreneurship from a successful entrepreneur than from an ordinary employee. Moreover, there is some spillover effect from "friend of friend" so that the position of one's neighbor in the social network makes a difference. As for the second element, it is often associated with structural issues such as the pattern of the network and the strength of the links. These are key factors that determine the level of social capital.

Secondly, the influence of social network on the utility one receives from economic activities is dependent on the productivity of social capital. Therefore, existence of complementary network effect should be a prerequisite for the creation and maintenance of social capital.

4.3 The model

Based on the discussion in last section, we focus on a model with complementary effects when examining the decision making process of agents in a social network under the setting of marginal region.

Specifically, we consider a network N consists of n agents. They are grouped into two types according to their occupations. Sub-network E consists of p entrepreneurs and the other sub-network W, consists of q employees ($N = E + W, n = p + q$). We assume that all employees are already equipped with necessary skill and ready to devote to entrepreneurial activities. They follow a two-stage movement when an entrepreneurial opportunity comes. In the first stage, one agent decides whether to become an entrepreneur or remaining as an employee. Being an entrepreneur increases the payoff level one gets from economic production. However, he also needs to bear the necessary cost. Then, in the next stage, given his payoff level, the agent chooses the optimal input of efforts in economic production to maximize his payoff under network

effects. Of course, given the differences in personal capacity, the payoff level of economic production varies across the group. In this research, we would like to simplify the condition so that payoff level differs between entrepreneurs and employees but is identical within the same occupation. We think it is acceptable to make such simplification since it allows us to focus on the influence from social network exclusively, exempt from individual heterogeneity. The level of payoff is exogenous, with w_h for being an entrepreneur and w_0 for remaining as an employee, $w_h > w_0$.

The structure of social network is characterized by two attributes. The first one is the state of connection, which determines the pattern of network. To be specific, the first attribute is about "who is connected to whom in the network" and "how they are associated with each other (directly or indirectly)". The second attribute is the intensity of connection. It controls "to what degree is individual's utility influenced by his or her neighbor". In the model, the first attribute is captured by an adjacency matrix G, whose elements g_{ij} record the link between agent i and agent j. By definition, the link is supposed to be symmetric so we have $g_{ij} = g_{ji}$. The value of g_{ij} takes either 1 (when agent i is directly connected to agent j) or 0 (when agent i and agent j are disconnected). We also have $g_{ii} = 0$ since self-influence is independent of the network. The second attribute is represented by a scalar θ, which is homogeneous to all the pairs inside the network. θ is likely to be a regional-specific factor, whose value is determined by social cohesion in the region. Within a network with higher cohesion and more frequent social interactions, θ is expected to be higher.

As usual, we solve the model backwards.

4.3.1 Second stage: engagement in economic activities

We start with the second stage when all the agents simultaneously choose their efforts devoted to economic production. As we have pointed out in the above discussion, the decision is influenced by the social ties of each agent and the network effect is assumed

to be positive in this case. We follow the linear-quadratic model presented by Ballester et al., which is widely used to model the complementarity of peer behavior. We also refer to the work of Helsley & Zenou (2014) and Verdier & Zenou(2017) for more detailed discussion on its variations.

(1) Preference

The utility for agent i from economic production is given by the following function

$$u_i(e_i) = w_i e_i - \frac{1}{2} {e_i}^2 + \theta \sum_{j=1}^{n} g_{ij} e_i e_j \quad (4.1)$$

where e_i is the effort level and w_i denotes his payoff level, properly in the form of wage or any types of revenue. The last term in equation (4.1) captures the network effect. Since we assume the mutual influence to be positive, we have $\theta > 0$. It shows that the utility agent i obtains from his social contacts is determined by his social connection state captured g_{ij}, θ and the effort level of these agents. We assume θ to take a value between 0 and 1 in order to control the decaying influential power as the social distance becomes longer. To be precise, when there is no direct link between two agents but they are indirectly linked through some intermediators, they are still influenced by each other's actions as there is spillover from "friend of friend". Yet the effect is weaker than when they are directly linked. We will leave a more detailed discussion on the function of θ to the point when we approach the equilibrium solution of the model.

This model turns out to be a useful and widely-applicable one. However, it seems to only consider the influence from social distance on the strength of peer effect. In reality, it is generally true that people's influential power differs. A straightforward example is that by making friends with an entrepreneur, one has higher possibility to get useful

information and benefits compared with interacting with an employee, since the former owns more resources. We here interpret this phenomenon that connecting to people with different attributes makes a difference to one's utility as the "quality" effect of social contacts. The more superior is the neighbor's ability, the higher is the quality of this link. Based on this concept, an alternative utility function could be given by the following equation.

$$u_i^*(e_i) = w_i e_i - \frac{1}{2} e_i^2 + w_j \theta \sum_{j=1}^{n} g_{ij} e_i e_j \quad (4.2)$$

$g_{ij} e_i e_j$ captures the fact that network effect depends on the effort level of both agents. Additionally, the overall utility agent i can derive from network effect by interacting with agent j is influenced by a constant contextual parameter θ and a variable personal parameter w_j. Discussion on this alternative model is included in Appendix 4. The result actually shows that without considering the "quality of social link" issue, the equilibrium effort given by equation (4.1) is enough to capture our assumption that influence from agent with higher payoff level is stronger.

In the second stage, each agent maximizes his utility taken his social connections and the payoff level of other agents as given.

(2) Nash equilibrium

We then solve the Nash equilibrium effort under equation (4.1). The first order condition with respect to e_i under equation (4.1) is given by (4.3). To derive the result, an effective approach is to introduce the Katz-Bonacich centrality measure.

$$\bar{e_i}(w_i, w_{-i}, g) = w_i + \theta \sum_{j=1}^{n} g_{ij} \bar{e_j} \quad (4.3)$$

Bonacich centrality. In a network, different agents occupy different positions. Some are regarded as more 'central' either because they maintain more relationships with other agents, or their connections with others agents are stronger. Depending on which criterion is adopted, we are able to measure the relative importance of agents in the network. A typical comparison of models under these criteria can be found in the work of Jackon and Wolinsky (1996). Among all the approaches, the Katz-Bonacich centrality is proved to be one of the most effective and is widely adopted. The measurement of agent i's Katz-Bonacich centrality is a count of the total number of paths of different lengths that starts from i.

Let G^k be the matrix that traces the indirect links between followers with length k, where k is an integer. The elements inside this matrix $g_{ij}^{[k]} \geq 0$ give the number of paths staring from i ended in j in this network with length k. We also have $G^0 = I$. We then define a matrix M to count the total number of paths from i to j with all possible lengths. Therefore, the element of M given by m_{ij} satisfies $m_{ij} = \sum_{k=0}^{+\infty} \theta^k g_{ij}^{[k]}$. Parameter θ captures the decaying effect of the strength of the link between followers as the length increases. θ should be small enough for this expression to be well-defined and then we have $M - \theta GM = I$, whose matrix form is given by $M = [I - \theta G]^{-1}$.

For agent i, the aggregate links of different lengths with all other agents in the network equal to the sum of the ith row of matrix M. We denote the Katz-Bonacich centrality of follower i using $b_i(g, \alpha)$. We have:

$$b_i(g, \theta) = \sum_{j=1}^{n} m_{ij} = \sum_{j=1}^{n} \sum_{k=0}^{+\infty} \theta^k g_{ij}^{[k]} \quad (4.4)$$

And the matrix form can be written as:

$$b(g, \theta) = M1 = [I - \theta G]^{-1}1$$

where 1 is the n-dimensional vector of ones.

A weighted Bonacich centrality is defined by the following equation:

$$b_{w_i}(g, \theta) = \sum_{j=1}^{n} \sum_{k=0}^{+\infty} \theta^k g_{ij}^{[k]} w_j \quad (4.5)$$

The weight attached to the path from i to j equals the payoff level of agent j. The matrix form of this equation is written as:

$$b_w(g, \theta) = Mw = [I - \theta G]^{-1}w$$

We should note that the weighted Bonacich centrality indicates that payoff level of the neighbor matters. While the Katz-Bonacich centrality deals with the number of links, weighted Bonacich centrality takes into account the heterogeneity of individual attributes. As we could see in equation (4.3), one's optimal choice of efforts consists of a self-induced part w_i which depends on his payoff level w_i and a peer-effect part $\theta \sum_{j=1}^{n} g_{ij}\bar{e}_j$. This means if the agent has high payoff level himself, he might end up with high devotion to economic activities even when he is less motived by his peers.

Previous researches have proved that when $\theta\rho(G) < 1$, where $\rho(G)$ is the spectral radius of matrix G, the equilibrium effort equals to the follower's weighted Bonacich centrality, see Ballester et al. (2006) and Verdier et al. (2017). Therefore we come up with the first proposition.

Proposition 1 (devotion to economic activities)

When $\theta\rho(G) < 1$ holds, the equilibrium effort for agent i is unique, which equals to his weighted Bonacich centrality. It is given by

$$\bar{e_i}(w_i, w_{-i}, g) = b_{w_i}(g, \theta) \quad (4.6)$$

This result shows that even though we do not consider the effect that more productive agents have stronger influential power over others by assigning a higher weight on the links. The heterogeneity of network effect caused by difference in payoff level can still be perceived using the weighted Bonacich centrality measure. When we look at equation (4.3), one's equilibrium effort level is consistent with one's payoff level. And this effort level then enters into the network effect function of other agents through $\sum_{j=1}^{n} g_{ij}\bar{e_j}$. In other words, since an agent with higher payoff level naturally would end up with higher effort, they contribute more to the utility of other agents who are linked to them. It captures both the influence from the structure of social network and the individual attribute. Therefore, in the following discussion we would focus on this model and leave discussion on solution to equation (4.2) in the appendix.

Needless to say, in addition to personal attribute w_i, the contextual influence from network itself is more straightforward. When a network is more complete (there are more connections between agents and matrix G has more nonzero values) and when the relationships are more cohesive (the decaying effect is weaker and θ takes a higher value), the agent will be motivated to pay more efforts.

In marginal regions, economic degradation results in a relatively low payoff for economic production. However, as we have pointed out previously, social cohesiveness is stronger and this could compensate for the low payoff and serves as an incentive for participation in economic activities. It is thus important to pay more attention to the maintenance and development of social networks in these regions in order to take

advantage of this intangible resource. In terms of the structure attributes, situation varies. In some cases, the social network is connected through some key agents who maintain wide relationships. This type of network is more likely to show some characteristics of a star-shaped structure and we named this type of network as “leader-centered network” (leaders refers to the key agents). In other cases, people have nearly equal connections with each other and the network is more complete. We name this type of network as “indiscriminative network”. Pedersen (2008) points out that small community tends to be more cohesive, therefore such indiscriminative network might be more easily to identify when the network size is relatively small. Also, since daily communication is an important aspect in the maintenance of social ties, especially in rural regions, an indiscriminative is less likely to show up where agents in the same community are separated spatially as a result of local geographical features. A general analysis in terms of the influence from network structure is difficult since the situation may get too complicated when the number of agents in the network increases. So in this research we just dip into this issue by offering two simplest examples of leader-centered and indiscriminative network to come up with some basic implications.

(3) “Leader-centered network” and “indiscriminative network”

We would like to illustrate the result by giving two examples. We start with a “leader-centered” example of three agents with only one key agent and then present an “indiscriminative network” where all agents are connected with each other.

A “leader-centered” networked with three agents is depicted by Figure 4.1, where agent 1 has links with both agent 2 and agent 3 while agent 2 and agent 3 has no direct links. G_1 is a matrix that captures their relationships.

$$G_1 = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

Using the Katz-Bonacich centrality measure, we have

$$\begin{bmatrix}\bar{e_1}\\ \bar{e_2}\\ \bar{e_3}\end{bmatrix} = \frac{1}{1-2\theta^2}\begin{bmatrix} w_1+\theta(w_2+w_3)\\ (1-\theta^2)w_2+\theta w_1+\theta^2 w_3\\ (1-\theta^2)w_3+\theta w_1+\theta^2 w_2\end{bmatrix}$$

$$\sum_{i=1}^{3}\bar{e_i} = \frac{(1+2\theta)w_1+(1+\theta)w_2+(1+\theta)w_3}{1-2\theta^2}$$

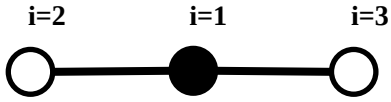

Figure 4.1 Leader-centered network with 3 agents

Assume $\theta < \frac{\sqrt{2}}{2}$, for individuals with same bonacich centrality, the one with higher payoff level is expected to pay more efforts. The aggregate effort will increase more significantly if the more central individual's payoff level increases. This result shows that the leader, who serves as a pivot of the network, has greater influential power to the network.

An indiscriminative network with three agents is depicted by Figure 4.2 and G_2 captures their relationships.

$$G_2 = \begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 1\\ 1 & 1 & 0\end{bmatrix}$$

$$\begin{bmatrix}\bar{e_1}\\ \bar{e_2}\\ \bar{e_3}\end{bmatrix} = \frac{1}{(1-2\theta)(1+\theta)}\begin{bmatrix}(1-\theta)w_1+\theta w_2+\theta w_3\\ \theta w_1+(1-\theta)w_2+\theta w_3\\ \theta w_1+\theta w_2+(1-\theta)w_3\end{bmatrix}$$

$$\sum_{i=1}^{3}\bar{e_i} = \frac{w_1+w_2+w_3}{(1-2\theta)}$$

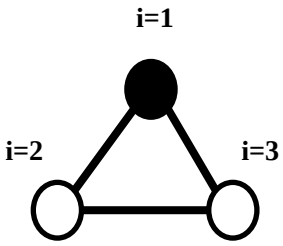

Figure 4.2 Indiscriminative network with 3 agents

Assume $\theta < \frac{1}{2}$, in an indiscriminative network, since all the individuals have the same centrality in the network, their relative effort level is consistent with their payoff level. And increase in payoff level for any of the individuals contributes equally to aggregate effort. Comparing this result with that of the leader-centered network, we could find that for the result to be well defined, θ should be smaller in an indiscriminative network. And when the network size is the same, total effort is higher as a result of intensified social ties.

Proposition 2 ("Leader-centered network" and "indiscriminative network")
Consider a network with 3 agents

(1) In a leader-centered structure where there is a pivot agent through whom all other agents are indirectly connected, assume $\theta < \frac{\sqrt{2}}{2}$, for peripheral agents their effort is in proportion to their payoff level. Leader has more influence on the network as the aggregate effort is more sensitive to the changes in his payoff level.

(2) In an indiscriminative structure with denser social connections, assume $\theta < \frac{1}{2}$, agent's relative effort level is consistent with their payoff level and an increase in their payoff contributes equally to aggregate effort.

(3) When the network size is identical, an indiscriminative network ends up with a higher aggregate effort compared with a leader-centered one, yet for the

equilibrium to exist, the synergy effect (captured by θ) should be weaker in the indiscriminative structure.

Payoff level of economic activity and the possession of social ties determine how much an agent contributes to local economy. As we stated previously, $\theta \sum_{j=1}^{n} g_{ij}\bar{e_j}$ is the part of effort induced by network effect. In a more cohesive network, we expect those socially active agents to be major contributors of local economic vitality. On the other hand, when the network is loose, individual incentive has more significant influence on effort level and the most productive agents are more likely to steer the direction of local economy. With the same network size, it is more efficient to increase the payoff level of leaders in order to improve the total utility of a leader-centered network. For an indiscriminative network, an increase in cohesiveness is equally beneficial to all the agents and is more preferable.

The above discussion shows that the direct result of network effect captured by the linear-quadratic model lies in that it motivates participation in economic production. The choice of occupation determines one's payoff from economic activities, therefore agents with different levels of involvement in economic production have different incentives in terms of whether to invest to get better paid. In the next part we turn to the first stage movement when the agent is offered with an entrepreneurial opportunity. We would like to see how their choice is influence by the social network and their possession of social capital.

4.3.2 First stage: intention of entrepreneurship

Assume that all the agents are aware of their choice of efforts devoted to economic production and act to maximize their utility taking the efforts and payoff level of other agents as given. To deal with the subgame-perfect equilibria of entrepreneurial choice, we follow the results in last part, from which we know that when $\theta\rho(G) < 1$ holds, the equilibrium effort for follower i is unique and equals to his weighted Bonacich

centrality $b_{w_i}(g, \theta)$. Payoff given by equation (1) then equals

$$\overline{u_i}(e_i) = \frac{1}{2}\overline{e_i}^2 = \frac{1}{2}(b_{w_i}(g, \theta))^2 \quad (4.7)$$

From the definition of Katz-Bonacich centrality we know that $b_i(g, \theta)$ counts the total number of paths from i to j ($j \in M$) with all possible lengths and can be expressed by equation (4.4). We could then decompose $b_i(g, \theta)$ into two parts. The first part is self-loop given by $m_{ii} = \sum_{k=0}^{+\infty} \theta^k {g_{ii}}^{[k]}$ and the second part, non self-loops, equals to $m_{ij} = \sum_{k=0}^{+\infty} \theta^k {g_{ij}}^{[k]}$. The weight assigned to these loops depends on the payoff level of the group. As we have stated that the payoff for entrepreneurs and employees are respectively identical at w_h and w_0. Then, the equilibrium effort is transformed to

$$\overline{e_i} = \sum_{j \in \mathrm{E}} \sum_{k=0}^{+\infty} \theta^k {g_{ij}}^{[k]} w_h + \sum_{j \in \mathrm{W}} \sum_{k=0}^{+\infty} \theta^k {g_{ij}}^{[k]} w_0 + \sum_{k=0}^{+\infty} \theta^k {g_{ii}}^{[k]} w_i \qquad (4.8)$$

The first term denotes the part of effort induced by the behavior of entrepreneurs and the second term denotes the part induced by interacting with employees. We could notice that these two terms are free from the influence of his own payoff level but only depend on his neighborhood (neighborhood refers to the totality of agents with whom agent i has connection with). By combing the adjacency condition (g_{ij}) and personal attribute (w_j), they capture both the quantity and quality of one's links. We consider it to be a good indicate of the social capital of agent i and use C_i to denote it hereafter.

$$C_i = \sum_{j \in \mathrm{E}} \sum_{k=0}^{+\infty} \theta^k {g_{ij}}^{[k]} w_h + \sum_{j \in \mathrm{W}} \sum_{k=0}^{+\infty} \theta^k {g_{ij}}^{[k]} w_0 \quad (4.9)$$

The last term in equation (4.8) shows the self-loops. Intuitively, when the utility of being an entrepreneur is higher than remaining at the status quo, the agent would take

the opportunity and set up his own business. Assuming that the cost of entrepreneurship is exogenous and fixed at c, then the agent would involve in entrepreneurial activities as long as $\overline{u_i}(\overline{e_i}(w_h, e_{-i}, g), \overline{e_{-i}}, g) - c > \overline{u_i}(\overline{e_i}(w_0, e_{-i}, g), \overline{e_{-i}}, g)$. Plugging (4.8),(4.9) into (4.7), this condition is specified as follows.

$$\frac{1}{2}\left(C_i + \sum_{k=0}^{+\infty} \theta^k {g_{ii}}^{[k]} w_h\right)^2 - c > \frac{1}{2}\left(C_i + \sum_{k=0}^{+\infty} \theta^k {g_{ii}}^{[k]} w_0\right)^2$$

Using some algebra and substituting $\sum_{k=0}^{+\infty} \theta^k {g_{ii}}^{[k]}$ with m_{ii}, it is easy to show that the above inequality is equivalent to

$$2(w_h - w_0)C_i m_{ii} + ({w_h}^2 - {w_0}^2){m_{ii}}^2 > 2c$$

We could then define a convex function $\Phi(m_{ii})$ given by

$$\Phi(m_{ii}) = ({w_h}^2 - {w_0}^2){m_{ii}}^2 + 2(w_h - w_0)C_i m_{ii} - 2c$$

$\Phi(m_{ii}) > 0$ is a sufficient condition for agent i to choose entrepreneurship. Since $\Phi(0) = -2c < 0$, it must be the case that equation $\Phi(m_{ii}) = 0$ has one root larger than 0, which should be equivalent to

$${m_{ii}}^* = \frac{-2(w_h - w_0)C_i + \sqrt{\Delta}}{2({w_h}^2 - {w_0}^2)}$$

where

$$\Delta = 4(w_h - w_0)^2 {C_i}^2 + 8c({w_h}^2 - {w_0}^2) > 0$$

For agent i, if $m_{ii} > {m_{ii}}^*$, then he would choose to become an entrepreneur. ${m_{ii}}^*$ can be regarded as the entrepreneurship threshold in this case. Agents with higher m_{ii} are more likely to change their occupation and invest in entrepreneurial activities. Since

m_{ii} counts the paths starting from i and ending in i, it represents the number of social links one maintains in the network regardless of who he is associated with. We denote this attribute as the socializing scale of the agent. If we rank all the agents in the network according to their socializing scale so that agent 1 has the highest socializing scale. i.e. $m_{11} = max_i m_{ii}$ and $m_{nn} = min_i m_{ii}$. We define a function $N^*(m_{ii}{}^*)$ to track the rank of the individual so that $m_{N^*+1,N^*+1} < m_{ii}{}^* < m_{N^*,N^*}, N^* \in M$, it is easy to show that $\frac{\partial N^*(m_{ii}{}^*)}{\partial m_{ii}{}^*} < 0$. This means that when the value of $m_{ii}{}^*$ is larger, only agent with relatively higher rank could satisfy the condition of entrepreneurship (note that for higher socializing scale, N^* is smaller). The proportion of individuals that become entrepreneurs is given by $\frac{N^*(m_{ii}{}^{(2)})}{n}$, which is also decreasing in the value of $m_{ii}{}^*$.

Let $\Delta w = w_h - w_0$, it is straightforward that $\frac{\partial m_{ii}{}^*}{\partial \mathrm{c}} > 0$, $\frac{\partial m_{ii}{}^*}{\partial \Delta w} < 0$, $\frac{\partial m_{ii}{}^*}{\partial \mathrm{C}_i} < 0$, which means when the entrepreneurial cost is higher or the increase in payoff is less significant, entrepreneurship threshold rises and it requires broader socializing scale for one to be motivated to take the risk of entrepreneurship. Consequently, the increase in cost or reduction in benefits would reduce the entrepreneurship rate. An increase in social capital, on the other hand, would lower the threshold of entrepreneurship. So that when the possession of social capital is generally higher, more agents in the network would be inclined to become entrepreneurs.

Proposition 3 (characterization of equilibrium entrepreneurship rate)

(1) Assume $\theta\rho(G) < 1$, all agents are ranked according to their socializing scale in the network. If for agent N^* we have $m_{N^*+1,N^*+1} < m_{ii}{}^* < m_{N^*,N^*}$,then all agents with higher rank than N^* (including N^*) will choose to be an entrepreneur while the rest with lower ranks will remain at the

status quo. The entrepreneurship rate at the equilibrium point is captured by $\frac{N^*(m_{ii}^*)}{n}$.

(2) When the cost of entrepreneurship is lower(higher), the increase in payoff after is more(less) significant and the average possession of social capital is higher, the region is expected to have a higher entrepreneurship rate.

Define $\Phi^P(m_{ii})$ as the incentive function for agent i to choose to be an entrepreneur when all others do so.

$$\Phi^P(m_{ii}) \equiv ({w_h}^2 - {w_0}^2)(m_{ii})^2 + 2(w_h - w_0)(w_h \sum_{j \in M-\{i\}} m_{ij}) \cdot m_{ii}$$

Proposition 4 (existence and uniqueness of entrepreneurship rate)
Assume $\theta\rho(G) < 1$ ***and consider a network of n agents with heterogeneous positions in the network. Agents with higher Katz-Bonacich centrality would choose to be an entrepreneur no later than those with lower Katz-Bonacich centrality. There would be*** $n + 1$ ***equilibria. They can be characterized as follows:***

(1) If $\Phi^P(m_{n,n}) > 2c$ ***, there exists a unique equilibrium where all agents are motivated to take entrepreneurial behavior.***

(2) If $\Phi^P(m_{n,n}) < 2c < \Phi^P(m_{n-1,n-1}) - 2(w_h - w_0)^2 m_{n-1,n} m_{n-1,n-1}$***, there exists a unique equilibrium where the least central individual maintains the status quo and the rest choose to be entrepreneurs and entrepreneurship rate equals to*** $\frac{n-1}{n}$

(3) If $\Phi^P(m_{n-1,n-1}) - 2(w_h - w_0)^2 m_{n-1,n} m_{n-1,n-1} < 2c < \Phi^P(m_{n-2,n-2}) - 2(w_h - w_0)^2 (m_{n-2,n-1} + m_{n-2,n}) m_{n-2,n-2}$***, there exists a unique equilibrium where entrepreneurship rate equals to*** $\frac{n-2}{n}$

(4) If $\Phi^P(m_{n-2,n-2}) - 2(w_h - w_0)^2(m_{n-2,n-1} + m_{n-2,n})m_{n-2,n-2} < 2c < \Phi^P(m_{n-3,n-3}) - 2(w_h - w_0)^2(\sum_{j\in N}^{n} m_{n-3,j})m_{n-3,n-3}$***, there exists a unique equilibrium where entrepreneurship rate equals to*** $\frac{n-3}{n}$

(5) Etc. until we arrive at the agent with the highest socializing scale. then

(6) If $\Phi^P(m_{11}) - 2(w_h - w_0)^2(\sum_{j\in N-\{1\}}^{n} m_{1,j})m_{11} < 2c$***, all agents prefer to be employed and no one invest in entrepreneurial activities.***

The result shows that when the payoff level and cost is exogenous, entrepreneurial behavior depends on the social ties of the agent. Each agent faces a threshold, which is determined collectively by the entrepreneurial cost, his social capital, as well as the payoff level of different occupations. Only when their socializing scale is above this threshold will they be willing to catch the opportunity and invest in entrepreneurial activities. As we can see, the socializing scale is only associated with how many contacts an agent has, no matter who they are. Nevertheless, associating with entrepreneurs rather than employees still facilitates participation since it could increase social capital, which functions to lower the entrepreneurial threshold.

It is also straightforward that population size and the original number of entrepreneurs in the network are important factors. Higher entrepreneurship rate contributes to a higher level of average social capital for all the agents inside the network and consequently the average threshold would get lowered. However, the analysis would be quite complicated because the network pattern also matters. Hence, we consider this issue in an extreme case where everyone has identical number of contacts so that we can simplify the discussion without considering the pattern of the network. We could then explore how network size and original entrepreneurship rate influence the result.

Consider the original entrepreneurship rate to be r_e. With population size n, the number of entrepreneurs equals to $r_e n$ and employees $(1 - r_e)n$

$$C_i = r_e n m_{ij} w_h + (1 - r_e) n m_{ij} w_0$$

So we have the threshold ${m_{ii}}^*$ given by

$${m_{ii}}^* = \frac{-2(w_h - w_0) m_{ij} [r_e n w_h + (1 - r_e) n w_0] + \sqrt{\Delta}}{2({w_h}^2 - {w_0}^2)}$$

$$\frac{\partial \mathrm{C}_i}{\partial r_e} = (w_h - w_0) n m_{ij} > 0;\ \frac{\partial \mathrm{C}_i}{\partial n} = (w_h - w_0) r_e m_{ij} + m_{ij} w_0 > 0$$

$$\frac{\partial {m_{ii}}^*}{\partial\, r_e} = \frac{\partial {m_{ii}}^*}{\partial \mathrm{C}_i} \frac{\partial \mathrm{C}_i}{\partial r_e} < 0;\ \frac{\partial {m_{ii}}^*}{\partial n} = \frac{\partial {m_{ii}}^*}{\partial \mathrm{C}_i} \frac{\partial \mathrm{C}_i}{\partial \mathrm{n}} < 0$$

Proposition 5(population size and original entrepreneurship rate)

The average entrepreneurial threshold is lower when population size and/or the original entrepreneurship rate is higher.

To summarize, based on this model, entrepreneurial decision depends on the relative power of a "push" force and a "pull" force. The most direct "push" power should be the cohesiveness of the network and the number of direct links one has with others. A higher level of cohesiveness and possession of social links not only increase the value of m_{ii}, but also builds up social capital, which then lowers the entrepreneurial threshold. Another important propelling force is related to the payoff level. What motivates entrepreneurship is not a decent pay, but the expectation for a significant improvement. The "push" force, quite straightforwardly, comes from the cost.

These propositions offer some implications for entrepreneurship in marginal regions. Admittedly, situation there is quite challenging. First of all, continuous depopulation and aging are threatening the social network structure as the size of network shrinks. Meanwhile, the decrease in population density is usually accompanied by geographical separation, especially common in mountainous areas, which cuts off physical

communications between local residents. In addition, poor economic environment limits the profitability in business. Economic gain as an entrepreneur is therefore less decent than more affluent regions and the increase in payoff level is less significant in most of the cases. These factors, as we have discussed above, narrow people's socializing scale while continuing to push upward entrepreneurial threshold. Nevertheless, rural culture, especially that of Asia countries, contributes to the solidarity and cohesiveness of the community. For example, Chinese rural community is often referred to as "acquaintance society", where neighborhoodship plays an important role in sustaining daily routines of local residents and the continuation of local traditions (Xiong & Payne, 2017). In other words, θ might be relatively higher in marginal region than elsewhere. A higher value of θ, on the contrary, contributes to higher value of m_{ii} and m_{ij}, counterbalancing the negative effects caused by population decrease and economic degradation. Additionally, even though profitability is limited in marginal region, as long as the improvement in payoff is significant enough, it is still possible to motivate participation. Despite the monetary payoff, the mental satisfaction of being an entrepreneur might also constitute part of the payoff, which is yet intangible.

In the above discussion, we assume the payoff to be binary and is only related to the choice of occupation. However, in reality, the actual payoff is often heterogeneous among agents and depends on their ability. Since the equilibrium effort and utility from economic production is simultaneously determined by the payoff as well as the network effect, it is not necessarily true that agents with higher social capital are the first to become entrepreneurs. Similar arguments can be found in the work of Helsley and Zenou (2014). Their research discusses the influence of social network on the choice of geographical location. They point out that there might be some "talented agents", whose marginal benefit of exerting effort is high but centrality in the network is low, ending up with the same geographical location choice as the socially-central agents. In order words, the incentive functions would be different even for people with same centrality in the network and individual ability is also an important determinant during the process.

But it still holds that a more significant improvement in marginal payoff would lower the entrepreneurial threshold. Therefore, how to improve the profitability of entrepreneurs is always one of the most crucial issues for local government to consider.

Another important point to note is that if we follow the entrepreneurial process continuously, the existence of network effect is likely to bring about a self-reinforcing result. As entrepreneurship rate increases, average social capital level is also going to rise. Consequently, the threshold continues to decrease and more entrepreneurs are likely to come up. The self-reinforcement of entrepreneurship is widely perceived and discussed in literature. As many researches on entrepreneurial activities have pointed out, entrepreneurs have a tendency to concentrate geographically (Minniti, 2005). This kind of agglomeration are usually explained by technology spillover (Acs & Varga, 2005), economy of scale (Rosenthal & Strange, 2004) and also cultural factors such as regional legitimacy of entrepreneurship (Kibler et al., 2014). The network theory offers another explanation of this phenomenon and associates it with the update of social capital. Based on this result, there could be certain point with respect to local entrepreneurship rate, above which the self-reinforcing process can be triggered. Therefore, it is especially important to achieve early-stage success in terms of entrepreneurship cultivation.

Additionally, the update of social capital also indicates that it is always wiser to adopt a step-wise policy when supporting the potential entrepreneurs. Since people with higher possession of social capital have relatively lower threshold, it is better to target the program at these people at the first stage. As these people transit from employees to entrepreneurs, the social capital of the remaining employees who are associated with them is expected to increase, which contributes to a lower threshold. In this way, government can lower its cost of entrepreneurial support as much as possible. In the next part, we would discuss on this “step-wise” policy when government offers subsidies to agents in the network to encourage entrepreneurship.

4.4 The government

In this part, we look at the behavior of government and explore what kind of policy is more preferable facing different network structures. Given the economic backwardness in marginal regions, it is of first priority for local government to stimulate economic development in the region. Therefore, in the short term, it is more likely for the government to emphasize the increase in new enterprises. According to proposition 1 and proposition 3, this can be achieved by lowering the cost of entrepreneurship. While we focus on the long-term objective of local government, a welfare-oriented policy should also be considered. The following discussion focuses on these two policies respectively.

4.4.1 Cost reduction policy

Firstly, we focus on the cost reduction policy. As we have assumed, the cost is identical and fixed for everyone. By offering a certain amount of subsidy, government could cut down the actual cost for the agents so that they would be motivated to participate. However, as network structure varies government response differently.

(1) In an indiscriminative network

In an indiscriminative network, the socializing scale is identical for all agents in the network since everyone maintains the same number of contacts. This means we have $\forall i,j \in M, i \neq j, m_{ii} = m_{jj},$ and also $\forall i,j,k \in M, i \neq j \neq k, m_{ij} = m_{jk}$. Consequently, there would either be a case when everyone chooses to be entrepreneurs or no one gets involved.

$$\Phi'(m_{ii}) \equiv (w_h - w_0)[(w_h + w_0) + 2(n-1)w_0](m_{ii})^2 - 2c$$

Proposition 6 (cost subsidy policy for an indiscriminative network)

In an indiscriminative network, when $\Phi'(m_{ii}) < 0$ ***, in order to motivate entrepreneurship, government needs to offer a subsidy equivalent to*** $s_i = c - \frac{(w_h - w_0)[(w_h + w_0) + 2(n-1)w_0](m_{ii})^2}{2}$ ***so that everyone involves in entrepreneurship. Otherwise, agents prefer to remain as employees.***

An interesting thing to note here is that as network size grows, the subsidy government needs to offer per capita would decrease since everyone would have lower threshold and more easily to motivate. However, in the indiscriminative network, government has no choice but to subsidize everyone or no one. In other words, there is either an all-entrepreneur or all-employee situation. The aggregate subsidy will increase with the group size, which might put pressure on local finance. Depending on the possession of financial resources, if the government is not able to offer enough funding, similar network with an indiscriminative structure would end up with totally different results.

(2) In a leader-centered network

When the network is not complete, the situation becomes complicated since the Katz-Bonacich centrality is heterogeneous among agents. We here examine the simplest case where there is only one leader for some implications. According to proposition 4, peripheral agents will not choose to be an entrepreneur as long as the leader remains as an employee. Therefore, there are only two cases. The first is when the government needs to subsidize all agents and the other is when only peripheral agents are to be subsidized. For the second case, it is actually consistent with the situation in an indiscriminative network since all peripheral agents are identical in terms of their incentive to become an entrepreneur. So we only discuss the first case and to see how a "step-wise" strategy minimizes the cost for government.

The M matrix in a n-agent star-shaped network is given by

$$M = [I - \theta G]^{-1} = \frac{1}{1-(n-1)\theta^2}\begin{bmatrix} 1 & \theta & \dots & \theta \\ \theta & 1-\theta^2 & \dots & \theta^2 \\ \vdots & \vdots & \ddots & \vdots \\ \theta & \theta^2 & \dots & 1-\theta^2 \end{bmatrix}$$

Denote $m_{ll}^{(1)}$, $m_{pp}^{(2)}$ the self-loop for leader and peripheral agents respectively, we have $m_{ll}^{(1)} = \frac{1}{1-(n-1)\theta^2} > m_{pp}^{(2)} = \frac{1-\theta^2}{1-(n-1)\theta^2}$ when $\theta < \frac{\sqrt{2}}{2}$ and also,

$$\Phi(m_{ll}) \equiv [({w_h}^2 - {w_0}^2) + 2(n-1)\theta(w_h - w_0)w_0]\left(\frac{1}{1-(n-1)\theta^2}\right)^2 - 2c < 0$$

$$\Phi(m_{pp}) \equiv [({w_h}^2 - {w_0}^2)(1-\theta^2) + 2\theta(1+(n-2)\theta)(w_h - w_0)w_0]\frac{1-\theta^2}{(1-(n-1)\theta^2)^2} - 2c < 0$$

When the government subsidizes all agents simultaneously, it needs to pay to $s_l = -\frac{\Phi(m_{ll})}{2}$ to the leader and $s_p = -\frac{\Phi(m_{pp})}{2}$ to all the peripheral agents. But if the government chooses a "step-wise" policy and subsidizes the leader first, after the leader has become an entrepreneur, the incentive function of peripheral agents is updated to the following equation.

$$\Phi^*(m_{pp}) \equiv [({w_h}^2 - {w_0}^2)(1-\theta^2) + 2(w_h - w_0)(w_h\theta + (n-2)\theta^2 w_0)]\frac{1-\theta^2}{(1-(n-1)\theta^2)^2} - 2c$$

The first term of the incentive function is increased by $\frac{2(w_h-w_0)^2\theta(1-\theta^2)}{(1-(n-1)\theta^2)^2}$. If this increase is big enough so that $\Phi^*(m_{pp}) > 0$, then the peripheral agents spontaneously turn to entrepreneurial behaviors without subsidy. Even if $\Phi^*(m_{pp}) < 0$, government can still save an amount of subsidy equals to $\frac{2(w_h-w_0)^2\theta(1-\theta^2)(n-1)}{(1-(n-1)\theta^2)^2}$, which reduces its financial

burden.

Proposition 7(cost reduction subsidy policy in a leader-centered network)
When the network structure is not complete and relies on leaders to link all agents, it is always more effective for the government to adopt a stepwise cost reduction subsidy policy. Targeting firstly at the most easily motivated agents, government can lower its cost by benefiting from the following increase in network effect.

A step-wise policy is especially beneficial under two cases. The first case is when the government is facing limited budget for supporting entrepreneurial activities. Then through this stepwise policy, they can maximize the effect of the policy. The second case is when the government has inadequate information about the network structure. This case is more common since the acquisition of personal information could be difficult as well as costly. However, key agents, which their strong personality are always easier to identify.

To summarize, in the case of a cost reduction policy, the structure of social network does matter. When the network is relatively complete, in order to ensure everyone gets equal opportunity when choosing their occupation, the policy needs to be wide reaching and it leads to two totally different results. When the network is sustained by some key agents, government can take advantage of the network effect by adopting a stepwise policy. Leaders should be the original targets of the policy. And after each round of subsidy, an increase in average possession of social capital is to occur and the threshold of entrepreneurship lowers for all the remaining agents. Government then benefits from a reduction in the total amount of subsidy it needs to offer.

4.4.2 Welfare-oriented policy

In addition to encouraging entrepreneurship in pursuit of economic prosperity, local

government should also be concerned with the social welfare state in the region. In this part, we focus on how a welfare-oriented government would choose its policy.

Consider the government is able to decide the effort level of each agent. In order to maximize total welfare, the decision function is given as follows

$$\max_{e_1,e_2,\dots,e_n} \sum_{i=1}^{n} u_i(e_i, e_{-i}, g)$$

$$= \max_{e_1,e_2,\dots,e_n} \left\{ \sum_{i=1}^{n} \left[w_i e_i - \frac{1}{2} {e_i}^2 \right] + \theta \sum_{i=1}^{n} \sum_{j=1}^{n} g_{ij} e_i e_j \right\}$$

First-order condition gives for each agent an effort level equivalent to (4.10)

$$\bar{e_i}' = w_i + \theta \sum_{j=1}^{n} g_{ij}\, \bar{e_j}' + \theta \sum_{j=1}^{n} g_{ji}\, \bar{e_j}' = w_i + 2\theta \sum_{j=1}^{n} g_{ij}\, \bar{e_j}' \quad (4.10)$$

Comparing with the result given by (4.3), due to agent's ignorance of his influence on other agents, the market equilibrium gives a too low effort level. Interestingly, in the social optimal case, the effort level is equivalent to the situation when all the agents are in a closer network where the scalar θ doubles. In other words

$$\bar{e_i}' = b_{w_i}(g, 2\theta)$$

Government could restore the first-best allocation by subsidizing the effort devoted by agents to economic production. Let's denote s_i^* to be the subsidy offered to agent i.

$$u_i^*(e_i) = (w_i + s_i^*)e_i - \frac{1}{2}{e_i}^2 + \theta \sum_{j=1}^{n} g_{ij}e_i e_j \quad (4.11)$$

And in order to equate the equilibrium effort under equation (4.10) with (4.11), s_i^* should be $\theta \sum_j g_{ij}e_j$. This indicates that individual with higher weighted Bonacich centrality will be compensated more.

Again, we could illustrate this point by giving an example. Firstly, we still look at a leader-centered network with three agents depicted in Figure. 4.1. Assume $\theta < \frac{\sqrt{2}}{2}$, the social optimal effort for each agent should be

$$\begin{bmatrix} \bar{e_1}' \\ \bar{e_2}' \\ \bar{e_3}' \end{bmatrix} = \frac{1}{1-8\theta^2} \begin{bmatrix} w_1 + 2\theta(w_2 + w_3) \\ (1-4\theta^2)w_2 + 2\theta w_1 + 4\theta^2 w_3 \\ (1-4\theta^2)w_3 + 2\theta w_1 + 4\theta^2 w_2 \end{bmatrix}$$

The subsidy for each agent should satisfy that $s_i^* = \theta \sum_j^n g_{ij}e_j$ and we can calculate the subsidy for each agent as follows

$$\begin{bmatrix} s_1^* \\ s_2^* \\ s_3^* \end{bmatrix} = \frac{1}{1-8\theta^2} \begin{bmatrix} \theta(4\theta w_1 + w_2 + w_3) \\ \theta(2\theta+1)(w_1 + 2w_2) + \theta(1-4\theta^2+2\theta)w_3 \\ \theta(2\theta+1)(w_1 + 2w_3) + \theta(1-4\theta^2+2\theta)w_2 \end{bmatrix}$$

Since agent 2 and agent 3 has the same Katz-Bonacich centrality, their choices of occupation are identical so $w_2 = w_3$ and they will receive the same amount of subsidy. For the leader, our analysis of choice of occupation has proved that $w_1 \geq w_2$. Therefore. $s_1^* > s_2^* = s_3^*$ and leader receives higher subsidy than the peripheral agents. In an indiscriminative network where Katz-Bonacich centrality is identical for all agents, they should all receive the same amount of subsidy. And subsidy to an all-entrepreneur network is definitely higher than that offered to an all-employee network.

Proposition 8 (subsidy to restore first-best allocation)

(1) The first best effort level of agents is higher than the marker equilibria since agent is not aware of his positive influence on other's utility.

(2) Government could restore the social best by offering agent i an amount of per effort subsidy equivalent to $s_i = \theta \sum_j^n g_{ij} e_j$

(3) Leaders receive higher subsidy than peripheral agents in the network and subsidy to entrepreneurs is higher than employees.

Under this subsidy policy, the gap in utility would widen since entrepreneurs and leaders, who are superior in payoff level or possession of social capital, are subsidized more. However, it is also possible that such subsidy policy would serve as an incentive for employees to increase their skill level in order to benefit more from this policy. Consequently, the entrepreneurship rate is likely to increase. In reality, such discriminative policy is difficult to implement considering the difficulty in acquiring personal information and the corresponding huge cost. Yet, a "one-size-fit-all" subsidy would discourage the employee from investing in business. They could avoid the cost of entrepreneurial activities while enjoying the same level of compensation as the entrepreneurs. In marginal region, this would be harmful to the recovery of local economy. Hence, it is important to strike a balance between the two parts.

4.5 Conclusion

Social context has a significant influence on entrepreneurial decision making. It is especially true for marginal region where network is cohesive and social contacts are highly valued. In this section, we try to explain the entrepreneurship decision making process of residents in marginal region by considering the function of social network.

The result shows that when there is complementary effect among people's productive efforts, agents who occupy more central positions in the network are motivated to devote more to economic activities. The centrality in then network could be well captured using the weighted Katz-Bonacich centrality measurement, which evaluates one's position in the network based on the socializing scale (how many people one is connected to) and the attributes of the neighbors (payoff level of the neighbors). It is always true that a closer and more complete network would have higher influence on individual behaviors since the network effect should be stronger. Given the expected utility through social interaction, the choice of whether to become entrepreneur or remain as employee differs. Since the socially central agents in the network have higher expectations from the network effect, they are more likely to become entrepreneurs. More generally, in a region where the average social capital possession is higher, entrepreneurship rate will also be higher when keeping other conditions the same. Needless to say, the cost of entrepreneurship and the marginal payoff as an entrepreneur are also important criteria for the decision makers. A lower cost and more significant improvement in payoff make entrepreneurial activities more attractive to the agents.

This has some implications for government in marginal regions when they aim to encourage entrepreneurship. Though restricted by population density and poor economic condition, high social cohesiveness could be a contributor of the improvement. Therefore, more attention should be paid to consolidating regional social network in order to build up social capital. From a financial perspective, a more direct approach is to offer subsidy to potential entrepreneurs, which we have discussed in detail in this research. Entrepreneurship is generally characterized as a risky and innovative behavior entailing high initial input. Access to subsidy improves the situation by reducing the early stage cost for entrepreneurs. Another aspect deserving more attention is the construction of a more favorable marker environment. Limitation of market size is one of the main obstacles for the increase in profitability. This also pushes the entrepreneurial threshold upwards as the expectation for a significant improvement

in income is low. It is therefore necessary to open up the market for local entrepreneurs by establishing more connections with the outside. For example, government could act to facilitate cross-regional collaboration in the marketing of local products or intensify the promotion of local products to consumers outside the region.

Our discussion on the policy choice for government also brings out the importance of policy customization. The network structure has a major influence on the choice of policy. When the structure is more complete, social capital tends to be higher in the region which is favorable for entrepreneurship. On the other hand, it also means higher homophily in individual behaviors. This asks for the policy to be more far-reaching in order to avoid generating the feeling of unfairness or resulting in dissatisfaction against the government among local residents. When the network features some powerful leaders, a stepwise strategy is recommended. By targeting at highly-central agents(leaders) first, government is able to benefit from the self-reinforcing effect of the network mechanism and minimize its expenditure on subsidy. In this sense, cultivation of and support for local leaders are of great importance in regions where social ties are loose. Typically, in mountainous regions where residents are geographically separated and face-to-face communication is hampered by inconvenient transportation, the existence of a person who maintains close relationships with the scattered families and serves as the “hub” of community information might make a great difference to the situation.

As for the welfare issue, a discriminative policy is able to motivate employees to involve in entrepreneurial activities in pursuit of higher subsidy. Nevertheless, it is more costly and harder to implement than an indiscriminative one. So the government needs to balance between their objective and the cost of policy based on the stage of local development as well the social and economic condition.

Appendix 4

Then we turn to the solution of equilibrium effort under equation (4.2). (4.2) can be rewritten as follows:

$$u_i^*(e_i) = w_i e_i - \frac{1}{2} e_i^2 + \theta \sum_{j=1}^{n} g_{ij}^E w_h e_i e_j + \theta \sum_{j=1}^{n} g_{ij}^W w_0 e_i e_j \quad (A\ 4.1)$$

g_{ij}^E and g_{ij}^W denote agent i's link with entrepreneurs and employees respectively. The first order condition gives the effort choice for each agent as is represented by (A4.2)

$$\bar{e_i}^*(w_i, w_{-i}, g) = w_i + \theta w_h \sum_{j=1}^{n} g_{ij}^E e_j^* + \theta w_0 \sum_{j=1}^{n} g_{ij}^W e_j^* \quad (A\ 4.2)$$

in matrix form we have

$$\mathrm{E}^* = W + \theta W_h G^E \mathrm{E}^* + \theta W_0 G^W \mathrm{E}^*$$

and $G^E + G^W = G$. We rank the agents according to their marginal payoff so that entrepreneurs occupy the first p rows of G and employees occupy the rest q rows. E^* and W are n-dimensional column matrix of agent's effort and marginal payoff correspondingly. W_h is a $n \times$ n scalar matrix with all its first p main diagonal entries equal to w_h and the rest being 0, and W_0 is a $n \times$ n scalar matrix with all its last q main diagonal entries equal to w_0 and the rest being 0. We still denote where $\rho(G)$ as the spectral radius of matrix G, then we come up with the following conclusion.

Proposition 9 (equilibrium effort in a network with weighted complementary effect) ***In the case where the 'quality' of social ties is considered which means payoff from social interaction is weighted by the payoff level of the neighbors, then if*** $\boldsymbol{\theta\rho(W_h G^E + W_0 G^W) < 1}$ ***holds, the best-reply to utility function (4.2) has a unique interior Nash equilibrium given by***

$$\bar{\boldsymbol{e_j}}^* = (\boldsymbol{I - \theta W_h G^E - \theta W_0 G^W})^{-1} \boldsymbol{W} \quad (\boldsymbol{A\ 4.3})$$

The proof of proposition 9, we can use the same arguments as in proof of proposition 15

in Verdier & Zenou, 2017. This result is quite similar to the one obtained under equation (4.1). Yet the influence from entrepreneurs and employees are separated and assigned with a weight consistent with their payoff level. In this manner, entrepreneurs' behaviors become more influential to the network.

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Chapter 5

Microfinance and Entrepreneurship

The last two chapters focus on the economic and social environment for entrepreneurial entry respectively. In this chapter, we turn to the institutions. Despite the fact that a relatively low opportunity cost of entrepreneurship and rich endowment of social capital might facilitate spontaneous entrepreneurial behaviors in marginal region, there are still remaining problems such as the lack of entrepreneurial skills, inaccessibility to funding, etc.. Therefore, it is also necessary to consider the approaches that support the actual implementation of business plans by easing these challenges.

In recently years, the rise of the microfinance industry has caught wide attention. One common objective of these projects is capacity building for the poor, which is usually achieved by empowering micro-entrepreneurs. Operations of microfinance differ in their practices and scales. What arouses our interest is those organized within communities. This type of microfinance allows for active involvement in economic activities by community members and is therefore considered to be more beneficial to the sustainability of local economic development. Additionally, since they are organized locally, it means microfinance organization has a better control of the information of borrowers. This could help mitigate the problem of low repaying rate, which is one of the most common problems for microfinance organizations. An early version to is the Rotating Credit Associations (ROSCA), which functions by gathering fixed contributions from its members to be distributed in turn, as a whole, inside the association (Ardener, 1964). Along with active engagement in business world by social enterprises, new attempts in this field such as the Grameen Foundation, featuring group lending, achieve fruitful results. Following the spread of microfinance, a lot of

researches have been done to evaluate the operation and effectiveness of microfinance based on empirical cases. Nevertheless, our research adopts a theoretical perspective.

In this chapter, we construct a framework of microfinance service in marginal region where micro-entrepreneurs are supported by investments from local people. This framework is similar to micro-equity discussed in the paper of Pretes (2002). In his work, micro-equity is referred to as grants provided without expectation for shares or profits, but in seek of social benefits. Providers of micro-equity are driven by 'the interest in developing the community's social equity — the desired goals of sustainability, economic development, generation of new products and services and other community benefits.' Our model associates the motivation behind investments with the pursuit of product diversity, which enhances the utility from consumption for local people and facilitates market growth. In addition to analyzing the influence of microfinance service on entrepreneurial activities, we are also concerned about the investment decision making of local residents in marginal region. We would like to identify the factors that determine the equilibrium on the market and find out the relationship between local investments and entrepreneurial activities.

Specifically, we consider the case in a region with close economy and all products are provided exclusively by M local enterprises. These enterprises compete on the monopolistic market. We follow the benchmark model proposed by Dixit and Stiglitz (1977). Each enterprise produces only one single type of variety. Due to poor local economic condition and the disadvantages as microenterprises, they are in need of financial support during the start-up stage. There are N local residents who are potential investors. We assume there to be some kind of microfinance institution or organizations, who gathers the investments and distributes them to support entrepreneurial entry in the region in pursuit of an increase in local economic vitality. Since consumers have preference for variety, the more diverse the product structure is, the higher utility they get. Local residents therefore expect an increase in their

consumption utility after the investment, which is considered to be the motivation behind this behavior. Their decision making process follows a two-stage movement. In the first stage, they decide whether to invest or not. In the second stage, they choose their level of consumption with the income residual. We derive the equilibrium number of enterprises and investors in the long term when free entry condition drives the profit of firms to zero. In our research, to simplify the analysis, we assume the behaviors of enterprises to be symmetric. This means that all the enterprises face the same demand and adopt the same production and pricing strategy.

This chapter is organized as follows. In the next section, we give a brief review on the development of microfinance and its contribution to entrepreneurial activities, based on which we are able to develop the model with more details. The third section presents a model to follow the movements of entrepreneurs and local investors. It approaches the equilibrium in the long term and illustrates the relationship between investment behavior, consumption and entrepreneurial entry. We also discuss the case where household income is too low for spontaneous investment to show up and how the government should react by subsidizing initial stage investors. The fourth section offers an exemplary analysis by specifying the model. Finally, the last section concludes the findings and provides some policy suggestions.

5.1 Microfinance in support of entrepreneurial activities

Emergence of microfinance is considered as a remarkable accomplishment in the past few decades as it renovates the financial system by proving that the economically disadvantageous are actually bankable (Woller, 2002). Generally, microfinance consists of micro-credit, micro-savings, micro-insurance and money transfer for the poor (Duvendack et al., 2011). Enterprise lending, which facilitates enterprise formation and development, composes one of its primary services (Brau & Woller, 2004). With the animating motivation of poverty alleviation, microfinance is expected to ensure

sustainable income growth by means of enhancing investment in economic activities and diversifying the sources of income (Hermes and Lensink, 2011).

Early MFIs usually feature a funding system with subsidies from government, aid agencies or multinational banks etc. (Tchuigoua, 2014). In later 20th century, the argument for financial sustainability of MFIs shifted the focus from subsidy-dependence to private investor attraction, which emphasizes an integration of social and commercial objectives (Cull et al., 2009). And this tendency inevitably puts more emphasis on entrepreneurship-supporting microfinance services. A boom of investment then follows in early 21st century. New players started to enter the capital market, especially those devoted to social responsible investing (Reille & Forster, 2008). These investors are pursuing social benefits from their investments to entrepreneurs and probably expect less capital return, only enough to cover inflation (Estapé-Dubreuil et al., 2012). Funding structure is significantly influenced by the type of the organization. Large organizations, such as the ASA and Bandhan Bank, operate with a cross-community or even cross-border scale. They are often motivated by more ambitious goals and able to attract donations and financial subsidies. On the other hand, community member investments consist of an important part of the funding for localized microfinance institutions in pursuit of regional revitalization. For example, in the US and UK, CDFIs(community development financial institution) which takes the form of community development bank, microenterprise development loan fund etc., play active roles in community development.[9] In Japan, under the concept of 'local finance for local development', NGO banks are set up in support of entrepreneurs with findings collected from citizens (Nagasaka, 2013).

The function of microfinance in enhancing entrepreneurship has been discussed by many scholars either based on empirical cases (Field et al., 2013; Maru & Chemjor, 2013; Babajide, 2012) or from a qualitative perspective (Bruton et al., 2011).

[9] http://cdfi.org/about-cdfis/cdfi-types/

Micro-entrepreneurs, the main targets of microfinance service, are faced up with growth issues as a result of inaccessibility to capital, lack of training and poor facilities (Grosh and Somolekae, 1996). While the most fundamental and direct benefit microfinance offers to entrepreneurs is availability of financial resources, it also facilitates entrepreneurial activities through other ways. The research by Newman et al.(2014) points out that in addition to business support, microfinance also provides occasions for social interaction, during which psychological and social capital of the entrepreneur is strengthened. Psychological capital has a positive impact on the creation and growth of enterprises by consolidating emotionally feeling confidence and hope. On the other hand, social capital functions through the spillover effect of communication that accelerates the spread of information and identification of opportunities. Pretes' (2002) research notes that microfinance is able to reduce transaction cost since it involves no collection efforts and entails less processing costs. Similarly, Park and Ren (2000) also mention that microfinance reduces transaction cost by getting rid of the traditional banking structure.

5.2 The model

In this research, we are interested in within-community microfinance, which is funded exclusively by local investors in support of micro-entrepreneurs. In marginal regions where external capital is hardly accessible, this type of self-sustaining financial group should be of great importance to local development. For one thing, it provides new sources of funding for local micro-entrepreneurs who are marginalized in conventional financial markets. For another, by circulating capital possessed by local people, it is expected to facilitate long-term sustainable development of local community. Since in most of the empirical cases, investors of community microfinance are concerned more about common goals, they show attributes of social investors. Therefore, we consider potential local investors to be motivated by indirect returns related to overall social improvement rather than direct economic profits. For the receiver of microfinance, they

benefits from easier accessibility of start-up capital and spillover of information within the microfinance group, which allow them to cut down on the cost at the initial stage of their business operation. We would like to find out how microfinance influence entrepreneurial activities in marginal region and which factors determine the intention of local residents to make investments.

To model the decision making process, we set the case in a marginal region without trade with the outside world. Migration is not considered in this model. M microenterprises produce in the region, providing one type of heterogeneous product each and competing on the monopolistic market. Productivity and cost is assumed to be the same for all microenterprises. There are N households in the region with heterogeneous income, which we assume to be uniformly distributed between an interval of w_{min} and w_{max}. Households consume with all their income on local markets and their consumption shows preference for variety. There is also a microfinance institution in the region that receives investments from local households and distributes them among microenterprises to support their business operations.

We focus on the long-term equilibrium where the number of microenterprises is endogenously determined under free entry condition. The existence of microfinance institution associates investors and microenterprises, and allows us to approach the relationship between local investment and entrepreneurial entry. Additionally, consumption utility in the region is also given by the equilibrium based on which social welfare is evaluated.

5.2.1 The market equilibrium

Households get utility from consumption of local products available on the market. Their preference for product diversity is captured by the classic CES utility function.

$$u_j = \left[\int_0^M {q_i^j}^{\rho} di\right]^{\frac{1}{\rho}} \qquad (5.1)$$

$$\sigma = \frac{1}{1-\rho}$$

$$\int_0^M p_i q_i^j di + s_{j,k} = w_j \qquad (5.2)$$

$$s_{j,k} = \begin{cases} s\ (s < w_{min}), & if\ k = 1 \\ 0, & if\ k = 0 \end{cases}$$

For household j, its utility is given by equation (5.1). q_i^j is the demand of household j for variety i and σ is the elasticity of substitution between different varieties. The income budget of the household is given by equation (5.2). p_i is the price for variety i. $s_{j,k}$ depends on the choice of investment. $k = 1$ means the household chooses to make an investment equivalent to s, otherwise $k = 0$, the household makes no investment and $s_{j,k} = 0$.

The utility maximization behavior of households determines the demand for each variety q_i, the utility from consumption u_j and the price index P on the market.

$$q_i^j = \frac{w_j - s_{j,k}}{{p_i}^{\sigma} P^{1-\sigma}}$$

$$q_i = \int_0^N q_i^j dj = \frac{1}{{p_i}^{\sigma} P^{1-\sigma}} \int_0^N \left(w_j - s_{j,k}\right) dj \qquad (5.3)$$

$$P = \left[\int_0^M {p_i}^{1-\sigma} di\right]^{\frac{1}{1-\sigma}} \qquad (5.4)$$

$$u_j = \frac{w_j - s_{j,k}}{P} \qquad (5.5)$$

On the monopolistic market, each microenterprise produces one variety. For a typical microenterprise i, in additional to a variable cost c_i for each unit of product, the establishment of the microenterprise induces a fixed cost f_i. Its profit function is given

as follows.

$$\pi_i = (p_i - c_i)q_i - f_i \qquad (5.6)$$

To maximize the profit, the microenterprise will adopt a pricing strategy where

$$p_i = \frac{1}{\rho} c_i$$

Given the assumed symmetry, cost and production are identical across microenterprises. Let us assume the per unit variable cost to be c and the fixed cost to be f. The free entry condition gives the equilibrium number of microenterprises.

$$\pi_i = (p_i - c)q_i - f = 0$$
$$M = \frac{\int_0^N (w_j - s_{j,k}) dj}{\sigma f} \qquad (5.7)$$

For the microfinance institution, it supports local microenterprises with the investments of local residents. Many scholars discuss the factors that influence the performance of microfinance, such as the role of loan officers (Siwale & Ritchie, 2012), endowment of capital for lending (Mukama et al., 2005), the macroeconomic context (Ahlin et al., 2011). In our model, we focus on two factors particularly, the investment quota s and the number of investors n, which together determine the total disposable capital for the institution. In the research of Mukama et al. (2005), it is noted that capital inadequacy is one of the most significant constraints on the operation of microfinance. Therefore, it is reasonable to think that an increase in disposable capital is able to boost the performance of the microfinance institution, which benefits microenterprises consequently with better service quality. For example, the duration for a request of financial support could be shortened. Therefore, we assume that the fixed cost of microenterprise is a function of the total investments. Denote the number of investors n,

we specify a function $f = F(ns)$ to show their relationship. And according to our assumption, fixed cost decreases when the aggregate investment increases, so we have $F'(ns) < 0$. However, the marginal effect of cost reduction is considered to show decreasing return to scale and therefore $F''(ns) > 0$ and we also assume that $\lim_{n\to\infty} F(ns) = F_0$.

Then, we are able to rewrite the equilibrium number of heterogeneous microenterprises as a function of investors

$$M(n) = \frac{1}{\sigma F(ns)}\left[(w_{max} + w_{min})\frac{N}{2} - ns\right] \qquad (5.8)$$

Differentiating $M(n)$, we get the following function

$$M'(n) = \frac{-s^2 F(ns) - s\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]F'(ns)}{\sigma F(ns)^2}$$

Proposition 1 equilibrium number of firms

When the marginal contribution of new investment to cost reduction is significant enough so that

$$\left|\frac{\mathbf{s}}{(\boldsymbol{w_{max}} + \boldsymbol{w_{min}})\frac{\boldsymbol{N}}{\mathbf{2}} - \boldsymbol{ns}}\right| < \left|\frac{\boldsymbol{F'(ns)}}{\boldsymbol{F(ns)}}\right| \qquad (\mathbf{5.9})$$

is satisfied, then as more households make investments to support entrepreneurial activities in the region, product diversity is expected to increase.

The right side of equation (5.9) is the proportion of the marginal reduction in cost to the total cost. And the left side denotes the proportion of individual investment to the total expenditure on consumption. Since investment behavior reduces the expenditure households spend on consumption, it would have negative effect on the total demand

and restrain the entry of new enterprises. On the other hand, the reduction in cost owing to the investment contributes to new entry behavior. The result shows that the required amount of investment per person and to what degree are these investments effectively used to reduce fixed cost are of great importance. In order to vitalize local economy through continuous growth of product diversity, the investment quota should not be too high, yet the utilization of the limited amount of investments needs to be highly efficient. This finding is consistent with the argument by Bruton et al. (2015). They point out that a low minimum threshold amounts for investment is important to expand participation.

Substituting equation (5.4), (5.8) into (5.5), we could calculate the total utility from consumption in the region.

$$U = \int_0^N u_j = \frac{(w_{max} + w_{min})\frac{N}{2} - ns}{P}$$

$$= \frac{(\sigma - 1)}{\sigma^{\frac{\sigma}{\sigma-1}} c} \cdot \left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^{\frac{\sigma}{\sigma-1}} \cdot F(ns)^{\frac{1}{1-\sigma}} \qquad (5.10)$$

Proposition 2 consumption utility

Changes in the total consumption utility depends on the effectiveness of cost reduction, when

$$\left|\frac{\boldsymbol{\sigma}}{(\boldsymbol{w_{max}} + \boldsymbol{w_{min}})\frac{\boldsymbol{N}}{\boldsymbol{2}} - \boldsymbol{ns}}\right| < \left|\frac{\boldsymbol{F'(ns)}}{\boldsymbol{F(ns)}}\right|$$

is satisfied, the increase in investors would contribute to the increase in consumption utility.

Similar to proposition 1, the differentiation of the utility function shows that the changes in total utility from consumption in the region also depend on the cost reduction effect of the investments. But in this case, the elasticity of substitution between varieties

makes a difference. When the elasticity of substitution is high, it is more difficult to enhance consumption utility. It is easy to capture this point since when different varieties are highly substitutable, the increase in utility through a more diversified product structure will be less significant.

5.2.2 Decision making

(1) The threshold

Based on the above discussion, we then approach the decision making process of household investments. Consider there are already n investors in the region. The utility for household j before and after the investment is represented by $u_{j,0}$ and $u_{j,1}$ respectively. Then, under ration choice, the sufficient condition for agent j to make investment is given as follows

$$u_{j,1} \geq u_{j,0}$$
$$\frac{w_j - s}{M^{\frac{1}{1-\sigma}}(n+1)} \geq \frac{w_j}{M^{\frac{1}{1-\sigma}}(n)} \qquad (5.11)$$

which is equivalent to

$$w_j \geq \frac{s}{1-[\varphi(n)]^{\frac{1}{1-\sigma}}} \qquad (5.12)$$
$$\varphi(n) = \frac{M(n+1)}{M(n)} = \frac{F(n)P(n)}{F(n+1)}$$
$$P(n) = \frac{(w_{max}+w_{min})\frac{N}{2} - (n+1)s}{(w_{max}+w_{min})\frac{N}{2} - ns}$$

Denote $w^* = \frac{s}{1-[\varphi(n)]^{\frac{1}{1-\sigma}}}$. When the actual wage is above w^*, household j is expected to have their utility increased after the investment and therefore get involved. Otherwise, no investment is made. In other words, w^* can be captured as the threshold wage for

investment and the choice of investment depends on the income level of the household. This can be supported by previous researches on the investment behaviors of households, pointing out that wealth is an important determinant of the attitude towards risk (Pratt, 1964; Arrow, 1965). For example, Calvet's (2007) analysis of Swedish data shows that financial sophistications are more risk-bearing when making investments. Similary, Guiso and Paiella (2008) also show that risk aversion decreases with household endowment.

We follow the process at discrete time points and each time only one household makes the decision. Since households with higher wage is more likely to invest, we assume that the households with the highest income is the first to face the investment choice and the decision making order is consistent with the wage order. As decision making process continues the wage threshold changes with the increase in investors.

In equation (5.12), $\varphi(n)$ captures the increasing rate of variety on the market. Straightforwardly, the threshold is a decreasing function of $\varphi(n)$, as we can see from equation (5.13). It is explained by the fact that when the increase in variety is more significant, households are expecting greater improvement in consumption and are more easily motivated to make investment. $\varphi(n)$ depends on the cost reduction effect represented by $\frac{F(n)}{F(n+1)}$ and the decreasing rate of total expenditure on consumption represented by $P(n)$. While the cost reduction effect contributes to the increase in product diversity, increase in the number of investors reduces total expenditure on consumption and this would make the decreasing rate caused by any additional investment more and more significant. In other words, while $\frac{F(n)}{F(n+1)}$ positively influences $\varphi(n)$, its effect is counterbalanced by $P(n)$.

$$\frac{\partial w^*}{\partial n} = \frac{\partial w^*}{\partial \varphi(n)} \frac{\partial \varphi(n)}{\partial n} = -\varphi'(n)$$

$$\varphi'(n) = \frac{[F'(n)P(n) + F(n)P'(n)]F(n+1) - F(n)P(n)F'(n+1)}{F(n+1)^2} \qquad (5.13)$$

Define two new functions $F^*(n) = \frac{F'(n)}{F(n)}$, $P^*(n) = \frac{P'(n)}{P(n)}$, we are able to show that the value of $\varphi'(n)$ depends on the relative value of $P^*(n)$ and $F^*(n)$ (proof given in Appendix A5-3). Since $P^*(n)$ is always decreasing in n, we focus on the attributes of $F^*(n)$ in the following discussion.

Proposition 3 the wage threshold

1. ***The effect of decreasing return to scale in cost reduction and the marginal contribution of additional investment counterbalance each other.***
2. ***When the former effect is stronger, the threshold should increase as more and more households make investments.***
3. ***When the latter effect is stronger, we could expect a self-reinforcing process to show up in which the increase in investors lowers the threshold even further. But such effect would die down with the continuous growth of investors.***

$\varphi(n)$ decreases with n when

$$\frac{F''(n)}{|F'(n)|} > \frac{|F'(n)|}{F(n)}$$

stands, which corresponds to the second condition in proposition 3. The left side of this inequality shows the rate of decreasing return to scale while the right side shows the rate of decrease in fixed cost. Due to the convexity of $F(n)$, the contribution of addition investment is failing, which discourages investment in the long turn and counterbalances the motivation. However, at the initial stage, we can expect a relatively stronger effect of cost reduction. If it is strong enough so that

$$P^*(n) > F^*(n+1) - F^*(n) \qquad (5.14)$$

is satisfied, then a self-reinforcing effect would show up.

While $P^*(n)$ is doubtlessly a decreasing function of n, the value of the right side of inequality (5.14) is unclear and depends on the attributes of $F(n)$. Given the assumption that the fixed cost has a minimum limit value F_0, as *n* increases it would become more and more difficult for inequality (5.14) to be satisfied because $F^*(n+1) - F^*(n)$ approaches 0. Therefore, we can conclude that even when the self-reinforcing effect shows up, it would die down eventually as the number of investors increases.

(2) Equilibrium number of investors

The above analysis shows that with the continuous growth of the investors, the wage threshold would finally end up with an increasing trend anyway. And since we assume the decision making progress of households with higher wage to lower wage, there must be an equilibrium point where no more investor joins in.

Based on equation (5.12), we know that potential investors are those whose wage is above w^*. We first start from a no-investor occasion. In this case, for there to be at least one investor, it must be satisfied that $w_{max} - \frac{s}{1-[\varphi(0)]^{\frac{1}{1-\sigma}}} > 0$ and $s < w_{min}$. The maximum value of s should then be determined by $min\left\{w_{max}\left[1-[\varphi(0)]^{\frac{1}{1-\sigma}}\right], w_{min}\right\}$. At the equilibrium, the proportion of investors should satisfy equation (5.15).

$$\frac{n}{N} = \frac{w_{max} - w^*}{w_{max} - w_{min}} \qquad (5.15)$$

Let $g(n) = \frac{(w_{max} - w_{min})n}{N}$ and $h(n) = w_{max} - \frac{s}{1-[\varphi(n)]^{\frac{1}{1-\sigma}}}$, $g(n)$ is a linear function of n with a slope equals to $\frac{(w_{max} - w_{min})}{N}$. The larger the range of wage and the smaller the population size, the steeper the slope is. $h(n)$ is an increasing function of $\varphi(n)$, therefore its attributes depend on the attributes of $\varphi(n)$.

Proposition 4 equilibrium number of investors

When the household with the highest income falls above the threshold, which is given by $\boldsymbol{w_{max} - \frac{s}{1-[\varphi(0)]^{\frac{1}{1-\sigma}}} > 0}$***, spontaneous investment shows up and there will either be a case in which everyone invests or investment stabilizes at some equilibrium point. The condition for an equilibrium to exist is given by*** $\boldsymbol{\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > w_{min}}$.

According to our analysis above, we identify three cases.

(1) When $\forall n \in N$, $\frac{F''(n)}{|F'(n)|} > \frac{|F'(n)|}{F(n)}$ or $\frac{F''(n)}{|F'(n)|} < \frac{|F'(n)|}{F(n)} \wedge P^*(n) < F^*(n+1) - F^*(n)$, $\varphi(n)$ is a decreasing function of n as is shown in Fig. 1. If $\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} \leq w_{min}$, then all households would invest. Otherwise, an equilibrium state exists where there are n^* investors. n^* is given by

$$\frac{(w_{max} - w_{min})n^*}{N} = w_{max} - \frac{s}{1-[\varphi(n^*)]^{\frac{1}{1-\sigma}}}$$

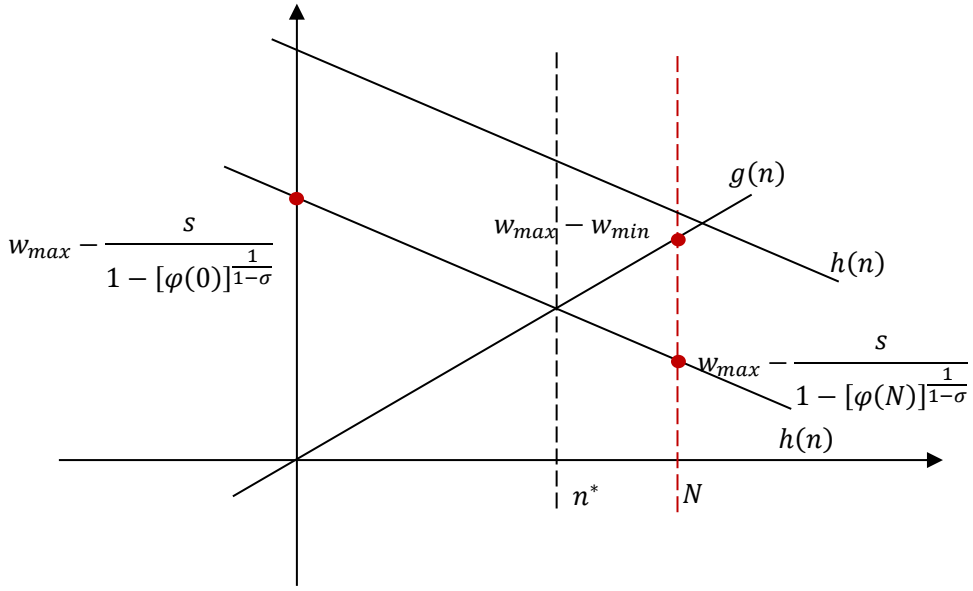

Figure 5.1 Case 1 when φ(n) is monotonously decreasing

(2) When $\forall n \in N$, $\frac{F''(n)}{|F'(n)|} < \frac{|F'(n)|}{F(n)} \wedge P^*(n) > F^*(n+1) - F^*(n)$, $\varphi(n)$ is an increasing function of n. From Fig 2 we know that the condition for there to be an equilibrium is the same as in the first case, which is given by $\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > w_{min}$. Otherwise, all households are expected to invest.

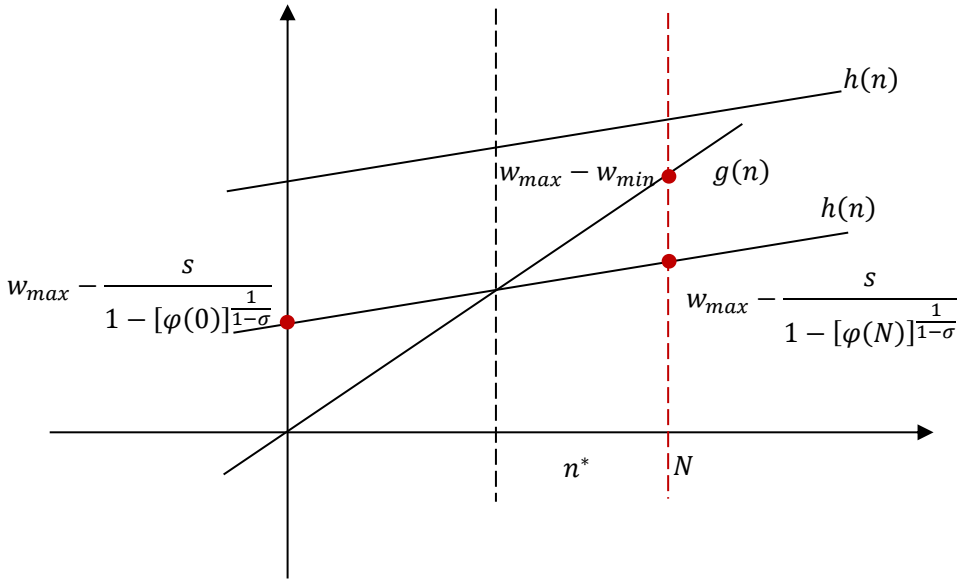

Figure 5.2 Case 2 when φ(n) is monotonously increasing

(3) If there exists $n° \in [0, N]$ for $n \in [0, n°]$, $\frac{F''(n)}{|F'(n)|} < \frac{|F'(n)|}{F(n)} \wedge P^*(n) > F^*(n+1) - F^*(n)$ and for $n \in [n°, \mathrm{N}]$, $\frac{F''(n)}{|F'(n)|} < \frac{|F'(n)|}{F(n)} \wedge P^*(n) < F^*(n+1) - F^*(n)$, $\varphi(n)$ is increasing on the interval of $[0, n°]$ and decreasing on $[n°, \mathrm{N}]$. Since we have $w_{max} - \frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > 0$, there will be at most one equilibrium point and it exists when $\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > w_{min}$. Otherwise, all households invest.

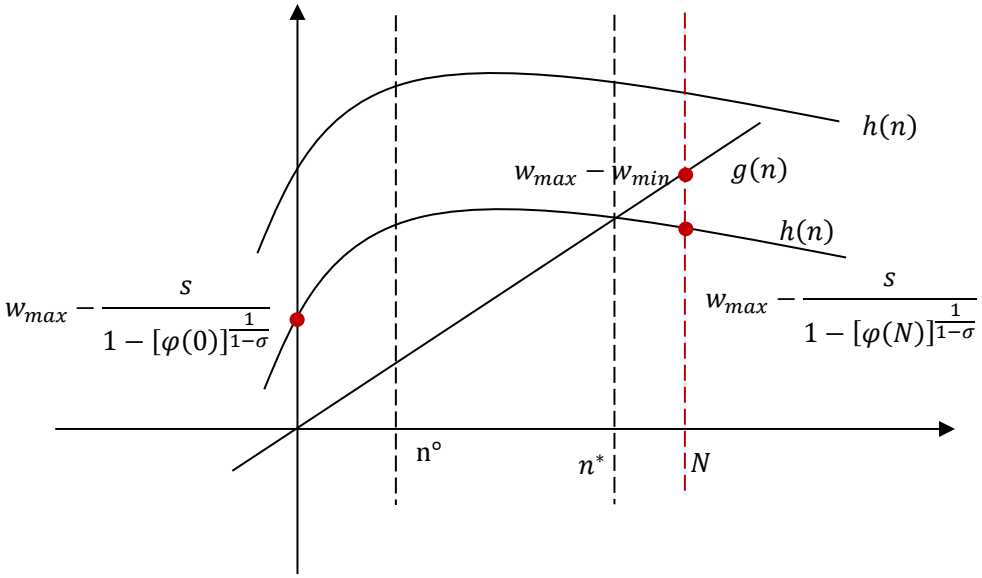

Figure 5.3 Case 3 when φ(n) is concave

From the figures, n^* is the cross of $g(n)$ and $h(n)$. When $g(n)$ is steeper or when the position of $h(n)$ is lower, n^* has a lower value. This indicates that when the wage gap is bigger or when the investment amount s is larger, there would be fewer investors at the equilibrium state. Also, the elasticity of substitution makes a difference. Differentiation of w^* with respect to σ, it is easy to show w^* is an increasing function of σ. When the elasticity of substitution increases, it becomes more difficult to motivate local investments due to the decrease in consumption utility.

In conclusion, when $s < min\left\{w_{max}\left[1-[\varphi(0)]^{\frac{1}{1-\sigma}}\right], w_{min}\right\}$ is satisfied, there will either be a case where all households invest or where an equilibrium is reached at n^*. The sufficient condition for equilibrium to show up is given by $\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > w_{min}$. This result shows that the amount of investment per household has a significant influence on the final state. This amount is exogenous and we can consider it to be determined by the institution. The smaller the amount is, the more motivated local residents to make the investment. But again, limited amount of investment would also hamper the proper function of the institution. Therefore, depending on the capability of the institution, the design of the policy is of great importance.

(3) Government subsidy

In the previous analysis, we discuss the decision making process starting from no investor. However, in regions where economic condition so poor that $w_{max} \leq \frac{s}{1-[\varphi(0)]^{\frac{1}{1-\sigma}}}$, spontaneous investment is not expected to show up. In this part, we consider the situation in which the government subsidizes some households with relatively lower thresholds at the initial stage to encourage follower investors. We rank all households in the region according to their income and assume that the government subsidizes t households in the region, whose income rank highest.

In case 1, since $\varphi(n)$ is a decreasing function of n, it is obvious that subsequent investments are not possible to be motivated since the threshold increases with the number of investor.

In case 2 and case 3, when $\varphi(n)$ is an increasing function of n, by subsidizing initial investment government can lower the threshold of participation. And the minimum number of investors to be subsidized is determined by equation (5.16). This equation captures the condition that the coverage of government subsidy should be wide enough

to intrigue spontaneous entrepreneurship. Particularly, in case 3, t should be smaller than n°.

$$w_{t+1} \geq \frac{s}{1-[\varphi(t)]^{\frac{1}{1-\sigma}}} \qquad (5.16)$$

When this condition is satisfied, the following process is the same as what we have discussed previously. When $\frac{s}{1-[\varphi(N)]^{\frac{1}{1-\sigma}}} > w_{min}$, investment will stabilize at some point n^*, otherwise all households are expected to invest. n^* denotes the number of subsequent investors in the region, which is given by the equation below. And the region will finally end up with $n^* + t$ investors.

$$\frac{(w_{t+1} - w_{min})n^*}{N-t} = w_{t+1} - \frac{s}{1-[\varphi(n^*)]^{\frac{1}{1-\sigma}}}$$

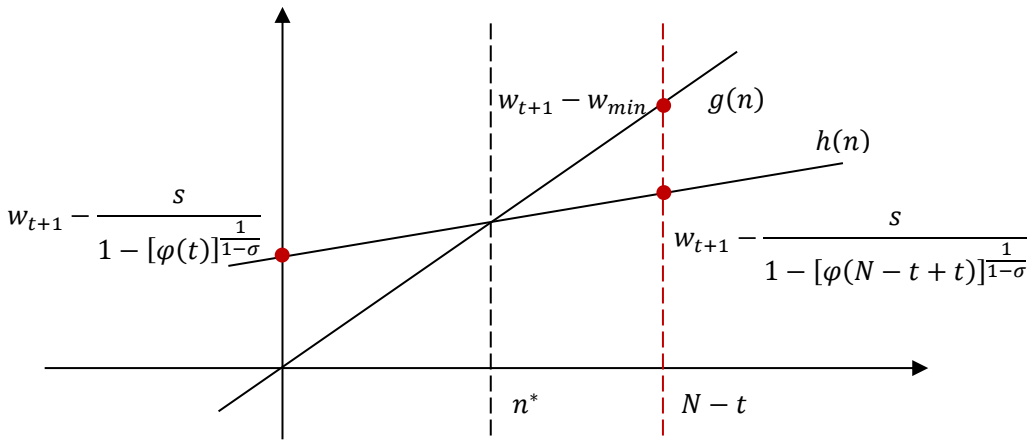

Figure 5.4 Government subsidizes when φ(n) is monotonously increasing

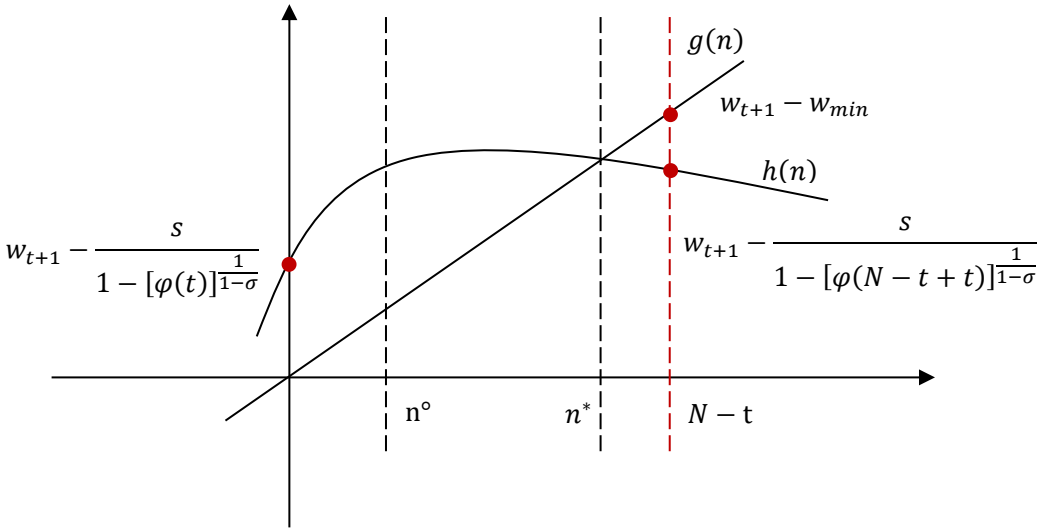

Figure 5.5 Government subsidizes when φ(n) is concave

5.3 Application of the model

To illustrate the previous results, we specify the fixed cost function as equation (5.17).

$$F = F_0 + \frac{s}{n} \qquad (5.17)$$

In this case, the number of variety on the market, consumption utility and the wage threshold is given as follows.

$$M(n) = \frac{n}{\sigma(nF_0 + s)}\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]$$

$$U = \frac{(\sigma-1)}{\sigma^{\frac{\sigma}{\sigma-1}}c} \cdot \left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^{\frac{\sigma}{\sigma-1}} \cdot \left(F_0 + \frac{s}{n}\right)^{\frac{1}{1-\sigma}}$$

$$w^* = \frac{s}{1-[\varphi(n)]^{\frac{1}{1-\sigma}}}$$

$$\varphi(n) = \frac{(w_{max} + w_{min})\frac{N}{2} - (n+1)s}{(w_{max} + w_{min})\frac{N}{2} - ns} \cdot \frac{n+1}{\mathrm{n}} \cdot \frac{nF_0 + s}{(n+1)F_0 + s}$$

We first look and the wage threshold and the existence of equilibrium state. The differentiation of $\varphi(n)$ is shown in equation (5.18).

$$\varphi'(n) = \frac{-s^2}{\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^2} \cdot \frac{n+1}{\mathrm{n}} \cdot \frac{nF_0 + s}{(n+1)F_0 + s} - \frac{1}{n^2}$$
$$\cdot \frac{(w_{max} + w_{min})\frac{N}{2} - (n+1)s}{(w_{max} + w_{min})\frac{N}{2} - ns} \cdot \frac{nF_0 + s}{(n+1)F_0 + s} - \frac{{F_0}^2}{[(n+1)F_0 + s]^2}$$
$$\cdot \frac{(w_{max} + w_{min})\frac{N}{2} - (n+1)s}{(w_{max} + w_{min})\frac{N}{2} - ns} \cdot \frac{n+1}{\mathrm{n}} < 0 \qquad (5.18)$$

$\varphi(n)$ is a decreasing function of n so the growth in investors is always pushing up the threshold wage even higher.

$$\varphi(0) = \frac{(w_{max} + w_{min})\frac{N}{2} - s}{(w_{max} + w_{min})\frac{N}{2}} \cdot \frac{s}{F_0 + s}$$

The maximum investment s_{max} set by the institution should be smaller than $min\left\{w_{max}\left[1 - \left[\frac{(w_{max}+w_{min})\frac{N}{2}-s}{(w_{max}+w_{min})\frac{N}{2}} \cdot \frac{s}{F_0+s}\right]^{\frac{1}{1-\sigma}}\right], w_{min}\right\}$. And the lower the value of s, the more investors there will be.

Differentiation of $M(n)$ and U is given as follows

$$M'(n) = \frac{-sF_0n^2 - 2s^2n + s(w_{max} + w_{min})\frac{N}{2}}{\sigma(nF_0 + s)^2}$$

$$U' = \frac{s}{\sigma^{\frac{\sigma}{\sigma-1}}c} \cdot \left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^{\frac{1}{\sigma-1}} \cdot \left(F_0 + \frac{s}{n}\right)^{\frac{1}{1-\sigma}} \left\{\frac{\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]}{(F_0 n^2 + sn)} - \sigma\right\}$$

The number of variety is expected to increase when ${n_1}' \leq \frac{\sqrt{4s^2+2F_0N(w_{max}+w_{min})}-2s}{F_0}$ and the total utility increases when ${n_2}' \leq \frac{\sqrt{(\sigma+1)^2s^2+2\sigma F_0(w_{max}+w_{min})N}-(\sigma+1)s}{2F_0\sigma}$. This indicates that the increase in the number of variety does not necessarily contribution to the increase in total utility. Then, with a development-oriented policy, the institution would like to end up with the number of investors increases to as close as to $\frac{\sqrt{4s^2+2F_0N(w_{max}+w_{min})}-2s}{F_0}$. While with a welfare-oriented policy, it is more desirable if the number of investors approximates $\frac{\sqrt{(\sigma+1)^2s^2+2\sigma F_0(w_{max}+w_{min})N}-(\sigma+1)s}{2F_0\sigma}$. When the population size is smaller than ${n_1}'$ and ${n_2}'$, the most desirable result is when all households participate. Then institution needs to set the investment amount s to satisfy

$$s \leq min\left\{\begin{array}{l} w_{max}\left[1 - \left(\frac{(w_{max} + w_{min})\frac{N}{2} - s}{(w_{max} + w_{min})\frac{N}{2}} \cdot \frac{s}{F_0 + s}\right)^{\frac{1}{1-\sigma}}\right], \\ w_{min}\left\{1 - \left[\frac{(w_{max} + w_{min})\frac{N}{2} - (N+1)s}{(w_{max} + w_{min})\frac{N}{2} - Ns} \cdot \frac{N+1}{N} \cdot \frac{NF_0 + s}{(N+1)F_0 + s}\right]^{\frac{1}{1-\sigma}}\right\} \end{array}\right\}$$

When the population size exceeds ${n_1}'$ and ${n_2}'$, it is better to rise the investment amount to restrict the number of investors. And the value of s should be determined by the following functions, with s_1 for a development-oriented region and s_2 for a

welfare-oriented region.

$$s_1 = \left[w_{max} - \frac{(w_{max} - w_{min})n_1{}'}{N}\right]\left(1 - [\varphi(n_1{}')]^{\frac{1}{1-\sigma}}\right)$$
$$s_2 = \left[w_{max} - \frac{(w_{max} - w_{min})n_2{}'}{N}\right]\left(1 - [\varphi(n_2{}')]^{\frac{1}{1-\sigma}}\right)$$

5.4 Conclusion and policy implication

Institutional environment, especially those concerning the financial system is of great importance to entrepreneurial activities. In marginal region, where entrepreneurship is mainly hampered by inaccessibility to funding and high start-up cost, it is necessary to develop supportive institutions in pursuit of economic prosperity. The rapid spread and growth of microfinance in recent decades turns out to be a promising solution to the issue. In this chapter, we focus on microfinance services operating on a self-sustaining basis. Households, as social investors, are motivated by the development of local product markets, from which they expect an increase in consumption utility as well. Benefiting from the investment, microenterprises are able to reduce fixed cost of business start-up. The effectiveness of cost reduction depends on the capability of the microfinance institution and more importantly, on the total amount to investment. By constructing a microeconomic model, we figure out the relationship between local investment and entrepreneurial behavior and approach the equilibrium number of investors and enterprises. The results highlight several factors.

The effectiveness of cost reduction has a fundamental influence on the result. It directly determines new entrepreneurial entry and then affects the utility households receive from consumption. Since investment reduces the disposable income, households would lose the motivation to invest if the increase in products diversity resulting from new entrepreneurial entry is not significant enough. Therefore, it is a crucial subject to enhance the performance of microfinance service through building up the capability of

the microfinance institution. For one thing, the design of microfinance program should be improved to reduce the transaction cost and strengthen the efficiency. In addition, these institutions can also contribute to cost reduction by building and consolidating connections between their clients. As is pointed out by Newman et al. (2013), facilitation of social interaction is a crucial function of microfinance institution. Therefore, it is suggested that microfinance operators should diversify their service and offer occasions for the sharing of knowledge, technology and skill, as well as collaborations between the clients.

Smaller income gap and investment amount, as well as lower elasticity of substitution contribute to higher investment rate. This offers some implications for the policy design. Firstly, microfinance might be less effective in regions where income inequality is significant. Secondly, emphasis must be paid to achieve the balance between pursuit of higher investment rate and better performance of microfinance institution. Thirdly, local investments are expected to decrease in the long term as product market develops. In marginal region, elasticity of substitution is expected to be lower at the initial stage. It is due to the fact that backwardness of economic development causes the problem of inadequate supply of products, which turns out to be an urgent issue for these regions. Therefore, local investments would be especially beneficial to improvement in welfare at first. However, as product diversity increases and varieties become more substitutable, the effectiveness of local investments would be weakened.

In regions where income level is too low and spontaneous investment is impossible to achieve, it is meaningful for the government to subsidize initial investment only when local economic condition allows for a self-reinforcing process. This process refers to the phenomenon that as more investors join in, the threshold lowers and more investors show up. Nevertheless, it must be noted that the feasibility of government subsidy still depends on whether the benefits from investments are great enough so that some threshold households exist.

Appendix 5

A 5-1 Equilibrium number of firms

Differentiation of the equilibrium number of heterogeneous firms is given by (A 5.1)

$$M'(n) = \frac{-s^2F(ns) - s\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]F'(ns)}{\sigma F^2(ns)} \qquad (A\ 5.1)$$

$M'(n) > 0$ is satisfied when $-s^2F(ns) - s\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]F'(ns) > 0$

Since we have $s^2 > 0, F(ns) > 0, (w_{max} + w_{min})\frac{N}{2} - ns > 0$ and $F'(ns) < 0$, the above inequality is equivalent to

$$|sF(ns)| < \left|\left[(w_{max} + w_{min})\frac{N}{2} - ns\right]F'(ns)\right|$$

Rearranging the inequality, we have

$$\left|\frac{\mathrm{s}}{(w_{max} + w_{min})\frac{N}{2} - ns}\right| < \left|\frac{F'(ns)}{F(ns)}\right|$$

A 5-2 Consumption utility

Differentiation of the total utility from consumption in the region is given by (A 5.2)

$$U'(n) = \frac{(\sigma-1)}{\sigma^{\frac{\sigma}{\sigma-1}}c} \cdot \frac{s}{\sigma-1} \cdot \left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^{\frac{1}{\sigma-1}} \cdot F(ns)^{\frac{1}{1-\sigma}} \cdot \left\{-\sigma - \left[(w_{max} + w_{min})\frac{N}{2} - ns\right] \cdot \frac{F'(ns)}{F(ns)}\right\} \qquad (A\ 5.2)$$

Since $\frac{(\sigma-1)}{\sigma^{\frac{\sigma}{\sigma-1}}c} \cdot \frac{s}{\sigma-1} \cdot \left[(w_{max} + w_{min})\frac{N}{2} - ns\right]^{\frac{1}{\sigma-1}} \cdot F(ns)^{\frac{1}{1-\sigma}} > 0$, $U'(n) > 0$ is satisfied when $-\sigma - \left[(w_{max} + w_{min})\frac{N}{2} - ns\right] \cdot \frac{F'(ns)}{F(ns)} > 0$

$$\left|\frac{\sigma}{(w_{max} + w_{min})\frac{N}{2} - ns}\right| < \left|\frac{F'(ns)}{F(ns)}\right|$$

A 5-3 The wage threshold

The value $\varphi'(n)$ is determined by the following equation

$$[F'(n)P(n)+F(n)P'(n)]F(n+1)-F(n)P(n)F'(n+1)$$

When$[F'(n)P(n)+F(n)P'(n)]F(n+1)-F(n)P(n)F'(n+1)>0$, the threshold is decreasing in the number of investors. Rearranging the inequality, this condition equals to

$$F(n)P'(n)F(n+1)>F(n)P(n)F'(n+1)-F(n+1)F'(n)P(n)$$

$$\frac{P'(n)}{P(n)}>\frac{F'(n+1)}{F(n+1)}-\frac{F'(n)}{F(n)} \qquad \text{(A 5.3)}$$

Let's denote $F^*(n)=\frac{F'(n)}{F(n)}$, $P^*(n)=\frac{P'(n)}{P(n)}$. It is easy to show that $P^{*\prime}(n)<0$. Differentiation of $F^*(n)$ shows that when

$$\frac{F''(n)}{|F'(n)|}>\frac{|F'(n)|}{F(n)} \qquad \text{(A 5.4)}$$

$F^*(n)$ is an increasing function of n. In this case, the right side of the inequality (A 5.3) is larger than 0. Since $P(n)>0$ and $P'(n)<0$, the left side is smaller than 0, which means the opposite of (A 5.3) stands. This makes $\varphi(n)$ an decreasing function of n. Thus, we have $\frac{\partial w^*}{\partial n}>0$ and the threshold increases with the number of investors.

Otherwise, when

$$\frac{F''(n)}{|F'(n)|}<\frac{|F'(n)|}{F(n)}$$

$F^*(n)$ is a decreasing function of n. Therefore $\varphi(n)$ increases with n when $P^*(n)>F^*(n+1)-F^*(n)$ and decreases with n otherwise.

A 5-4 Influence of elasticity of substitution on wage threshold

$$\frac{\partial w^*}{\partial \sigma}=\frac{\mathrm{sln}\varphi(n)}{\left(1-[\varphi(n)]^{\frac{1}{1-\sigma}}\right)^2}\cdot\frac{[\varphi(n)]^{\frac{1}{1-\sigma}}}{(1-\sigma)^2}$$

since $\varphi(n)=\frac{M(n+1)}{M(n)}>1$, $\frac{\partial w^*}{\partial \sigma}>0$, so w^* is an increasing function of σ.

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Chapter 6

Conclusion

The pursuit of independent and sustainable development of marginal region brings out the importance of entrepreneurial activities, especially those involving local members. However, it remains difficult to activate entrepreneurship in marginal regions considering their disadvantageous conditions. In order to realize revitalization of these depleted regions, it is necessary to identify the most crucial factors that functions particularly under the marginalization context so that government and organizations can respond in a more effective and efficient way.

Our research is motivated by this task. Based on theories from sociology and economics and taking into account the unique background in marginal region, we find out three factors being of greatest importance to entrepreneurship in marginal region: entrepreneurial skill, social network and financial institution. We model the entrepreneurial decision making process respectively under these factors using microeconomic analytical method. This allows us to figure out how regional attributes influence the way these factors function. Here, we would like to conclude the main findings and implications we have derived so far.

6.1 Major determinants of entrepreneurship in marginal region

Entrepreneurial behavior is the collective result of various factors. According to major theories on entrepreneurial decision making, these factors can be categorized into personal ones and external ones. Personal factor refers to factors that are related to one's ability, personality or experience, which is exclusively possessed and could be controlled by the decision maker. External factors are those embedded in the

environment. They make up the situation where the decision maker behaves and are not fully controlled by him or her.

An examination of the current situations clarifies the main challenges as well as the strengths of marginal region in terms of entrepreneurship. Challenges come from the shortage of specialized knowledge, skill and accessibility of resources necessary for the conduct of entrepreneurial activities. Nevertheless, a strong and cohesive relational network there contributes to the accumulation of social capital that might facilitate and enhance entrepreneurship. Therefore, we propose a framework of the major determinants with three factors. On the personal level, it is skill that plays a most fundamental role during the process. On the external level, influences come both from the social and the institutional aspect and we pay special attention to social network and institutional innovations with this regard.

6.1.1 Possession of skill

Given the relatively low educational level in marginal region, improvement in labor skill after training is considered to have more significant influence on entrepreneurial results. Our analysis shows that the effectiveness of an improvement in entrepreneurial skill in encouraging entrepreneurship mainly depends on industrial structure, price of heterogeneous product in open market and substitutability of products in the region. When the new entries organize their production with higher intellectual content, it is more likely that an increase in overall skill level would facilitate entrepreneurship and generate higher social welfare. Otherwise, only when local demand shows consistency with the general market will skill improvement be effective to entrepreneurship. Even though entrepreneurial cost might cause conflict between entrepreneurship and social welfare, in regions where population is smaller or wage gap between skilled and unskilled labor is significant, it is still possible to pursue increases in both entrepreneurship and social welfare through skill improvement.

Most of the existing researches emphasize the importance of skill to entrepreneurship by associating it with self-confidence, behavior control or expectation for potential gains (Linan, 2008). Our research approaches this issue from a macro perspective and pay attention to the demand for different labor types in the production. Similar discussion can be found in the work by Van Praag and Cramer (2001), which points out division between entrepreneurs and wage labor is determined by individual characteristics. In addition, while the contribution of entrepreneurship to regional development and social welfare is widely discussed, seldom attention is paid to the cost beard by the entrepreneurs. Following the model proposed by Schweinberger and Woodland (2015), the inclusion of entrepreneurial cost in the model allows us to consider the conflicting effect in utility when the benefits of market development are counterbalanced by the efforts devoted to entrepreneurial activities.

6.1.2 Social (Relational) network

Social network is chosen as a key influential factor due to the fact that influence from one's acquaintance is amplified by closer social relationships between people living in marginal regions. Our analysis shows that when complementary effect exists in terms of economic efforts, expected payoff from entrepreneurship is determined by the attributes of social network. It functions through the creation of social capital, which is consistent with one's position in the network and can be enhanced with a closer and more complete network structure. Agents who have more social ties and whose social acquaintances have higher payoff level are considered as more central and to have greater level of social capital. In the work of Westlund and Bolton (2003). they regard social capital as "a community characteristic that facilitates or inhibits the kind of innovative, risk-taking behavior" and "enters directly into the utility function". Echoing this viewpoint, our research also relates the possession of social capital with one's utility from economic activities, and we find that agents with higher social capital are

inclined to devote more efforts. Therefore, they have higher motivation to increase their marginal payoff in pursuit if higher utility, which becomes the incentive of entrepreneurship. Generally, a higher average possession of social capital would lead to higher entrepreneurship rate when keeping other conditions the same. Moreover, a lower entrepreneurial cost and more significant improvement in payoff add the attraction of entrepreneurial activities.Additionally, with this model, we are also able to support the saying that marginal regions are privileged with higher social capital (Poon et al., 2012) by attributing it to higher level of social cohesion and more complete network structure based on the results.

6.1.3 Institutional environment

We regard financial institution as of great importance to entrepreneurship in marginal region since lack of capital turns out to be one of the main obstacles for the implementation of entrepreneurial plan (Paulson and Townsend, 2004). We elaborate on microfinance service operating exclusively within the region. We contend that it contributes to entrepreneurship by reducing the start-up cost for micro-entrepreneurs. In this part of the research, we consider both entrepreneurial behaviors and the intention for local people to invest. Our analysis highlights the importance of the effectiveness in terms of cost reduction to entrepreneurial activities as well as investments. Besides, smaller income gap and investment amount, as well as lower elasticity of substitution also motivate investments.

Our research offers a theoretical explanation for the function of microfinance to entrepreneurship. It actually shows that operation of microfinance does not necessarily lead to prosperity in entrepreneurial activities. In Babajide’s (2012) research on microfinance in Nigeria, it is also pointed out that microfinance does not have significant contribution to the growth of micro and small enterprises. He attributes it to the small size of loan, which limits the effectiveness of receiving microfinance service.

This empirical finding is in in keeping with our argument that the competence of microfinance matters. It is therefore especially meaningful to optimize the institutional deign of microfinance organizations in pursuit of more promising results.

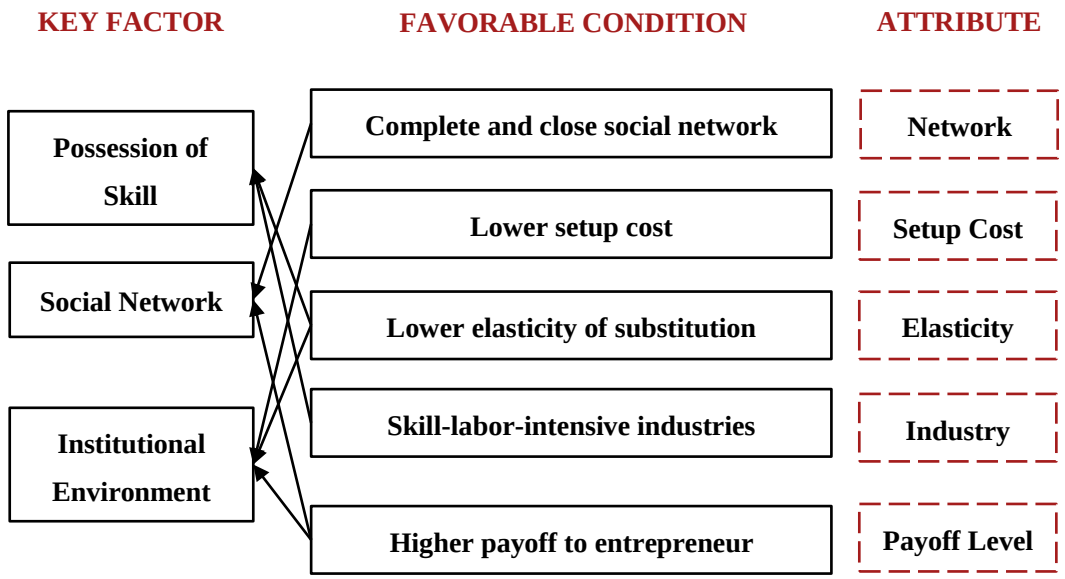

Figure 6.1 Key factors and favorable conditions

6.2 Policy implication

Based on the main findings and the problems in marginal region, we derive some implications for policy design in these regions.

Orientation of new entry. Skill training programs do have positive influence on encouraging entrepreneurship and improving social welfare under certain conditions. And for marginal regions where population tends to have a small size, it is especially meaningful since it is more likely to have entrepreneurship accompanied by social welfare improvement. Nevertheless, given the importance of industrial structure, it is more beneficial if newly established enterprises would produce in industries which require higher skill. Therefore, it is suggested that the provision of entrepreneur training program should be combined with guidance for the choice of business field.

Consolidation of social capital. Social capital embedded in the cohesive social network in marginal region is a unique source of motivation for entrepreneurship. It therefore makes sense to pay efforts to build up local social network. With regard to this task, it can be achieved by creating new links between disconnected agents or strengthen the existing relationships between community members. We consider the first approach to be more effective in regions where households are sparsely located and existing network is quite incomplete. It is necessary to provide more occasions for local communication by means of workshop, gathering etc, where people get acquainted and form new relationships. On the contrary, in communities where people already maintain extensive social ties and the network features relatively complete, consolidating the existing social ties by arousing community spirit or facilitating mutual-aiding behaviors is preferential.

Differentiated subsidy policy design. Considering the lack of initial funding for new business establishment, one possible solution is for the government to directly support through subsidies. A more efficient way, according to our research findings, is to differentiate the subsidy policy. Considering the influence from the social network, it is always more efficient to target at the leaders first, which allows the government to take advantage of the network effect and reduce policy cost. Meanwhile, it also brings out the importance of leadership cultivation. The existence of a person who serves as the "hub" of community communication is crucial to the effectiveness of policy implementation.

Improvement in market environment. To enhance the attraction of entrepreneurship, actions should be taken to increase the expectation of reward for entrepreneurs. Since for most marginal regions limited market size is one of the main obstacles, it is necessary to establish more connections with the outside for the expansion of market for

local products. Facilitation cross-regional collaboration and promotion of local products to consumers outside the region would be beneficial.

Proper institutional design for microfinance service. In regions where income inequality is significant, effectiveness of microfinance might be lower. And in regions where income level is too low and spontaneous investments do not show up, it is only meaningful to sponsor local people when a self-reinforcing investment process is expected to show up. This indicates that before the provision of microfinance service, a careful examination and comprehension of social environment is necessary. Lastly, in pursuit of higher entrepreneurship and investment rate, the capability of the microfinance services must be built up. In additional to enhancing its basic function as a financial institution, it is also suggested to take up the role as a facilitator of communications between microenterprises.

6.3 Limitations and future research

The research attempts to clarify the mechanism behind entrepreneurship in marginal region. Nevertheless, the uncertainty of human behavior and regional disparity make it a challenging task. Though we are able to derive some implications following a microeconomic methodology, we consider the work to be limited in three aspects.

Firstly, our analysis focuses on the supply side and mainly examines the behaviors of entrepreneurs. Nevertheless, success of entrepreneurship is also dependent on whether the supply matches the demand. With this regard, future research could consider the discussion over the success rate of entrepreneurship, which might be related to the business sensitiveness of entrepreneurs and the features of local demand in marginal regions. It is also reasonable to related the success rate with the possession of entrepreneurial skill so that the discussions in chapter 3 could be polished.

Secondly, in pursuit of general implications, we base our discussion on several assumptions and neglect some minor factors. However, the real story is more complicated. This could be improved by combining microeconomic analysis with other analytical methods such as data simulation and empirical research. For example, in chapter 4, we focus on several simple network structures and derive some general results. With data simulation, more elaborative discussion can be made by considering more complex social network. As for empirical research, it is necessary to develop the current model with more details through a careful examination of the feature of target region.

Thirdly, we mainly set our models under a no-trade and no-migration context given the fact that economic scale in marginal region is currently low and population size remains relatively stable after waves of depopulation. Nevertheless, as population aging is still in progress, there is an increasing need to attract human capital from outside region. Additionally, as local economy gradually recovers owing to entrepreneurial activities, trading with the outside is also expected to expand. Therefore, we are also considering loosening these constraints in future research and explore this process with a dynamic perspective.

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