Evaluations for National Language Policy—Putonghua through Industry of Farming, Forestry Animal Husbandry, and Fishery (IFFF) in Shanxi Province of China

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Abstract

The national language policy—promoting Putonghua has significantly improved people's communication skills in public which boosted economic growth eventually. However how and through which channel(s) do(es) Putonghua contribute to the economic growth? I find that language policy can facilitate a language directly become a language skill as a type of human capital—LSHC, become a supporter for knowledge and health become a working skill as human capital—LAHC, and become a factor help other elements change to other capital—LFOC. With the case of Industry of Farming, Forestry Animal Husbandry, and Fishery (IFFF) in Shanxi Province, I prove that language policy has log linear effect on IFFF's output per capita; policy affects economy through both education system and public service but more significantly through the second channel; policy effects through compulsory education are negative while it through public service are positively substantial. Such unusual relationship between policies and compulsory education onto IFFF does match the facts that students with more communication skills—LSHC would like to move to industries with more verbal communication. Labor force in IFFF around rural area of Shanxi Province gain their LAHC only through public services.

JEL Codes: J24, Z13, I25, R58, C26
Keywords: Putonghua, human capital, language policy, language in education, rural public planning, instrumental variables

Introduction

More than 60 years' national language policy—promoting Putonghua has significantly improved people's communication skills in public which boosted economic growth eventually. In 2017, the government set the target to increase up to 80% (including most rural area) of Chinese who use Putonghua to communicate in public from 70% (most in urban area) until 2020. However how and through which channel(s) do(es) Putonghua contribute to the economic growth?

To answer these questions appropriately, it is important to analyze relationships among a language policy, a language, a language skill, human capital, production resources, and economic growth first. Solow (1958) summarizes that aggregate production is a framework to distinguish how much of economic growth to attribute to changes in factor (production resources) allocation (e.g. the accumulation of physical capital, how much to attribute to technology, and to the number of workers and their hours and weeks of work). Gradually economists realize that there is another missing important production factor—human capital in the model which is needed to be studied. Human capital is the stock of skills that the labor force possesses (Goldin, 2014), and it expressively affects economic development. Types of human capital are various, it can be a language skill from mastering a language, a working skill from mastering a knowledge, or a good health from better living conditions. A language can become a language skill as a type of human capital and learning a language also can be the entrance for human beings to accomplish most of human beings' activities. If a language is anywhere with human being, a policy to promote it can be permeated and eventually affect the economic growth by steps.

Secondly, to answer these questions appropriately, it is also crucial to understand Chinese language policy—promoting Putonghua and languages are used in China. More than 90% of the population in China is Han Chinese, and less than 10% is minority groups who have different languages. In Han Chinese, there are many dialects used by people who live in different locations. Although Han Chinses

share common cultures, the pronunciation of different dialect may be great different from others and verbal communications between people who speak different dialects was difficult. To break the communication obstacles, the nation created a new language—Putonghua in 1950s and use language policy to promote all citizens to learn Putonghua and use Putonghua to communicate in public.

This paper is designed to evaluate and estimate accurate relationship between intangible asset—a language and real economic developments. The paper is categorized as following. Section 2 introduces literatures about human capital and the process from a language into human capital or other kinds of capital. By categorizing types of capital, I suggest that there are three approaches for a language involved with capital establishment. The first approach is that a language can be the transformable element for human capital; the second is that a language is the carrier for other transformable elements converted into a human capital; and the third is that it also can help transformable elements converted into another type of capital.

Section 3 introduces national language policy, dialects, and economic development in Shanxi Province. Combined the statements in Section 2, I believe that there is heterogenous problem among three transformation processes from a language to language related production resources. Therefore, strategies of selecting proper study subjects to match the corresponding capitals may be effective. By law, Putonghua is implemented through nationwide education system, public media and state& local governments. Thus, industries which need communications may be involved with more than two types of transformations; while industries need no communications may be limited with one approach. To understand relationship between a language and production resources, it is better to start from analyzing one approach first then extend to three relations. Thus, empirically finding an industry which limits with one type of language related capital is priority. Fortunately, there exist such type of an industry—the Industry of Farming, Forestry Animal Husbandry, and Fishery (IFFF), which need lest verbal communication but more education (knowledge) or/and living conditions related human capital and physical capital for production. The effect of language policy inside the IFFF may become a good facet to evaluate a language policy.

Section 4, 5 and 6 build a 2STS models to test and evaluate hypothesis in Section 2 and 3. And conclusion is given in Section 7.

Previous Literature

(1) Human capital, a language and a language skill

a. Human capital

The definition of human capital[1] is “the skills the labor force possesses and is regarded as a resource or asset.” Goldin (2014) explained “Human capital is the stock of skills that the labor force possesses” and Cohen & Soto (2007) pointed out that two major components of human capital are education and training, and human health.

Robert Solow’s work on economic growth in the 1950s begun the great works on analysis of human capital. Solow found that there was something (regression residual) unexplainable by physical productive factors—capital stock (K) and the number of workers and their hours and weeks of work (L) only. Many economists (Mincer, 1958) then noticed that these residuals became bigger in size with empirical data from much of the twentieth century; and they gradually realized the missing term might be “human capital”. Mankiw, Romer & Weil (1992) tried adding human capital growth to the Solow model, and found physical capital accumulation and land clearing explain a substantial fraction of economic growth in the past, but not well in the more modern era. Gallman[2] (1972) and Denison (1962) found that in a fraction of the growth of income per capita in U.S. history, the residual has increased from about 57 percent in period of 1840-1900 to around 85 percent in period of 1900-1980s.

Economists gradually realize that these changes in residual were due to changes of education, and these changes are endogenous. Galor and Weil (2000) proved that the endogeny was in education which is an important channel to gain human capital. They explained these endogeny as once population increases, technology advances. Then any a small technological change can increase incomes and induce parents to allocate some of their resources to school their children. As education increases, which in turn boosts technological change, income and population.

[1] Oxford English Dictionary

[2] Robert Gallman’s chapter in Davis, Easterlin, Parker, et al. (1972)

Except education, the other channel for increasing human capital is through human health. Good nutrition, public health system, and medical treatments can make people's good health. Studies[3] show that these three phases over long period of time can lower the mortality rate, longer life expectancy, and increase the BMI. Goldin (2014) states increased production and new developed resources allow people to improve their health condition which will increase their human capital; and more human capital will allow people to become more productive.

b. A language and a language skill

Human capital as a possible and vital productive factor can be understood as the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability (skills) to perform labor so as to produce economic value (Mincer, 1972), while the mechanism from certain elements into productive factors is complex, and unclearable yet (O'Sullivan & Sheffrin, 2003).

During the transformation from elements into a human capital, there is a specific actor—a language which is not only the vehicle to help accelerating and accomplishing this changeover but also a convertible element itself. A language (by Marriam-Webster) is the words, their pronunciation, and the methods of combining them used and understood by a community. Mastering a language is the entrance for human beings to learn knowledge, establish logic thinking, and then accomplish complex managements. Most of human beings' activities cannot be existed without using a language; and we learn a language because we want to learn knowledge which can guarantee to accomplish tasks. In this scenario, a language is a supporter to transfer elements such as knowledge into human capital (I name it as Language Affected Human Capital—LAHC), not an element. On the other hand, if a human being can do the same activity with any one of languages that the individual masters, then a language is an element which can change into a Language Skill Human Capital (LSHC).

(2) LAHC and LSHC

A language affecting economic development has intrigued scholars from various disciplines for a long time. However, how a language becomes LAHC or LSHC, and by what formation we can track down these changing processes is not clear yet.

a. Literatures about LAHC

Studies about LAHC are rare in the field of economics but relatively more by linguistics and ethnic scholars. In economic field, studies about LAHC is generally neglected because people do not realize that mastering a language is the foundation for learning knowledge. For instance, people may not notice how they learn their mother tongue in their childhood but remember how to learn knowledge with the language. Ditcher (1997) and Heugh (2006) suggested that in developing countries, the use of local languages as a medium of instruction lowers drop-out and repetition rates which leads to a higher aggregate stock of human capital. Arcand and Grin (2013) accomplished the approach connecting 'language' as an independent variable and 'economic development' as a dependent variable, with a special emphasis on languages associated with the former colonial powers; and they found that former dominant language such as English is in no manner associated with a higher level of economic development as decolonization.

b. Literatures about LSHC

Literatures about economic returns on a language skill are abundant and well developed. With more broadly globalization, a language skill become more and more important type of human capital. Studies about LSHC based on empirical data from 20th century showed that language skills might have positive or negative effect on economic development; while study results based on data from 21st century have been merged to the same conclusion that the language skill from a developed country's official language has positive effect on labor's (especially a labor from developing country) earnings. These languages include English, French, Spanish, German and so on. English, as the language of the world, people who is not a native English language speaker can gain benefit from mastering English. Recent studies include analysis by Azam, Chin, & Prakash (2013) and Chakraborty & Bakshi (2016) about English-speaking ability in India; Seitzhanova, Plokhikh, Baiburiev, &Tsaregorodtseva, (2015) about it in Kazakhstan; Wang, Cheng, & Smyth (2017) and Guo & Sun (2014) in China; and Isphording & Otten (2011) and Isphording (2013) in Spain. Studies about other languages' skills include Angrist & Lavy (1997) about significance of French-language skills; Saiz & Zoido (2005) estimated the economic returns on Spanish, French and

[3] by The World Health Organization (WHO), Gerontology Research Center (National Institutes of Health, USA), and the U.S. Centers for Disease Control and Prevention (CDC)

other foreign languages in US; and Chiswick, Rebhun, & Beider (2016) about positive returns on Hebrew in Israel.

c. Literatures related with language affecting other capitals

A language is not only the element which transfers to a type of human capital—language skill and the vehicle which supports other human capital generation, but also can participate the generation for other capitals such as social capital. Kim, Liu, & Leblang (2015) stated that a good language environment means reducing the transaction cost which significantly affects FDI attractions. Smales & Apergis (2017) proved that using specific words for the announcements of monetary policies can result unexpected surprise policy effects. Wang, Cheng, & Smyth (2016) states that proficiency in Mandarin (Putonghua) has a positive effect on an individual's total consumption expenditure as well as most categories of consumption expenditure.

Related knowledges for understanding the topic

(1) Language policy

A nation's language policy is known as that the government uses legislation to promote one or two official language(s) to be used by people over others nationally. If people inside a nation speak different languages or dialects, and communications among people who use different languages or dialects become difficult, the government would like to legally announces one or two which majority people use as the official language of the nation.

National language policies are implemented by regulating individuals to use the official language(s) (both in verbal communication and written expression) in publication, in commercial, or/and in workplace communications. As a soft law, national language policies generally do not use legal instruments as binding force to sentence the illegal actions. Thus, in order to have and keep policies being effective, as a best choice, the government mainly uses legislation to embody using the official language or/and the official language learnings through some systems which can spread the policy effect more broadly and long lasting.

The best place to spread the effect of a language policy is through education system, where can train young people to understand and learn the official language, accept it later, and gradually get used to using it when they are inside the education system and keep using them outside the system as well. Because language is the main medium of knowledge learning, compulsory education is priority to have intensive and comprehensive language regulations. As a good result, most of people who graduate from compulsory education system start using the official language automatically. Promoting and regulating to use the official language in education system can have longest-acting policy effect.

The second-best place that national language policy should be implemented is through various government agencies. As the symbol of a nation, national and state/local government agencies shall be forced to use the official language even the policy is a soft law. It is common that only the official language allowed to be used in all/most government agencies as the procedural language. Promoting government agencies use the official language has the strongest legal effect.

And the last main place best to implement language policy is through media agencies. Broadcasting, films, TV programs, and media platform can be requested to use the official language as the basic language. Media agencies have significant cultural penetration, thus promoting to use the official language through media agencies can have the widest effect in a relative short time period.

As people who do not know the official language become relying on it, the development of some ethnic language might be stagnated, and eventually it might be dead due to nobody know and can speak it. Thus, when the official language has been promoting, in certain region it is necessary that the government also uses legislation to protect and promote these regional and ethnic languages whose viability is threatened. It is very common that there are competitions between protecting regional and ethnic languages and promoting the official language. If policies to promote official are too intensive, other ethnic languages might be destroyed, or even disappeared.

(2) Development of promoting the normalization and standardization of the standard spoken and written Chinese language

The official language of the People's Republic of China (PRC) is Putonghua (also called Standard Mandarin). China has seven dialect families[4]; and each dialect family also has several sub-dialects. Differences of pronunciation between some sub-dialects inside the same dialect family may be significant different in pronunciation, vocabulary or/and grammar; and they are mutually intelligible. Thus, having an official language which could smooth people's communication was urgent and crucial for the government when the nation was independent in 1949.

In 1956 the government announced the official language of the nation is Putonghua—" the standard form of Modern Chinese with the Beijing phonological system as its norm of pronunciation[5], and Northern dialects[6] as its base dialect, and looking to exemplary modern works in *báihuà* 'vernacular literary language' for its grammatical norms"[7]. The characters of Putonghua are based on the simplified Chinese characters.

In brief, these are three stages of the development of promoting Putonghua legally. The first stage is 1956- 1966. It was the first decade that the nation started to comprehensively promote the normalization and standardization of the standard spoken and written Chinese language. The main task in this period was to teach all citizens Putonghua because it was only around 40% of population in 1950s who spoke Mandarin could understand Putonghua while the rest of population could not communicate with each other fluently.

The second stage is 1977-1985 when the nation restarted to promote Putonghua after a decade's "the Cultural Revolution" (1966-1976). The main tasks in this period were to keep promoting Putonghua and the standardized Chinese characters as "State organs use it as the official language", "(Putonghua) shall be used as the basic language in education and teaching in schools and other institutions of education", and " (Putonghua) shall be used by the broadcasting and TV stations as the basic broadcasting language; and Publications in Chinese shall be in conformity with the norms of the standard spoken and written Chinese language"[8]. Furthermore, in order to make Putonghua become convenient to be learned by people from different dialect regions, the Ministry of Education created standards to evaluate the fluence of speaking Putonghua for people to compare the difference between their own dialect and Putonghua. And these standards gradually became the Putonghua Proficiency Test (PSC in Chinese). The progress in this stage make the promoting became more systematical; and after less than a decade's work, "the proportion understanding the standard language nationally rose to 90% and the proportion understanding the standard language among the speakers of Mandarin dialects rose to 91% in 1984"[9].

The last stage is 1987- 2017, and the promoting work was mainly designed to keep the same process as the previous stage. In 2006, around 70% of Chinese (especially people in urban area) can use Putonghua to communicate in public[10]. While on the other hand, promoting Putonghua also prevented the development of dialects. All linguistic studies have proved that the majority of young people from ethic language region who live in a city (whether the city is inside the ethic language region or not) cannot speak their own dialect and even some of them cannot fully understand the dialect. In order to balance the developments of both Putonghua and dialects, the congress proved the 'Law of the People's Republic of China on the Standard Spoken and Written Chinese Language (Order of the President of the People's Republic of China No.37)' in 2000. The law restates that the national language policy is still promoting Putonghua, and meanwhile it is also necessary and important to keep using dialects (Article 16 and Article 17) under certain circumstances and using proved foreign languages (Article 11 and Article 12) by law or/and State Council in Chapter II.

On March 2017, the Ministry of Education announced the new language policy "The Plan to Generalize Using the Standard Spoken and Written Chinese Language—Putonghua" (the Plan) and

[4] There are several classification schemes (five, six, seven, eight, or even night families) by linguistician due to the intricacy among dialects. Severn dialect families is based on the classification scheme used by *Xiandaihanyu* (2012).
[5] The pronunciation of Putonghua uses the pronunciation of dialect in Luanping County of Hebei Province, not the pronunciation of Beijing Dialect. Because both dialects belong to the same sub- dialect of the family of northern dialect.
[6] Northern dialect family is also called as Mandarin.
[7] Chen (1999) pp16-17, and Order of Present of the People's Republic of China No.37
[8] Order of Present of the People's Republic of China No.37
[9] Chen (1999) pp66-67.
[10] "Survey of Language Situation in China", 2006

setup the target to increase up the rate of population speaking Putonghua to average 80% (including most rural area) until 2020. Like policies during the second stage, this policy precisely lies out more detailed targets for different regions, possible binding forces to secure these targets, and conditions and financial supports responding to binding forces for the implements.

For these targets, the Plan categorizes that east region where the Putonghua level is high should rise the proportion of speaking Putonghua to 80%-85%[11], middle region should rise the proportion to 75-80%, and west region where the Putonghua level is various should adjust the target rate based on the conditions respectively, and the target range is 50%-above 80%[12].

Learned from previous works, the Plan summarizes numbers of sections that policy should come into force. The main section is still the education system. Education environment and teachers should be fully matched all requirements under the Law. The second section includes government agencies and media agencies which are the same as in the second stage, and it also adds public services as a new channel. And the last section is specifically focused on young rural labor forces and minority group of people. The Plan suggests that regardless these young rural labor and minority group of people stay at their residences or move to east-coast area, they can get special free trainings on both working skills and Putonghua.

(3) Jin Dialect

Jin Dialect (Jinyu) mainly means the dialect spoken by people who are from Shanxi Province and adjoining areas with neighbor provinces of Inner Mongolia, Heibei, Heman, and Shaanxi Provinces. One classification is that Jinyu is the sub branch of Northern Dialect Family, and the other is that Jinyu is the eighth dialect family with Northern Dialect Family, which is supported by many Jin linguists due to complexity of the dialect.

Jin Dialect has preserve the entering tone '入声'[13], a glottal stop as in the Wu dialects, but distinct in this respect from most other Mandarin dialects. Jin also employs complex tone sandhi, which rules depend on the grammatical structure of the words being put together. In Jin dialect, an adjective–noun compound may go through different sets of changes compared to a verb–object compound; and these tones that merge when words are pronounced alone but behave differently (and hence are differentiated) during tone sandhi (Shanxi Daily, 2015). These unique characteristics of Jin dialect makes it far from Putonghua in pronunciation, vocabulary, and grammar.

Linguistic studies and researches from CNKI in 2000-2015 show that Jinyu in all regions have been disappearing. Linguistic fieldworks in cities show many young people cannot speak their mother language fluently; and young people in country side can speak both Jinyu and Putonghua, and they can use Putonghua much frequently; and elderly people in country side still use Jinyu but most of them can understand Putonghua.

(4) Promoting Putonghua in Industry of Farm, Forestry Animal Husbandry, and Fishery (IFFF) in Shanxi Province

a. Brief economic development of Shanxi Province

Shanxi Province is located on loess plateau, where is a key hub for many communications in cities between east plain area, west area, and north-west area. Its long-standing position gives it a rich and varied cultural and folkloric tradition. As the land of human origins, today Shanxi is famous as one of the most popular tourist destinations. Shanxi's long development also gives it vast resources of coal and iron for its heavy industry development, and its secondary industry is also mainly related with its heavy industry.

b. Agriculture in Shanxi Province

Natural conditions for developing agriculture in Shanxi Province are not well. Two-thirds of the province is composed of Loess Plateau; cultivated area is less than one-third, forestland is 20%, meadow is 5%, and inland water is only around 2%. Only regions like Datong, Taiyuan, Xinzhou, Linfen, and

[11] Different proportion level responds to different policy being effective.

[12] For development conditions are better area, the target should be above 80%; conditions are average, the target should be around 70%; and where conditions are bad, the target should be 10% higher than the previous level and the baseline for the worst area should be above 50%.

[13] Also called as checked tone, is one of four syllable types in the phonology in Middle Chinese. This syllable ends in a stop consonant or a glottal stop.

Yuncheng are in the basin areas, where becomes the major crop areas. Climate in the region is semiarid climate, which is severe for cultivation. Rainfall intensity and storms are the main factors influencing water loss and erosion. Thus, the main type of crops in the province is one annual crop (such as spiked millet, spring wheat, naked oats, potatoes), and few three crops in two years or two crops in one year. There is only a small part of area can grow cash crops (such as cotton and sesame) and some fruits.

Except natural conditions are severe, technologies and level of farm mechanization are low in Shanxi Province. Most farmers continue to practice traditional agriculture which requires extensive use of water and agrochemicals cause the patterns of free-range livestock grazing; and leave untreated disposal of animal waste adds to soil and water pollution (ADB, 2016). Farmers also remain largely unorganized and cannot take full advantage of market and rural finance opportunities. Thus, the annual grow rate of total power of agricultural machinery is around 5% only (Figure 1), and many countries are poverty counties and/or on the priority list for treatment of accelerated soil erosion in the nation.

Most serious problems for agriculture is the shrinking and low qualities of rural labor force, especially labor force in IFFF. Shanxi is a typical place of having large population in less land; and rural labor should leave for other industries from IFFF but the flow should be balanced. According to state's statistics, the total population growth of the province was from 36.44 million to 38.13 million (2000-2016), and its natural growth rate is around 5.61‰. For the last decade, the rural labor force participation rates for 11 regions growth from 35%-49% to 43%-52% which means the average annual growth rate is only around 2‰-4‰ (Figure 2); and the percentage of labor force in IFFF over the rural labor force decreased from 55%-77% to 47-67% which means the average annual shrinking rate is 2‰-17‰ over the same period. These changes mean there is a constant net losing labor in IFFF.

It is not only losing the quantity of labor from IFFF, but also the human capital of labor in IFFF is at a low level. According to The Third National Agricultural Census (2017), the education level of the majority population in Chinese rural countries is 9- grade after the compulsory education. Young people even who has low education would like to become 'peasant-worker' in city due to the high wage. In Figure 5, the enrollment rate of high school in 11 regions increased significantly is from 1999-2015. Combined with Figure 2-5, it is clear that there is a constant labor flow from IFFF to other industries, and labor force who flows out from IFFF are educated young people and more likely elder people or people with low education stay in farming. Lower educational labor force in IFFF will make the future development of agriculture instable.

c. Promoting Putonghua in Shanxi

According to Shanxi Provincial Education Department and the department in charge of the work related to spoken and written language under the State Council, works for promoting Putonghua in Shanxi Province almost keep the same pace as the national policy designed. The promoting is mainly through education system and society as the Law requires. Different from provinces in east coast area, it is common that inland provinces prefer follow national design without adjustments. From 1999-2005, national language policies are binding firmly, and the implement by local department was strictly as the national policies required; from 2009-, national policies become more diversified, and the effective date for policies become more flexible. However, while the implement by each region in Shanxi was still quick to be activated and most policies can be effective at the early date as the nation suggested.

Because Jin dialect is unique and complex, from 2015, the state also started to protect Jinyu. The protection works does not challenge Putonghua, it focuses on creating a Jinyu corpus.

Data

Data for this study includes two parts: (a) historical panel economic data from Shanxi statistical yearbook and language data index based on national and provincial language policy; and (b) instrumental variables representing human capital in language skills based on Part (a).

Shanxi Province has 11 prefecture-level divisions, and available released data is historical data 1999-2016 in state's yearbook. All data has been conversed to per capita level. In order to eliminate endogeneity, the model use the growth rate level of data and these data are:

Real income from Industry of Farming, Forestry Animal Husbandry, and Fishery (IFFF): it excludes income from the service and related service of IFFF. It represents the pure income directly from agricultural industry.

The fist type of physical capital in IFFF: the total power of agricultural machinery (kw)[14] which is a better indicator to represent the level of capital used in the industry. The second type of physical capital in IFFF is length of highways which is the required transportation for an industry.

Public service: public social welfare system in local country which is supported by local fiscal fund. It represents human health type of human capital.

Educational support: fiscal fund for compulsory education system. It is used for instrumental variable of indirect human capital through education system.

Teachers in compulsory education: numbers of teachers in the compulsory education system. It is used for conducting instrumental variable of human capital through the education system.

Graduation from compulsory education: number of students who graduate from 9 years-compulsory education. It is also used to conduct the instrumental variable of human capital through the education system.

Dummy variable of division: represent 11 prefecture-level divisions in Shanxi Province. And dummy variable of year: represent 10 years from 1999-2016.

Data to represent language policy is an index based on historical national and local language regulations to promote Putonghua, and local regulations to protect Jin Dialect. National policies have bigger weight than local policies. I assume that policies to promote Putonghua has positive effect on language skill and policy for protecting Jin Dialect has negative effect on language skill of speaking Putonghua. Furthermore, language policies in education system are more than them in public services.

Language policy-in-education (LPE): annual index of national and provincial level language policy to implement Putonghua in education system. It is also used to conduct the instrumental variable of human capital through the education system.

Language policy-in public service (LPSS): annual index of national and provincial level language policy to implement Putonghua in public service, such public media and public affair. It is also used to conduct the instrumental variable of direct human capital.

Empirical specification and model

(1) Putonghua, dialect, language policies and IFFF in Shanxi case

a. Limitations in estimations of LAHC, LSHC, and LFOC

As state in Section 2, a language can be the element for conducting LSHC, the vehicle for other elements to become human capital-LAHC, and the factor for establishing other capitals-LFOC. Although the effects by a language are profound and vigorous, there is heterogeneity in the processes from a language to become various production resources. If there exist dynamically changing language policies, the in-use language might involve with creating all three types of capitals. While on the other hand, LAHC and LFOC might be insignificant if the in-use language is relative constant or dominating other multi languages because people focus on elements of knowledge or machineries more.

Thus, hypotheses of existing LAHC, LSHC, and LFOC cannot be estimated and evaluated together in macroeconomic level. These dynamic heteroerotic changings in each capital cannot be captured appropriately in current empirical data. Cohen and Soto (2007) agree that "…uncertainty remains about how to evaluate the various aspects of human capital formation". For instance, in an industries such as services industry, LSHC might be significant while LAHC might be limited and LFOC might be ambiguous; in industries such as manufacture, all of three capitals might be existed, but LAHC and LFOC might be neglected directly by the immense value of the physical capital or other capitals; while in industries such as agriculture, it might be only LAHC existed, and other two might be invisible due to no available empirical data can be clearly used to extract the values of LSHC or LFOC. When there is more than one type of human capital involved, the empirical examination might become difficult and not reliable since theoretically we do not know what the real relationship is between language and a language skill / a language related skill during the process (no theoretical models for evaluating it yet).

b. Possible capitals used in agriculture in Shanxi Province

Section 3 shows that technology level in Shanxi's agriculture industry is basic, farm mechanization is embryonic, and natural conditions are infertile. Therefore, LFOC in Shanxi's agriculture

[14] Different section of IFFF uses different machineries for production, such as irrigation and drainage machinery, agricultural tractors, or threshers; all these machineries need electronic power.

should be statistically limited. Traditional agriculture style involves more recourses are human capital, then LAHC and/or LSHC is involved. According to The Third National Agricultural Census (2017) in 2016, the highest education level of labor force in agriculture in middle area is junior high school level (52.6%) or primary school level (32.7%); Combined with the labor force statues in 11 regions in Shanxi in Section 3, LSHC should be rare in Shanxi's agriculture development. Empirically, agriculture is the industry which LAHC through education as the main type of human capital and other physical capitals in the production.

c. Types of LAHC and language policy effect in IFFF

Except LAHC through education, public health is also another important human capital in IFFF. Goldin (2014) states that good nutrition, public health system, and medical treatments are needed for conducting health of human capital. In 2002, the New Rural Cooperative Medical Insurance (NRCMI) was established; and in 2008, the Urban and Rural Planning Law of the People's Republic of China was effective. These two policies significantly boosted rural development of basic public services nationally. Well-developed public services can improve the health of human capital which increase economic growth.

Promoting Putonghua by law (Article 14) is as '… (Putonghua shall) be used as the basic language in education and teaching in schools and other institutions of education', 'by the broadcasting and TV stations as the basic broadcasting language', 'be used as the basic spoken and written language for the facilities in public places, in signboards and advertisements, names of enterprises and other institutions, and packaging and specifications of commodities marketed in the country'. It means that Putonghua participates to conduct LAHC through education and public service in IFFF of Shanxi Province.

(2) Modify the model

Model equations in this study is based on Goldin (2014) and Hall & Jones (1999) for growth specification, and Arcand and Grin (2013) for language policy effect in economic development.

$$Q = f(K, v[E, \lambda Pop], A, X) \quad (1)$$

Equation (1) by Goldin states that Human capital (*E*) enters the aggregate production function by augmenting labor, which is a function of the level of population (*Pop*) and the aggregate labor force participation rate (λ). Aggregate output (*Q*) is altered as well by other inputs such as the stock of capital (*K)*, resources (*X*), and the level of technology (*A*).

$$\frac{Y}{L} = (\frac{K}{L})^{\alpha/(1-\alpha)} Ah \quad (2)$$

Equation (2) by Hall & Jones state that at equilibrium, the growth rate of output per capita $(\frac{Y}{L})$ equals the summation of the growth rate of technology *(A)*, the stock of capital (*K)*, and Human capital (*h*).

$$Graduation = f(teacher, education\ facility) \quad (3)$$

Equation (3) by Arcand and Grin (2013) states that the graduation of a compulsory education is function of quality of teacher and teaching facility that the education system implied.

the two stages of estimations for language policy effect in Shanxi's IFFF is designed based on following hypotheses: the instrumental variable—Graduation in Equation (4) is affected by language policy in education and language policy in the society at first stage; and it becomes a type of human capital for the production in the second stage. Income in Equation (5) is generated with physical capital of machinery used and required transportation in agriculture industry, language policy affected public service—a type of human capital, and graduation represented education type of human capital.

$$Grad_t = Teacher_t + edLPS_t + soLPS_t + S_t + Y_t + \varepsilon_t \quad (4)$$

At the first stage of Equation (4), variable 'edLPS$_t$' is the product of language policy in education and fiscal supports for compulsory education. Variable 'soLPS$_t$' is the product of language policy in society and fiscal supports for public service. Both represent the channels that language policy affect education facilities.

$$Income_t = Income_{t-1} + K1_t + K2_t + Grad_t + soLPS_t + S_t + Y_t + \varepsilon_t \quad (5)$$

At the second stage of Equation (5), in order to control endogenous effect, possible continuous effect by language policy in a longer period, and missing variables for production, I assume that there are draff effect from previous production level onto current production level. Thus, current agricultural production is determined by previous production, machinery, human capital from education, and human capital from public services.

Furthermore, whether language can affect the generation of human capital or not, I also set up another two equations—Equation (6) and Equation (7) to test hypotheses whether existing language policy affect capitals.

$$Income_t = Income_{t-1} + K1_t + K2_t + grad_t + PS_t + S_t + Y_t + \varepsilon_t \quad (7)$$

Equation (7) assumes that there is no language effect for human capital development, and human capital are directly from education graduation and public service. Variable '$grad_t$' is the real value of graduation rate and variable 'PS_t' is the real value of public services.

$$Income_t = Income_{t-1} + K1_t + K2_t + grad_t + soLPS_t + S_t + Y_t + \varepsilon_t \quad (6)$$

Equation (6) assumes that the language effect only can help generate human capital through society in public, and education is not affected by language policy.

Result

In Table 1, compared the results for Equation (7) and Equation (6), the value for physical capital of total power of agricultural machinery is unrealistic small, so is the transportation system for production. As an important component of human capital, value of education should be significant; unfortunately, estimated value of human capital from education is small and not reliable. Statically whether there is endogeny in production is unclear too. The only good result is the language affected human capital of public service is significant for agriculture development both in magnitude and statistics.

If the assumption that education can be affected by language policy is true, estimated results should be meaningful in economic sense. In Equation (4), all factors for education type of human capital are significant at acceptable levels. It shows that quality of labor force's human capital is substantially relied on the quality of teacher (82%) and teaching facilities and materials (80%). Promoting Putonghua through compulsory education by teacher, teaching faculties and teaching environment can help knowledge efficiently changed into human beings' ability for economic production. The magnitude of language affected social environment for education use is relatively small but it is reliable.

And at the second stage, all estimated values in Equation (5) become statically reliable at acceptable levels. The values of both physical capital of total power of agricultural machinery and the transportation system for production become reasonable. However, these physical capitals are still relatively lower than the endogenic effect in magnitude. These results match the realistic limited conditions of machinery in Shanxi' agriculture is Section 3. The R^2 and value of previous production effect show that there exist missing factors, such as natural resources—natural events and disasters, in agriculture development in Shanxi Province. Data of area of natural events and disasters[15] in Shanxi Province (Figure 7) show negative effect on the growth of IFFF in Equation (5).

The most conspicuous results in the second stage is that both the values of language policy affected education (-2%) and social public services (28%) are significant. The value of the graduation from compulsory education is negative which is different from values without policy effect in Equation (6) and (7). In general, education can increase the creative ability, which is the opposite of the estimated value in Equation (5). However, with information introduced in Section 3 and survey and field studies done by linguists and sociologists, the real effect by education on agriculture industry should be negative. Since 1980s, there is an irreversible population flow from rural area to city. Traditionally, in Chinese culture, pursuing a higher education level is the best way to change an individual's life and career, especially for young people who live in a poor rural area. Because agriculture industry is not profitable and working conditions are severe in Shanxi Province, 'rural migrant workers in city' becomes a very common phenomenon in many of Chinese countries as it in Shanxi Province. Thus, the human capital of education in IFFF should be limited, and even negative. The estimated results clearly proved these facts. The magnitude of language affected public serve is great, and it is crucial for the agriculture industry. These results also match the statue of labor force in rural area. When young students who can pursue higher education leave the country area permanently, and young migrant workers move to east-coast cities for better paid job, only middle-aged and elderly people whose education level is primary school level or junior school level, have to be left and they are the majority labor force who can continue traditional style's farm production. When they get aged, good public medical system and public services can substantially extend their working ability and help them to maintain their strenuous manual labor in agriculture.

Conclusion

[15] Because there is no regional data available, the model cannot use it.

The subject of this paper is to evaluate the national language policy effect. In order to do so, it is necessary to clarify the relationship among a language, language policy, human capital, and economic growth first. Based on categorizing literatures from early period by Mincer (1972) to very current by Smales and Apergis (2017), first I conclude that a language can be an element which can transfer into a type of human capital—language skills (I name it 'LSHC'), the supporter for other knowledge to change into a type of human capital—education / trainings and health (I name it 'LAHC'), and also a factor for other capital to become efficient (I name it 'LFOC'). Language policies can promote a language as any role of these three depending upon the design of the language law and conditions of an economy.

For these three types of capitals related with language effect, LSHC is easiest to be understood and it has been well studied. Bigger LSHC, better the development of industries which need this language skills. However, LAHC or/and LFOC maybe ambiguous, and they are often neglected by people. Because LAHC is the combined product of a language and knowledge, and a language is the vehicle of the knowledge, it is very understandable that the support effect by a language becomes decayed. So does LFOC.

The second conclusion that I conduct is that there is heterogeneity in the generation process from a language into LAHC, LSHC, or LFOC. It is various in form of capital when the analyzed industry varies. Thus, values of LAHC, LSHC and LFOC cannot be estimated at an accumulative level. Selecting an accurate subject industry is crucial for understanding meanings of each capital. For instances, economists generally use immigrations/floating population (who need to learn a new language and maintain healthy in the new environment) as observed target to estimate LSHC. On the other hand estimated LAHC has been in popular because people do not notice LAHC. To analyze LAHC, I choose a very unique industry—agriculture, which may be involved lest LSHC and LFOC with additional assumptions, as the target.

The third conclusion that I make is that language policy in China is dynamic, and profound. It has been implemented through any public areas, and effect of the policy is significant. In order to observe the development of language policy, I create two language indices—Language policy-in-education (LPE) and language policy-in public service (LPSS) to represent the level of implemented policy in education and public services. These two indices are essential for conducting the instrumental variable of human capital through the education system and human capital in public service.

And finally, using yearbook data in production and education from 11 regions' Industry of Farming, Forestry Animal Husbandry, and Fishery (IFFF) in Shanxi Province, I conclude that national language policy affects the industry of IFFF does as the supporter for human capital in education and in public services as Goldin (2014) stated. Language affected human capital in public services is positively bigger while it affected human capital in education is negatively small. These results match the current labor force situations in countries of Shanxi Province and of many other inland provinces.

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Appendix

Figure 1: 11 regions Annual growth rate of total power of agricultural machinery in 2000-2015

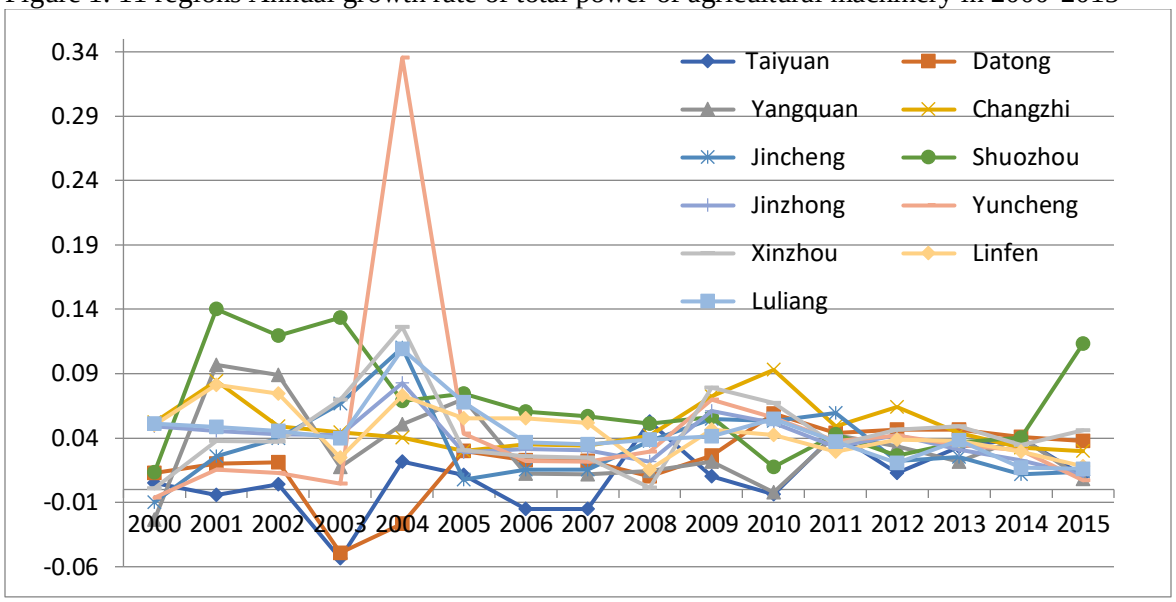

Figure 2: 11 regions' rural labor force participation rate 1999-2015

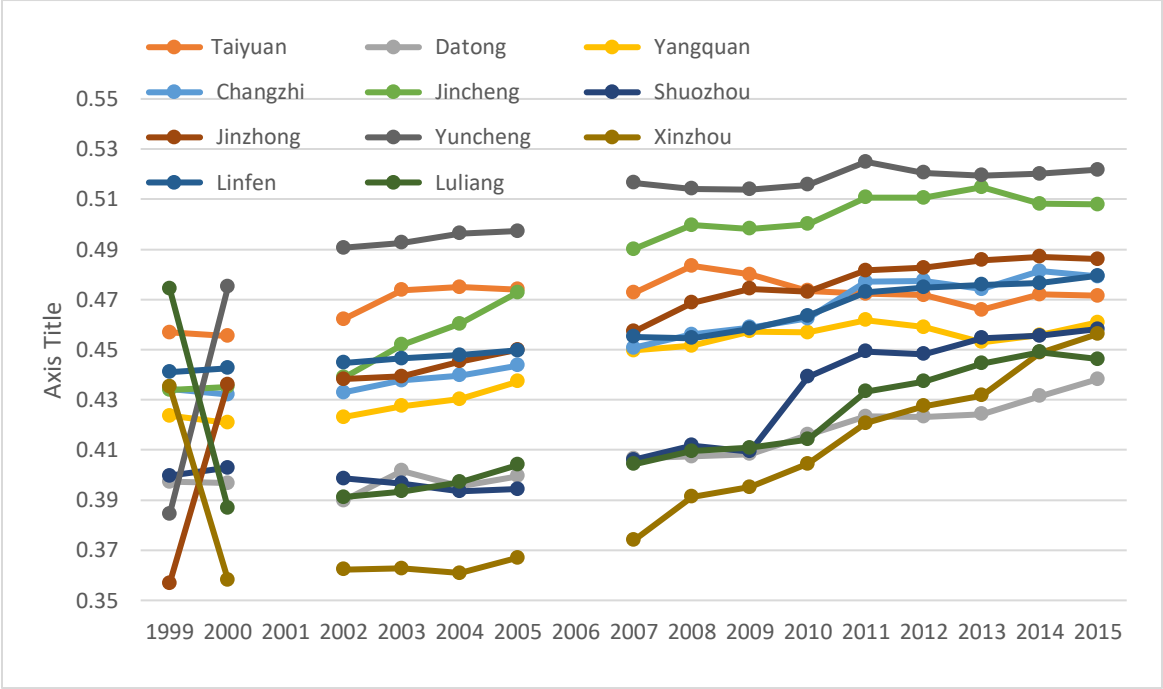

Figure 3: 11 regions' agricultural worker percentage 1999-2015

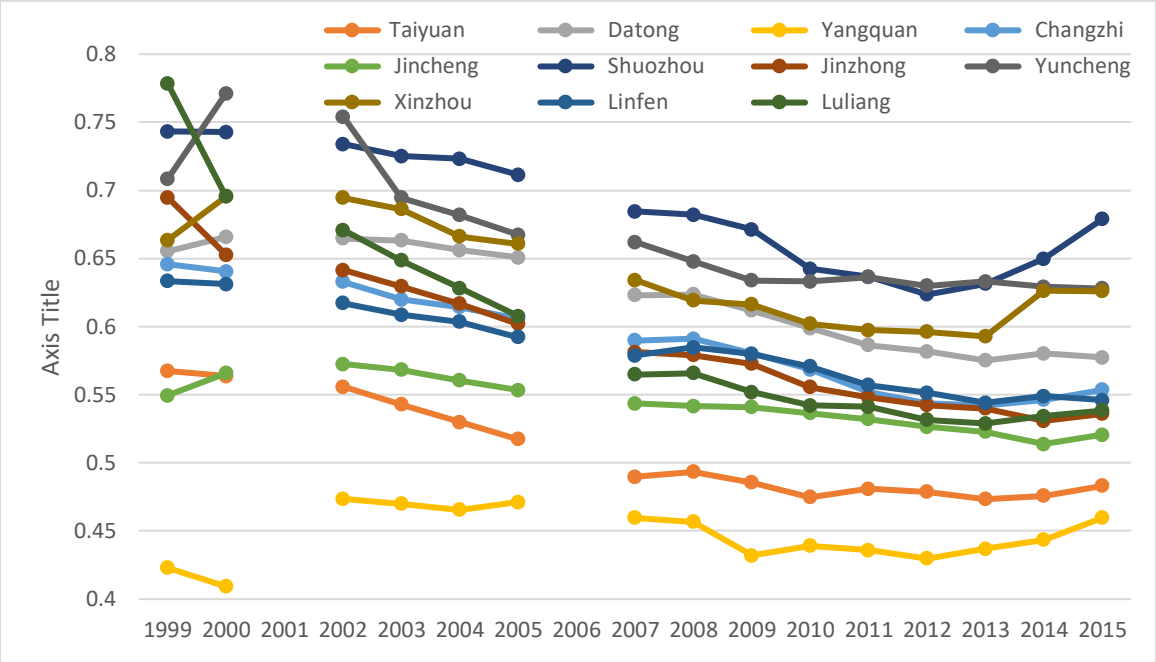

Figure 4: 11 regions' agricultural labor force participation rate 1999-2015

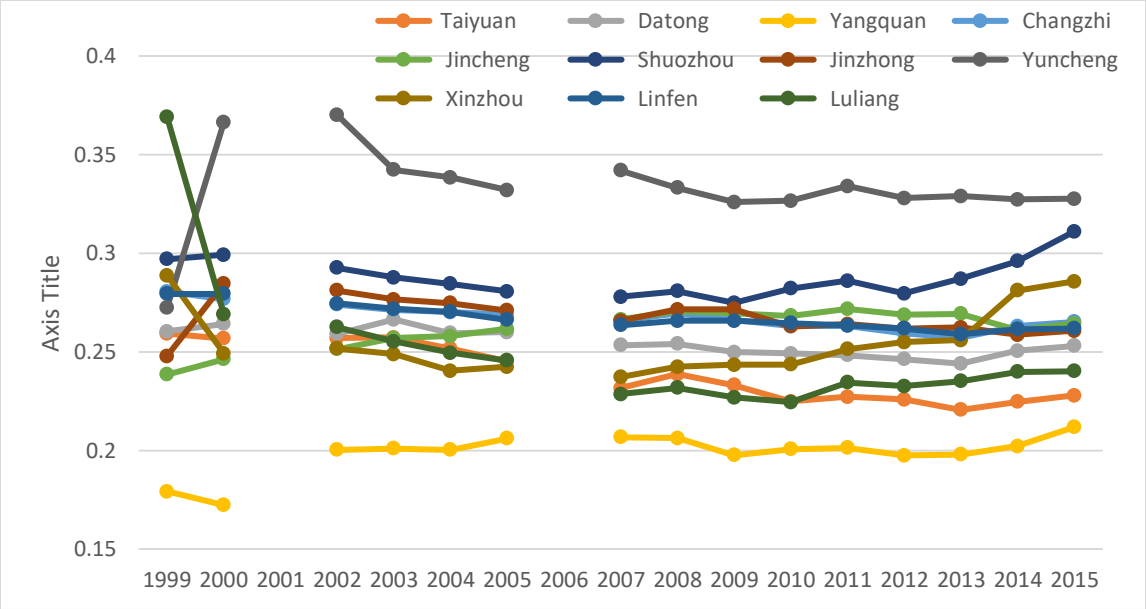

Figure 5: 11 regions High school enrollment rate in 2000-2015

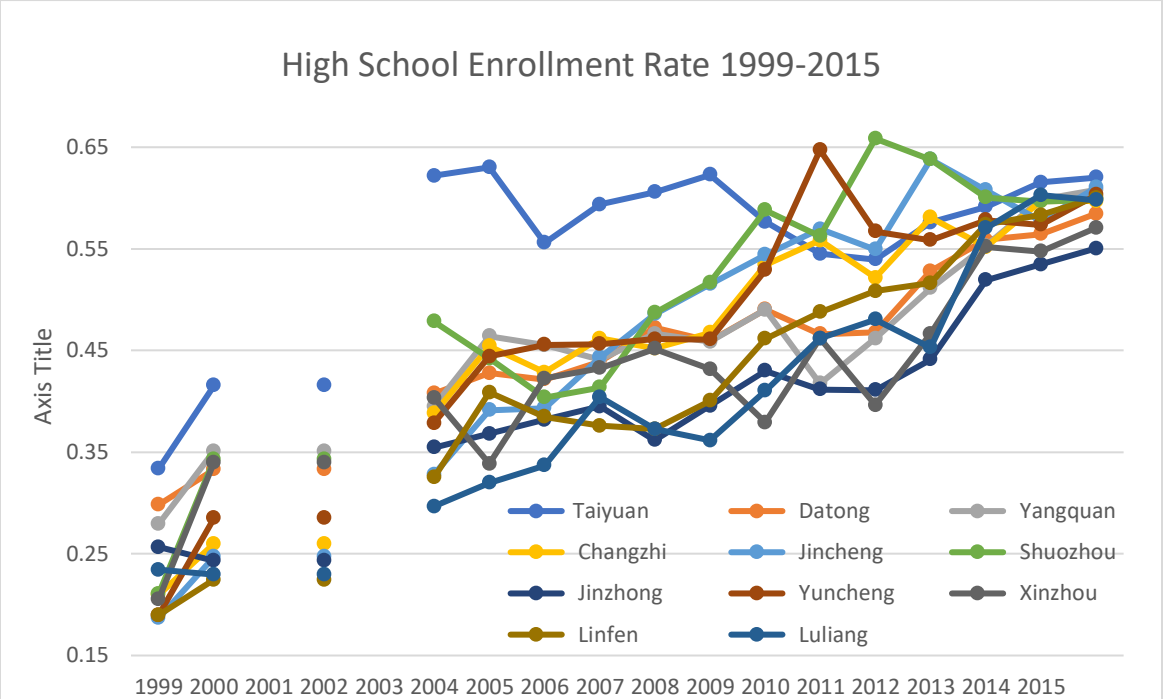

Figure 6: Area of Natural Events and Disasters Unit: mu

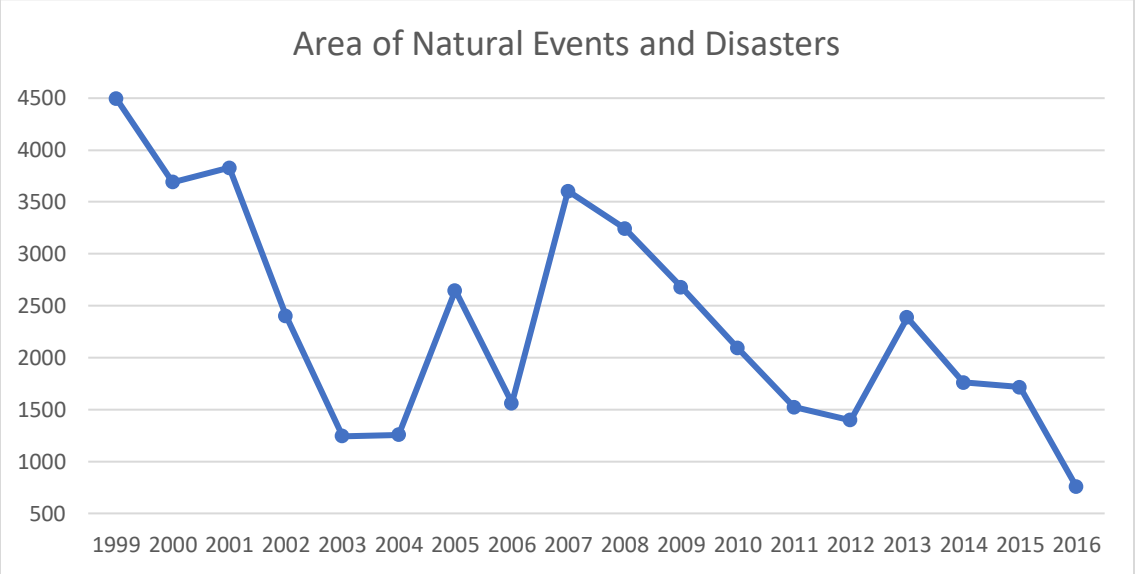

Table 1: Estimations and stats

	Eq (4) $Grad_t$	Eq (5) $Income_t$	Eq (6) $Income_t$	Eq (7) $Income_t$
$Income_{t-1}$		0.098*	0.10*	0.10*
$K1_t$		0.03596***	0.0025**	0.005**
$K2_t$		0.02727**	0.0158*	0.017
$Grad_t$		-0.0185*		
$grad_t$			0.081	0.083
Tea_t	0.816**			
$edPF_t$	0.801**			
$soPF_t$	0.007***	0.27798***	0.265***	
spF_t				0.012**
S	Yes	Yes	Yes	Yes
Y	Yes	Yes	Yes	Yes
MSE	0.01595	0.006408	0.006315	0.006278
R^2	0.379363	0.353517	0.362933	0.366636
P_F	2.61E-06	6.53E-05	3.2E-05	2.40E-05
N	187	187	187	187

P value: * at 10% level; ** at 5% level, *** at 1% level

Whether resource development has widened the regional income gap ?

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Abstract

An the 19th National Congress of the Communist Party of China and work report of the government in 2018, it is proposed that in order to solve the outstanding problems of unbalanced development, it is necessary to solve the problem of the disparity between the rich and the poor caused by the uneven distribution of regional income in the resource enrichment areas. Shaanxi Yulin, where energy development is a pillar industry, is regarded as a representative of resource enrichment areas. This region has been viewed as a national-level poverty county in the past. However, after extensive development of resources in recent years, the economic level has advanced by leaps and bounds. Internal and external income gaps in the region have been widened, and other indicators such as gross income, primary industry income, and secondary industry income of other prefecture-level cities within and outside Yulin Prefecture have been selected to determine whether resource development zones will widen the internal and external income gaps in the region. Using quantitative analysis methods to conduct empirical research, the study found that resource development has widened the internal and external income gaps in the resource enrichment areas, then put forward related reasons, and pointed out that taking the first, second and third industry coordinated development, extending the industrial chain,transforming government functions to narrow the gaps.

Keywords: income gap; resource enrichment area; resource curse

Introduction

At the 19th National Congress of the Communist Party of China, Xi Jinping proposed that there are many difficulties in the process of building a well-being society in an all-round way. The outstanding point is that the problem of disparate and unbalanced development has not yet been resolved [1]. During the two sessions(NPC and CPPCC) in 2018, Li Keqiang also considered the imbalanced development of China as the current outstanding problem in the development of the country.

At present, the academic community is widely concerned about the widening gap between the rich and the poor caused by resource curses. Foreign scholars[2] start from the unbalanced development of the region and point out that resource curses, if not resolved through government intervention, would jeopardize the development of the country. Inequality and poverty may lead to social tensions. Some domestic scholars [3-5] believe that the Reform and Opening have significantly improved the lives of Chinese residents, but there is still a certain gap between the increase in urban disposable income and farmers' net income. Some scholars[6-8] believe that the income gap is mainly due to some social factors (such as institutional factors and economic development factors) and some non-social factors. In particular, expert Wang Zhong, through the Theil index method, concludes that the mineral economic growth in resource enrichment areas is not conducive to the overall improvement of its economic structure, and it is also not conducive to the conclusion that the gap between rich and poor has been narrowed in the region. There are also scholars[9-13] who mainly discuss the causes of the gap between the rich and the poor. After analyzing and summarizing, they propose reasonable solutions to narrowing the gap between the rich and the poor as well as promoting social equity. Experts Shen Ling and Tian Guoqiang, through empirical analysis, conclude that reducing the gap

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between the rich and the poor by reducing the overall number of low-income earners can promote innovation, while reducing the gap between the rich and the poor by increasing the overall income of low-income earners cannot promote innovation.

These scholars have studied the impact of the gap between the rich and the poor in our country on the impact of residents across the country, as well as corresponding rationalization proposals and effective countermeasures. However, if we can conduct a deep study on the regional income gap from the perspective of resource development, it will be more conducive to solve the basic contradiction of China's unbalanced development, and it can provide a reliable theoretical basis for the healthy development of regional economies, especially resource enrichment areas. If the regional economy lacks balanced development and coordinated development, it will easily lead to unbalanced income distribution and thus generate income inequality. The most typical resource enrichment area is the Sanxi area. The Sanxi area refers to three areas of Shanxi Province, Shaanxi Province and Mengxi area. On the basis of studying the academic achievements of scholars at home and abroad, due to the typicality and representativeness of Shaanxi Province,we explore whether the resource enrichment areas in Shaanxi Province have widened the income gap,so we study Yulin City, Shaanxi Province as a typical example in order to explore the common problem of the similar areas all over the country. It is designed to respond to the call of the country, exploring the causes of this problem, explore countermeasures actively and solve the outstanding problem of unbalanced development.

Status and Problems of Resource Development Areas

Based on the economic data from 2000 to 2015 in Yulin City, Counties of Yulin City and the three cities in southern Shaanxi Province, samples were collected and processed, and problems were identified through comparative analysis of the status. The variables are shown in Table 1.

Table 1 Variable Table

Variable type	Variable symbol	Variable name	Variable type	Variable symbol	Variable name
Explained variable	Y_1	Regional income	Explanatory variables	X_5	Yulin's primary industry income compared to the ratio of three cities in southern Shaanxi
	Y_2	The total income of Yulin area compared with the ratio of three cities in southern Shaanxi		X_6	Yulin's secondary industry income compared with the ratio of three cities in southern Shaanxi
	Y_3	The ratio of North Six County to South Six County		X_7	The Per Capita Disposable Income of Yulin Town Relative to the Three Cities of Southern Shaanxi
Explanatory variables	X_1	Raw coal production		X_8	Per capita income ratio between North Six County and South Six counties
	X_2	Second industry income		X_9	The ratio of the secondary industry income between North Six County and South Six Counties
	X_3	Agricultural income		X_{10}	The ratio of fiscal revenue between North Sixth County and South Six counties
	X_4	Energy income compared to agricultural income multiples			

The proportion of income from resource development increases year by year, with obvious extrusion effect

There are 2 districts, 1 county-level city, and 9 counties in the jurisdiction of Yulin City. The permanent population is 3.382 million (2016), and agricultural production mainly produces miscellaneous grains. Viewing from natural resources reserves it is a world-famous source of energy

and mineral resources. The predicted reserves of coal in Yulin City are 277.64 billion tons and the proven reserves are 150.49 billion tons. The predicted reserves of natural gas are 4.2 trillion cubic meters and the proven reserves are 301 billion cubic meters. The estimated oil reserves are about 1.1 billion tons, and the proven reserves are about 400 million tons; the predicted reserves of rock salt are about 1.93 trillion tons, and the proved reserves are 5.1 billion tons. In the past, In the past, the economy in this area was very backward and it was a national poverty area. At present, through the vigorous development of energy resources, the regional income level has risen significantly and has become an important energy continuum for the country. This region is a typical representative of resource development. Table 2 compares the income generated by energy extraction from 2000 to 2016 in Yulin City and the income of other industries.

Table 2 Comparison of Energy Income and Agricultural Income in Yulin City from 2000 to 2015

index	X_1	X_2	X_3	X_2/X_3	Y_1	X_2/Y_1
2000	1640.00	46.60	24.01	1.94	105.05	44.36%
2001	2583.00	62.10	23.30	2.67	129.31	48.02%
2002	3227.00	83.37	32.03	2.60	162.83	51.20%
2003	4088.00	113.30	33.90	3.34	204.76	55.33%
2004	4405.00	171.05	43.95	3.89	278.53	61.41%
2005	6560.00	260.06	48.84	5.32	447.63	58.10%
2006	10588.00	358.05	60.28	5.94	592.34	60.45%
2007	11992.00	503.92	82.04	6.14	795.98	63.31%
2008	15533.00	796.10	110.24	7.22	1172.76	67.88%
2009	20929.00	860.78	120.01	7.17	1302.31	66.10%
2010	25732.00	1205.77	152.88	7.89	1756.67	68.64%
2011	28354.95	1629.66	187.06	8.71	2292.25	71.09%
2012	32004.80	1928.53	209.72	9.20	2669.88	72.23%
2013	33854.89	1915.09	232.74	8.23	2779.46	68.90%
2014	36263.31	1966.78	250.03	7.87	2920.58	67.34%
2015	36103.50	1523.68	250.08	6.09	2491.88	61.15%

Source: According to the statistical yearbook of Shaanxi Province

Since resource exploitation industry is a pillar industry in resource enrichment areas, it accounts for a large proportion of the output value of the secondary industry. Therefore, the income from resource extraction in Table 2 is replaced by income from the secondary industry. From Table 1, it can be seen that Yulin City's energy extraction volume has increased significantly year by year, and the secondary industry's income has become more energy-intensive. Compared with the primary industry income, it has increased from 1.94 times in 2000 to 6.09 times in 2015. The share of the secondary industry's income in the total living area has increased from 44.36% in 2000 to 61.15% in 2015, of which 9.19 times and reached 9.19 times and 72.23% around 2012. This also reflects the sharp increase in demand for China's coal market during the "golden decade" of the coal industry. Under such circumstances, the energy industry has developed rapidly and even ahead of schedule. The regional coal production capacity has been released in large-scale, leading to excess capacity. A large number of people step into the rich class because of energy have been created, and the coal-based industry development pattern has led to a serious lag in the development of primary industries, which has led to a lack of income growth for farmers engaged in agricultural production, and has also squeezed out other industries.

Larger income gap compared to other regions outside, short-term interests conflict with long-term interests

The income gap in Yulin City has not only become more pronounced in this city, but has also gradually widened compared with other cities in Shaanxi Province. Shan Nan is the southern part of Shaanxi Province, and the prefecture-level cities in the southern part of Shaanxi Province are Shangluo, Ankang, and Hanzhong. Hanzhong City and Ankang City in southern Shaanxi Province are very similar to the southern regions of China in terms of natural conditions because rice is mainly

planted in agriculture. Compared with Yulin City, the primary industries of the three cities in southern Shaanxi Province account for a relatively large proportion, and there is no abundance mineral resources.

Table 3 Comparison of Economic Data between Yulin City and Southern Shaanxi Province

index	Y_2	X_5	X_6	X_7
2000	0.4196	0.1974	0.5915	0.2701
2001	0.4797	0.1801	0.7621	0.2823
2002	0.5437	0.2364	0.8906	0.3031
2003	0.5674	0.2352	0.9625	0.2971
2004	0.6633	0.2693	1.1705	0.3116
2005	0.9406	0.2571	1.5717	0.3099
2006	1.0747	0.2795	1.8390	0.3104
2007	1.2218	0.3179	2.1787	0.3522
2008	1.4571	0.3373	2.7872	0.3967
2009	1.4232	0.3437	2.5845	0.3915
2010	1.5647	0.3913	2.6898	0.3991
2011	1.6170	0.3928	2.6553	0.4006
2012	1.5942	0.3936	2.5408	0.4015
2013	1.3858	0.3904	1.9826	0.4005
2014	1.2882	0.3943	1.7513	0.3926
2015	1.0241	0.3788	1.2902	0.3904

Source: According to the statistical yearbook of Shaanxi Province

Table 3 shows the comparison of the economic data of Yulin City and the three cities of southern Shaanxi Province from 2000 to 2015. It can be seen that Yulin's total income and per capita disposable income lag behind the three cities of southern Shaanxi Province in 2000, but the gap in subsequent years is quite different. Continuously shrinking, in 2011 the total revenue of Yulin City reached 1.5 times the sum of the three cities of southern Shaanxi Province, and the per capita disposable income also widened the gap between them. The relative income of the primary industry did not change significantly during this period of time. The fundamental reason is that the secondary industry in Yulin City, especially the resource extraction industry has developed rapidly, resulting in a rapid increase in the income of its secondary industry. The rapid growth of income makes outstanding contributions, while the development of other industries lags behind and there is a situation where short-term interests conflict with long-term interests. What needs to be explained is that due to changes in statistical conditions in Shaanxi Province in 2014, there have been some small fluctuations in the statistics since 2014.

The income gap in different internal administrative regions is widening, and social and economic development is constrained by resources.

"Coal and non-coal" are often mentioned in resource enrichment areas. The difference between the two is that the former relies on coal to develop regional economies and the latter focuses on traditional agricultural production to develop regional economy. The Yulin Municipal Administrative District has a total of one municipal district and 11 counties and districts, of which the municipal district is Yuyang District. The locals refers to Luyang District, Shenmu County, Fugu County, Hengshan County, Jingbian County, and Dingbian County as “Northern Six Counties”. The six counties have one thing in common: they are rich in natural resources within the counties. Mizhi County, Jiaxian County, Wubao County, Qingjian County and Zizhou County are called “Southern Six Counties”. The common point of these six counties is mainly agricultural production.

Table 4 Comparison of economic data between Northern Six County and Southern Six counties in Yulin City

index	X_8	X_9	X_{10}	Y_3
2000	3.3979	11.3458	5.3384	5.0730

2001	4.8001	21.5329	7.8207	7.1334
2002	5.2564	32.0089	8.4468	7.7056
2003	5.7157	40.9213	12.2392	8.5870
2004	5.7842	53.1342	19.6120	9.0467
2005	6.9160	32.5768	20.9265	9.8412
2006	6.7008	37.6436	23.1246	10.0928
2007	6.7996	37.2928	23.2258	10.9721
2008	7.4837	39.0149	30.8140	11.9350
2009	6.3431	27.9259	37.1169	10.7404
2010	6.8790	29.7280	42.8729	11.4906
2011	5.4575	33.1939	44.5606	12.3226
2012	5.9451	31.9898	44.6490	12.5742
2013	4.9360	25.3603	38.9244	11.5777
2014	4.9550	28.5045	33.6095	11.7396
2015	3.0674	23.5992	30.8219	9.8926

Source: According to the statistical yearbook of Shaanxi Province

Table 4 reflects the mining of coal and other resources in recent years. The gap between the gross production value and the fiscal revenue between coal-producing counties and non-coal-producing counties has gradually widened. Yulin City is a resource-based city. The income of resource extraction has long dominated the industrial structure of the city, and resource development has contributed a lot to the total regional income. Therefore, there has been a situation of over-reliance on the coal industry. In order to quickly grasp the economy and increase the growth rate of GDP, local governments often start with the coal industry, increase coal production, coal withdrawals,extraction and so on. They are actually stepping up the economic development of the coal industry. Dependence has led to a dominance of the coal industry. It is the dominance of a single company that has caused economic support to tilt toward the coal industry, indirectly restricting the development of local manufacturing and other non-resource-based industries, making it difficult to upgrade the industrial structure, resulting in very low added value,short industrial chains and single product structure.

Empirical analysis of the widening income gap in resource enrichment areas

Correlation test

Due to the high correlation between the selected indicators, there is multicollinearity. Therefore, before the regression analysis, the correlation tests of each variable should be performed to obtain the degree of correlation between the variables. The test results are shown in Table 6.

Table 6(a) Variable Correlation Test Results

	Y_1	X_2	X_3	X_4
Y_1	1	0.996998	0.991445	0.85702
X_1	0.99004	0.97972	0.993113	0.855348
X_2	0.996998	1	0.978951	0.87217
X_3	0.991445	0.978951	1	0.815326
X_4	0.85702	0.87217	0.815326	1

Table 6(b) Variable Correlation Test Results

	Y_2	X_5	X_6	X_7
Y_2	1	0.907895	0.9613	0.924118
X_5	0.907895	1	0.782554	0.968978
X_6	0.9613	0.782554	1	0.833074
X_7	0.924118	0.968978	0.833074	1

Table 6(c) Variable Correlation Test Results

	Y_3	X_8	X_9	X_{10}
Y_3	1	0.497034	0.495944	0.956971

X_8	0.497034	1	0.701298	0.366908
X_9	0.495944	0.701298	1	0.401593
X_{10}	0.956971	0.366908	0.401593	1

From the correlation coefficient matrix in Table 6, we can see that Y1, Y2, and Y3 are highly linearly related to each index of the group, and the correlation between each index is also very high. The correlation coefficient between each explanatory variable in the model is relatively high. There is indeed a serious multicollinearity, and a stepwise regression approach is used to examine and solve multicollinearity problems.

In order to determine the degree of interpretation between different explanatory variables, a one-variable regression between the explanatory variable and the explanatory variable is performed and analyzed, and the effects of the coefficient of determination and T-test are found, and the influences of Y1, Y2, and Y3 are found, and stepwise regression results are obtained , as shown in Table 7.

Table 7 Stepwise Unary Regression Results of Explained Variables

Independent variable	Y_1				Y_2			Y_3		
variable	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
Parameter estimate	0.08	1.43	12.39	388.05	5.11	0.54	7.84	0.51	0.41	0.34
t statistics	26.31	48.18	28.42	6.22	8.10	13.06	9.05	2.33	2.64	11.26
R^2	0.98	0.99	0.98	0.73	0.82	0.92	0.85	0.28	0.33	0.90

Stepwise regression results showed that X2, X6, and X10 are the core factors affecting Y1, Y2, and Y3, then X3, X7, and X9 are the following.

3.2 Regression model results

Using Eviews 8.0 software analysis, the explanatory variables are gradually increased with X2, X6, and X10 as the core, and the results of the model analysis obtained by regression are shown in Table 8. We conduct inspection after stepwise regression.

Table 8(a) Regression Analysis Model

	Model One	Model two	Model three	Model four
Constant term	55.54	-45.97***	-45.13***	-61.81**
	(1.69)	(-4.79)	(-4.83)	(-2.86)
X_1			0.004	
			(1.32)	
X_2	1.43***	0.91***	0.90***	0.89***
	(48.18)	(28.06)	(26.98)	(21.09)
X_3		4.63***	4.08***	4.73***
		-16.39	(8.26)	(15.25)
X_4				3.84
				(0.82)
D.W.	0.75	1.91	1.74	1.95
Adjusted R^2	0.99	0.99	0.99	0.98
AIC	11.85	8.9	8.89	8.97

Table 8(a) In model 2, the F statistic is 3490, which is obviously significant. The coefficient of adjustment is close to 1, and each variable is a significant factor of Y1. The overall linear relationship of the regression equation is significant. The regression of model 3 and model 4 all resulted in significant variables becoming insignificant, so model 3 and model 4 should be eliminated. Through the regression analysis of model 2, it is found that the t-test and AIC information criteria of each variable are in a reasonable range, indicating that the variable selection is reasonable, and both X2 and X3 have a significant positive effect on Y1. Therefore, the regression equation should be Y1 = 0.9105X2 + 4.6284X3 - 45.9741. With other factors unchanged, when X2 increases by 100 million yuan, Y1 increases by 0.9105 billion yuan.

Therefore, it can be found that there is a clear extrusion effect in the resource enrichment areas. The resource area is heavily resource-developed and the government can also obtain higher taxes.

Therefore, it is welcomed by local governments, provides sufficient policies, institutional guarantees and a favorable development environment for the energy industry, and increases the investment in infrastructure construction, promoting a large number of enterprises. And various social capitals are transferred to the energy industry. However, problems have gradually emerged. Local governments have invested a great deal of their resources in the energy industry and will inevitably reduce their investment in other industries. As a result, other important industries of the national economy will not be fully developed, resulting in a single economic structure in the resource area and lack of sustainability.The typical feature of the resource development industry is that it is a labor-intensive industry. A large number of talents and laborers in the area are constantly engaged in the resource industry, which makes the industry have a higher degree of geographical concentration, causing a lag in the level of urbanization.

Table 8(b) Regression Analysis Model

	Model five	Model six	Model seven	Model eight
Constant term	0.12**	-0.27***	-0.74***	-0.16
	(1.5)	(-4.46)	(-4.12)	(-0.73)
X_5		2.26***		2.66***
		(7.78)		(3.48)
X_6	0.54***	0.37***	0.35***	0.38***
	(13.06)	(12.54)	(7.7)	(10.94)
X_7			3.42***	-0.73
			(4.96)	(-0.56)
D.W.	0.22	1.52	1.11	1.6
Adjusted R^2	0.92	0.98	0.97	0.98
AIC	-1.25	-2.86	-2.19	-2.76

In Table 8(b), the F-statistic is 241, which is obviously significant. The admissible coefficient of adjustment is close to 1, and each variable is a significant factor of Y2. The overall linear relationship of the regression equation is obviously established, and the model 8 and model 9 results in insignificant variables becoming insignificant, so model 8 and model 9 should be eliminated. Through the regression analysis of model 7, it is found that the t-test and AIC information criterion of each variable are in a reasonable range, indicating that the variable selection is reasonable, and both X6 and X7 have a significant positive effect on Y2. Therefore, the regression equation should be Y2 = 0.3537X6 + 3.4198X7 - 0.7444.

So we can find short-term benefits and long-term conflicts of interest in the resource area. Resource enrichment areas have relatively abundant resources but the level of economic development is relatively backward, and resource advantages are often over-utilized. In the initial stage, it can be vigorously developed through large-scale development to form a resource development industry with low cost as the dominant feature, and then form a specialized production department and a series of advantageous industries. However, the yield of other industries such as agricultural production is relatively low, it is difficult to absorb social resources, and the short-term results are small. In contrast, the short-term return of the resource industry is obvious and it is easier to obtain investment outside the region. It is precisely because of the measures taken are blind and sloppy as well as lack of long-term planning,it hasn't lead to long-term planning and design of resource enrichment areas and has ignored the environmental and ecological damage caused by resource extraction. When the resource reserves gradually decrease, if there is no development of related alternative industries, it will easily bring about the consequences of economic downfall.

Table 8(c) Regression Analysis Model

	Model nine	Model ten	Model Eleven	Model twelve
Constant term	0.53***	0.33***	0.39	0.34***
	(12.75)	(4.95)	(1.69)	(5.03)
X_8			0.3	0.1
			(0.79)	(1.15)
X_9		0.16***	0.29	0.12*
		(3.33)	(1.31)	(1.82)
X_{10}	0.34***	0.31***		0.30***

	(11.26)	(12.19)		(12.08)
D.W.	1.46	1.95	0.11	1.7
Adjusted R^2	0.89	0.94	0.27	0.94
AIC	-3.79	-4.28	-1.81	-4.26

In Table 8(c), the F statistic is 114, which is obviously significant. The coefficient of adjustment is close to 1, and each variable is a significant influence factor of Y3. The overall linear relationship of the regression equation is significant, while the regressions of model 11 and model 12 all lead to the notable significant variables becoming insignificant, so model 11 and model 12 should be eliminated. Through the regression analysis of model 10, it is found that the t-test and AIC information criteria of each variable are within a reasonable range, indicating that the variable selection is reasonable, and both X9 and X10 have a significant positive effect on Y3. Therefore, the regression equation should be Y3 = 0.1648X9 + 0.3071X10 + 0.3335.

it can be found that the socio-economic development of resource development areas is constrained by resources. After the Reform and Opening, with the central government's decentralization of economic and management rights and the impact of fiscal reforms, the governments of all regions have actively pursued their interests for the development of the region under the conditions of market economy. The resource enrichment areas have been encouraged and supported by the government for a long time and have a good industrial foundation under a series of policies. However, under the influence of various factors, the long-term sustainable development of resource enrichment areas and the gradual widening of the income gap remain thorny issues. After the country implemented the reform of the economic system, the overall speed of social and economic development in these areas has slowed down significantly. The overall level has dropped. Most resource enrichment areas have changed rapidly before they changed, and per capita GDP has even fallen to the national average level. For example, in some resource enrichment areas, some energy companies do not have an effective link with local economic development in production, and this also raises the problem of the expansion of economic benefits and the disconnection with increasing income of local farmers. The resource enrichment areas are faced with limited choices and rely on only a single resource for the development of the social economy. The fundamental reason is that these areas are heavily dependent on resources in the process of economic development.

In summary, the main reasons for the income gap between Yulin City and outside the city are X2, X6 and X10. As a result of resource development, the extrusion effect of resource enrichment area is obvious, short-term benefits and long-term conflicts of interest and socio-economic development are constrained by resources. As a result, the income of the secondary industry has rapidly increased, and the wage income of the coal industry, which accounts for the dominant economic position, has grown rapidly, widening the income gap with other social classes and even other non-resourced regions. The rapid increase in the fiscal revenue of Yulin City has aggravated the increase in the uncountable local welfare gap.

In general, ignoring the interests of local residents and unbalanced social development clearly do not meet the principle of building a harmonious society. Blindly increasing the exploitation of resources, only paying attention to the interests of a few people and ignoring the income problems of other people in the region. Constantly increasing the income gap between groups is also not conducive to solve the problem of insufficient development and imbalance, and it is also not conducive to comprehensive national development as well as the strategy of building a well-being society.

Strategies to narrow the income gap in resource enrichment areas

The first, second and third industry coordinated development

Collaborative development refers to the virtuous cycle of synchronous and harmonious development that is eventually formed through mutual adaptation, mutual cooperation, and mutual promotion within the system and among various subsystems. Due to the relative differences in various factors of production between industries in resource enrichment areas, some industries have a scarcity of certain elements while others are relatively surplus. For example, infrastructure construction in poor areas in resource enrichment areas often lacks financial support and management services, while resource-based enterprises have abundant capital reserves, and they also have a large number of management talents who understand the economy, plan, and have innovative spirits.The first, second and third industry coordinated development is one of the effective ways to solve this structural irrational problem. It can greatly promote the development of industrial systems from disorder to stability and can also optimize the allocation of existing resources. The overall efficiency, thereby optimizing the

overall structure of the system, increasing the value of the system, reducing system costs, reducing the adverse impact on the environment and ecology in the production process of resource-based industries, and providing an ideal operating mechanism, embarking on the road of sustainable development, and obtaining synergies.

Industry chain extension

To think long-range, we can't just look at the current. Resource enrichment areas should pay attention to the extension of the industrial chain, avoid low-level redundant construction and development,emphasize deep processing of resources, deep processing of featured industries, and focus on the choice and cultivation of alternative industries,as well as give priority to the development of alternative industries. For example, in the primary industry, it is necessary to vigorously develop mountain agriculture and mountain crops, establish industries with local high-quality agricultural characteristics, and establish it on the basis of consolidating food security production.

In the secondary industry, we must pay attention to the development of modern coal chemical industry and other industries, focus on the deep processing and development of resources and specialty industries, expand the industrial chain of energy companies, and increase the added value of products. Strategic emerging industries need to be highly valued and developed. In the current environment of the times, strategic emerging industries have lower entry threshold, and the level of local development has not drastically been expanded. This is the initial stage, but competition in all regions is becoming increasingly fierce. Therefore, resource enrichment areas should seize opportunities and make full use of their advantages to accelerate development.

In the tertiary industry, Yulin City has a population of more than 4.86 million permanent residents and it is a large city in Shaanxi Province. It has already entered the rank of big city, and its traffic location has obvious advantages. It has created better conditions for the vigorous development of the service industry and should be vigorously promoted. Develop special services such as red culture, tourism resources and patriotic culture. We should develop service industries that are geared towards the people's livelihood, and we must also vigorously develop services for rural areas. It is necessary to organically integrate long-term interests with current interests, and fully consider that resources can be scientifically developed and efficiently utilized. The cooperation between the two focuses on the construction of basic projects and focuses on the development of long-term projects. The development planning, mining scale of mineral resources should be scientific and rational,blind and predatory development should be prohibited,the utilization of resources should be taken as the development goal, and the development of circular economy should be promoted. The development of resources has entered a virtuous track that meets the needs of the present generation and does not pose a hazard to the development of future generations.

Government functions transformation

The concept of people's livelihood is a highly reflective of economic, social, and political views. The governments of the resource areas should review the situation, change the government's functions, and make full use of the role and function of macroeconomic regulation and control. At present, there are many difficulties and problems in the process of economic and social development in the resource enrichment areas. There are still many tasks and projects that need to be solved and implemented in the economic cooperation and co-building. However, the input is very limited. It is necessary to correctly grasp the entry point for cooperation between the district and the mine. Therefore, we must firmly grasp the starting point and integration point of the regional economic cooperation, bear the basic idea of "based on people's livelihood"in mind, solve the income gap of residents in resource enrichment areas, based on local conditions there, clearly focus on investment priorities, and focus on implementing Livelihood Project and Huimin Project. The government should solve the income problems of local residents, thereby reducing the income gap of residents in resource enrichment areas.

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A Topic in Sustainable Finance - A New Approach to Government's Funding to Social Enterprises

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Abstract

A social enterprise (SE) is a business entity created by social entrepreneurs to several organizational goals, which, according to Dees (1998, revised in 2001), include adopting a mission to create and sustain social value (not just private value), recognizing and relentlessly pursuing new opportunities to serve that mission, engaging in a process of continuous innovation, adaptation, and learning, acting boldly without being limited by resources currently in hand, and exhibiting heightened accountability to the constituencies served and for the outcomes created. The concept of SE originates from both social entrepreneurship, which is defined as NPOs engaging in entrepreneurial activities, and corporate social responsibility (CSR), which is defined as for-profit businesses conduct non-profit or social activities. As many SEs are mostly in the startup stage in many countries and thus are in need of government's financial support, this study aims to explore the effect of several government's policy tools on firm value of an SE and to identify the optimal government tool to support SEs. In this study, a simplified firm value model of SE is constructed and then the research is directed to evaluate the effects of various policy tools on the value of a SE. With risk analysis on the distribution of firm value, a new approach to government's funding policies is proposed with improvement of firm value and reduction of corporate risk to ensure SE's long-term sustainability. Related issues, such as earnings management, agency cost, and risk assumption, are also discussed for the practical purpose.

Keywords: social enterprise, social entrepreneurship, corporate social responsibility, firm value, funding policy

Introduction

Throughout the twentieth century, organizational entities have evolved from two different extremes of a spectrum according to their organizational mission. On one extreme, non-profit organizations (NPO) are formed to serve for specific social purposes, while on the other extreme for-profit businesses are established and aiming to generate stockholder's wealth or maximize firm value. Traditionally, NPOs highly rely on philanthropic donations and government's funding, which would not only discourage innovative activities, but also make NPOs unable to self-sustain in the society. Social entrepreneurship, therefore, is suggested to take advantages of profit-making entrepreneurial activities to achieve the social missions of NPOs. On the other extreme, for-profit businesses are pressured by the society to blend social responsibility into conventional corporate goal of wealth maximization, a field often called corporate social responsibility (CSR). Both social entrepreneurship and CSR push the rise of social enterprises (SEs), which are positioned in the center of the organizational spectrum. (See Figure 1)

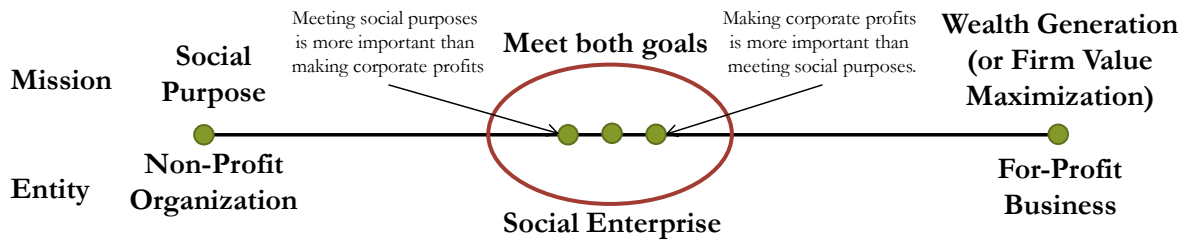

Figure 1. The Spectrum of Organizational Entity

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Social enterprises are entrepreneurial entities mixed with non-profit and for-profit ventures aiming to achieve both social purposes and wealth generation (or firm value maximization). A good example of SE is DC Central Kitchen founded in 1989. This enterprise first picked up wasted food, turned it into balanced meals for NPOs, and trained jobless adults in the culinary arts. In 2014, Central Kitchen provided at least three million meals a year to schools, shelters, and NPOs. With their successful business model, the kitchen has not only accommodated many interested volunteers, but also created job opportunities for the unemployed and generated business revenues to achieve sustainable growth. Another example of SE is the Big Issue Magazine, which aims to create job opportunities for homeless people by selling their magazines and contribute the homeless to regain their self-help confidence. In 2016, the magazine was sold 200 million copies, which achieved both their economic and social purposes.

From the perspectives of major funding sources, NPOs highly rely on government's sponsorship and society's donations while for-profit businesses finance their equity and liability from financial institutions and markets. By contrast, SEs can benefit from the funding sources of NPOs (e.g., governmental sponsorship and philanthropic donations) and from entrepreneurship of for-profit businesses (e.g., fundings from investors, financial institutions, and financial markets). Although SEs can have multiple funding sources, yet many SEs nowadays still encounter financial difficulties in most situations. The first reason for the difficulties is mainly because SEs take the form of business entities. There may be involved with complicated legal issues when the government implements funding policy tools to sponsor SEs. Also, philanthropic donations can be very uncertain and unpredictable to SEs. More importantly, SEs are not as profit-driven as for-profit business, which would constrain their business activities and innovative offerings from making too much profit.

As many SEs are mostly in the startup stage in many countries and thus are in need of government's financial support, this study aims to explore the effect of several government's funding policies on firm value of SEs and to rationalize the optimal government tool to support SEs. By examining the financial impact of policy tools on firm value of SEs, policy-makers can not only select the optimal policy tool to support SEs, but also help SEs sustain and succeed in the business world. In this study, a simplified corporate valuation model is constructed to evaluate the effects of various policy tools on corporate value of an SE. With risk analysis on the distribution of firm value, a new approach to government's funding policy is therefore proposed to ensure SE's long-term sustainability.

Literature Review

Social Entrepreneurship and Social Enterprise

The concept of SE originates from social entrepreneurship. Dees (1998, revised in 2001) discusses social entrepreneurship and formulates the theory of social entrepreneurship, which is frequently defined as NPOs engaging in entrepreneurial activities (Lasprogata and Cotton, 2003), or for-profit businesses conducting non-profit or social activities (Wallace, 1999; Baron, 2007). SEs are business entities created by social entrepreneurs to achieve several organizational goals, which, according to Dees (1998, 2001), include adopting a mission to create and sustain social value (not just private value), recognizing and relentlessly pursuing new opportunities to serve that mission, engaging in a process of continuous innovation, adaptation, and learning, acting boldly without being limited by resources currently in hand, and exhibiting heightened accountability to the constituencies served and for the outcomes created.

Abundant studies explore social entrepreneurship from the innovation perspective. For instance, Austin et al. (2006) characterize social entrepreneurship as innovative activities that create social value within or across government, business, or nonprofit sectors all fits within this conceptual space. They propose four aspects to distinguish social entrepreneurship from business entrepreneurship: market failure, social mission, resource mobilization, and performance measurement. Market failure states the situation in which an SE emerges when there is a social market failure. Secondly, social mission means that an SE should aim to create social value for the public good. Thirdly, resource mobilization means that human and financial resource mobilization is a prevailing difference between social and business entrepreneurship, in turn leading to different approaches to managing these resources. Lastly, performance measurement means that performance measurement of social entrepreneurship could be more complicated due to non-quantifiability, multi-causality, temporal dimensions, and perceptive differences of the social impact created. In addition, Peredo and McLean (2006) argue that social entrepreneurship can be flexibly

exercised where some person or persons (1) aim either exclusively or in some prominent way to create social value of some kind, and pursue that goal through some combination of (2) recognizing and exploiting opportunities to create this value, (3) employing innovation, (4) tolerating risk and (5) declining to accept limitations in available resources. On the other hand, Choi and Majumdar (2014) argue that social entrepreneurship can be regarded as an essentially contested concept and that a universal definition that would be accepted among contestant parties which are hardly possible to reach. Responding to this recognition, their study proposes the conceptualization of social entrepreneurship as a cluster concept, which can serve as a conceptual tool to help advancing social entrepreneurship as a coherent field of research despite its contested nature.

Building on theories of social entrepreneurship, many studies explore to model an SE. For example, Alter (2007) suggests a hybrid spectrum of organizational forms, including traditional non-profit, non-profit with income-generating activities, SE, socially responsible business, corporations with corporate social responsibility, and traditional for-profit. From the mission orientation, an SE can be classified as mission-centric, mission-related, and mission-unrelated, while from the perspective of business integration, business program can be embedded, integrated, or unrelated to an SE. On the other hand, Bull et al. (2008) propose that an SE is blended with a variety of capital investments, including economic, social, intellectual, and ethical capitals. While this study conceptualizes a current ideology of the neo-classical economic paradigm, it fails to provide managerial implications to practitioners in reality. More recently, Dobson et al. (2018) conduct a case study on a cultural SE, ViaVia Travellers Cafes, and reach the following findings: First, there is no replicable business model for the development of an SE. Second, the study suggests an iterative approach for an SE to develop in scaling. Third, for a successful SE to grow, adaptation and innovation need to be built into the organizational structure.

Although many studies on SE attempt to suggest a feasible development model combined with business and social entrepreneurship, many SEs, in reality, fall into financial trouble simply because these firms cannot fund themselves entirely through sales or investment. They are not profitable enough to receive traditional funding from the private sector, such as attracting interested investors or access financial markets, thus leading to a financial-social return gap. Bugg-Levine et al. (2012) propose that financial engineering can provide a new approach to funding SEs. They argue that an SE can learn to structure their funding by seeing charitable donations as a form of capital seeking for social return and financial-engineering tools as a funding source requiring financial return. In the subsection, existing problems of SEs in Japan are investigated to indicate the financial difficulty faced with SEs.

Existing Problems of SEs in Japan

Although the concept of social entrepreneurship has been proposed for decades and the entities of SE have been developing in society for years, many SEs are still faced with survival and sustainable problems from several various perspectives. In this subsection, the challenges faced with SEs are discussed from the perspectives of human resources, finance, and society.

From the internal perspective, the first challenge to the development of many SEs is lake of corporate resources. As pointed out by Barney (1991), corporate resource endowments are particularly crucial in creating sustainable competitive advantages from the resource-based view. However, a questionnaire conducted by Japan Finance Corporation (JFC) (2014) reveals that 49% of the responding SEs indicates that labor shortage is a major issue to Japanese SEs. Of the respondents answering labor shortage, 41.9% of them report that their firms are lack of skillful employees. By contrast, according to Hulten (2010), 44% of Microsoft's success can be attributed to the know-hows and skills developed by their employees. Based on this evidence, it can be easily found that many SEs are lack of both blue-collar and white-collar employees. The shortage problem in both labor and human capital can significantly affect many SEs to survive in the economy.

The second challenge faced with many SEs is mainly in the financial aspect, including low profitability and insufficient financing sources. In the same survey released by JFC in 2014, 35.4% of SEs report that low profitability is a major challenge to Japanese SEs. Furthermore, according to Takeuchi (2015), 37.4% of SEs in Japan are operating at a loss even with the presence of multiple grants and subsidies provided by the government. The financial difficulty faced with many SEs is mainly due to their low profitability. Many SEs in Japan are established by NPOs as well as social-conscious individuals, not by entrepreneurial founders with business spirits, which could be the first reason contributing to SE's low profitability. Secondly, although many SEs have learned to take advantage of business models, yet they still fail to monetize economic and social needs. Furthermore, the fact that many SEs are in the field of less profitable business also make SEs difficult

to generate sustainable profits, according to Suzuki (2009). SE's low profitability not only cause SEs to search for multiple external financing sources, but also pressures them to highly rely on government's resources when external financial sources are exhausted.

The net effects of SE's financial difficulty are two-fold. Firstly, financial difficulty of many SEs make these firms even more difficult to get a loan from the banking industry. Since banks make their loan decision based on financial statements of a business, without convincing cash flows and collateralized assets a SE cannot finance from financial institutions or markets. In addition, as many SEs are in poor financial situation, insufficient financial resources make the firms fail to provide sufficient on-job training and to hire qualified employees.

The third challenge to SEs comes from the macro-environment. Although many SEs are founded with social mission to resolve certain social issues, these firms are rarely known to the public. According to a survey conducted by JFC in 2015, only 28.8% of the respondents can clearly point out an SE, social business, or community business. The result is majorly because most of the firms are small and medium enterprises (SMEs), and hence are lack of enough financial resources to publicize their social mission. Furthermore, traditionally the public believes that most of the social mission should be the task of government. In this atmosphere of society, it would be even challenging for SEs to get mental support and to earn trust from the people. The resulting effect is private donation might be very limited. Lastly, since private donation is one of financial sources to an SE, private donation would be significantly affected by current macroeconomic condition. The impact of macroeconomic condition on private donation may be substantial when the economy is in recession.

In this subsection, three major challenges are discussed to understand the difficulties of an SE to survive in the business environment. It is important to point out that the three challenges have inter-tangling effects on each other, rather than stand-alone effects. Of the three challenges, the financial aspect plays a crucial role in untangling the knots of the survival problems of an SE, which implies that the challenges faced with an SE could be less significant by improving its financial situation.

Analytic Approach

As discussed in the previous subsection, the major challenge faced with an SE comes from the financial aspect. This paper aims at exploring how the funding policies of the government can better help an SE as there are already sufficient studies exploring social entrepreneurship and other related areas. Since government's funding is an important source of financing to an SE, this paper aims to explore how the government's funding policies can affect an SE from the perspective of corporate value. In this section, a model of firm value is firstly constructed and then

A Model of Firm Value

To simplify the analysis, we suppose a SE produces only one type of product. Its sales revenue at time t (S_t) is equal to price (P) times quantity sold (Q) at time t, as indicated below:

$$S_t = P_t Q_t \tag{1}$$

As a general form, all the firm's costs/expenses (C) can be categorized into fixed cost (f) and variable cost (v). The total cost is therefore calculated from the following equation:

$$C_t = f_t + v_t Q_t \tag{2}$$

Moreover, total cost, C, is assumed to grow at an inflation rate, i, each year as follows:

$$C_{t+1} = C_t(1 + i) \tag{3}$$

The operating income of the firm, π, at time t is therefore defined as

$$\pi_t = S_t - C_t \tag{4}$$

We assume the risk source of the firm is the quantity sold, following a geometric Brownian motion (GBM) with a drift rate, α, and a volatility, σ.

$$dQ = \alpha Q dt + \sigma Q d\omega \tag{5}$$

where $d\omega$ denotes a Wiener process.

The starting point of quantity sold at time 0 is Q_0. The quantity sold at any time t, Q_t, can deviate from the starting point, Q_0, but can never be negative. The value of the firm at time T is an integral of π_t, as shown below:

$$V_T = \int_{t=0}^{T} \pi_t e^{r(T-t)} dt = \int_{t=0}^{T} (S_t - C_t) e^{r(T-t)} dt \quad (6)$$

Traditional Funding Policies

In this study, two commonly-used government's funding policies under consideration are grant and public procurement. The government sets up grants to strengthen the financial ability of SEs to encourage social participation and innovation generation. The Social Innovation Fund and Investing in Innovation Fund of the Department of Education in the US, as well as the Big Lottery Fund in the UK are two examples. Let G_t denote the grant awarded at time t. Grants are Normally provided to SEs to reduce the operational cost, so the value of the firm receiving the grant can be expressed as follows:

$$\begin{aligned} V_T^G = \int_{t=0}^{T} \pi_t e^{r(T-t)} dt &= \int_{t=0}^{T} [S_t - (C_t - G_t)] e^{r(T-t)} dt \\ &= \int_{t=0}^{T} (S_t - C_t + G_t) e^{r(T-t)} dt \end{aligned} \quad (7)$$

Another type of government's funding policy is public procurement, which is constructed to purchase goods and/or services from SEs. It is very common for a government to make purchases from the private sector. However, many countries have passed the law to signify their support to SEs. A good example was that the UK enacted the Social Value Act in 2012 to requiring the government to open up both growth and employment opportunities for SEs to deliver public goods and/or services. Let ΔS_t denote the additional sales due to public procurement at time t and ΔC_t the additional cost incurred due to public procurement at time t. The value of the firm receiving government's purchase can be expressed as follows:

$$\begin{aligned} V_T^{PP} = \int_{t=0}^{T} \pi_t e^{r(T-t)} dt &= \int_{t=0}^{T} [(S_t + \Delta S_t) - (C_t + \Delta C_t)] e^{r(T-t)} dt \\ &= \int_{t=0}^{T} (S_t - C_t + PP_t) e^{r(T-t)} dt \end{aligned} \quad (8)$$

where $PP_t = \Delta S_t - \Delta C_t$.

By comparing Equation (7) to (8), one should easily discover the impacts of the two subsidy policies, i.e., grant and public procurement, on the firm vale are the same when $G_t = PP_t$. In addition to the previous two policy tools, there are many other types of government's supports to SEs. For instance, tax reliefs or fiscal incentives are designed to reduce the tax burden of SEs when an enterprise is classified as an SE or an investment as a social investment. The UK government passed the Social Investment Tax Relief Act to benefit those who made social investments by giving a reduction of 30% of the investment in income tax bill for that year. When the benefit of tax reduction is equal to the amount of a grant or public procurement, its impact on the firm value is similar to that of the preceding two policy tools. However, since the tax relief law creates incentives for social investors to reduce their personal or corporate income tax, this policy serves to attract interested investors to make social investments.

There are also other government's policy tools. For example, a government can set up guarantee funds to provide SEs with credit guarantees, which would allow SEs to easily get financing from the primary market or the banking industry. In addition, there are several non-finance policy tools, such as awareness campaigns or incubation/acceleration. As these non-finance policy tools are out of the scope of this paper, interested readers can refer to Sanchez (2016) for detailed discussion.

Proposed Funding Policy

The actual problems faced with government's funding two-fold, i.e., resource insufficiency and allocation inefficiency. Resource insufficiency originates from the fact that the government's funding

is a scarce resource, so the funding can never be sufficient to meet all financial needs of SEs. Along with the problem of resource insufficiency, a related problem is allocation inefficiency, reflecting the fact that a well-performed SE might not require government's subsidies yet still receiving the funding, while an underperformed SE would need more funding from the government yet unable to receive more. It is therefore plausible to reduce funding to a well-performed SE and increase funding to an underperformed SE so as to improve allocation efficiency.

The central concept of the proposed funding policy is to reduce funding from a well-performed SE and to inject funding to an underperformed SE. This new policy can thus not only improve allocation efficiency of funding, but also make the scarce resource available to more SEs. For the illustration purpose, the return on investment (ROI) of an SE at time t, R_t, is defined as follows:

$$R_t = \frac{S_t - C_t}{C_t} \tag{9}$$

The proposed new policy is that the government's subsidy is triggered when R_t is less than the lower-bound return, R^D, and the subsidy stops when R_t is greater than the upper-bound return, R^U. The mechanism of the proposed funding policy is exhibited in Figure 1.

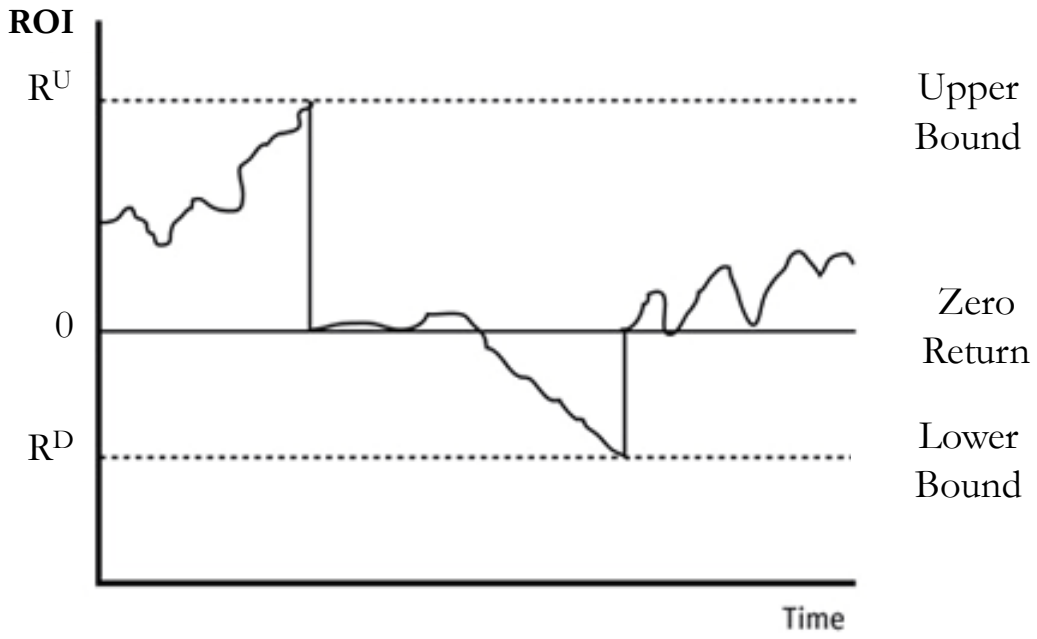

Figure 1. The Mechanism of the Proposed Funding Policy

Numerical Analysis

Monte Carlo Simulation

To demonstrate how the proposed policy can impact on the firm value of a SE, a numerical analysis based on the technique of Monte Carlo simulation is conducted. As described earlier, the quantity sold, Q, is assumed as the major quantity source of an SE. For implementation convenience, the stochastic process of Q for a time interval, Δt, can be rewritten as the following equation:

$$\Delta \ln Q = \left(\alpha - \frac{\sigma^2}{2}\right)\Delta t + \sigma\sqrt{\Delta t}\varepsilon \tag{10}$$

where ε denotes a random draw from a standardized normal distribution with a mean of 0 and a standard deviation of 1.
According to Equation (10), Q's evolution can be described as follows:

$$Q_{t+1} = Q_t e^{\left(\alpha - \frac{\sigma^2}{2}\right)\Delta t + \sigma^2\sqrt{\Delta t}\varepsilon} \tag{11}$$

The operational cost is assumed to grow at the inflation rate, i, as shown below:

$$C_{t+1} = C_t e^{i\Delta t} \quad (12)$$

The value of an SE without subsidy and that with subsidy are formulated into Equation (13) and (14), respectively:

$$V_T = \sum_{j=0}^{n} \pi_j \, e^{r(n-j)} \quad (13)$$

$$V_T = \sum_{j=0}^{n} (\pi_j + S_j) \, e^{r(n-j)} \quad (14)$$

where $\mathrm{T} = n \times \Delta t$ and S_j denotes the subsidy that an SE receives.

For the purpose of performance appraisal, two measures are constructed to evaluate the effects of government's funding policies on the firm value of an SE. The first measure is the probability of success, P, which is defined as the probability that the firm value greater than zero. For the implementation purpose, P is derived as follows:

$$P = \frac{N}{SR} \quad (15)$$

where SR represents the number of simulation runs and N is the number of runs in which the firm value of an SE greater than zero.

Another way to evaluate the effects of the funding policies on SEs is to scrutinize how these funding policies would impact on the firm value. By examining the mean and standard deviation of the distribution, we can obtain the coefficient of variation (CV) as expressed below:

$$CV = \frac{\sigma_V}{\mu_V} \quad (16)$$

where σ_V and μ_V represent the mean and standard deviation of the firm value, respectively.
To evaluate all the funding policies, we want the optimal policy to achieve the highest P and the lowest positive CV. For the proposed approach to funding SEs, it is therefore logical to examine both P and CV with different pairs of the upper and lower bounds.

Base Case Analysis

Suppose that a new start-up SE aims to provide more employment opportunities to the disable people such that of all their employees, over 80% are disable. Under the current capital installment, the SE can produce only one product, which is currently priced at $10 with a life cycle of three years. The management initially predicts that they can sell 1,000 units per month (Q_0=1,000), incurring a fixed cost of $5,000 per month and variable cost of $7 per unit. The management predicts the market will grow constantly at 5% per year with a standard deviation of 20%. Both the risk-free rate and inflation rate are assumed to be 5% and 3% per year, respectively. With 10,000 simulation runs, the mean of the firm value and its standard deviation are calculated to be -$66,708 and $21,790, respectively, with the distribution curve exhibited in Figure 2.

With the market uncertainty and high cost structure, the SE obviously cannot last long in the normal business world. Suppose that the SE is qualified for government's assistance, so the SE receives $2,000 per month in grants or equivalently a profit pf $2,000 from the public procurement system. Under the government's policies, the distribution of the firm value shifts rightward with a mean of $103 and a standard deviation of $21,809, as shown in Figure 3. It is important to point out that with more government's assistance, the distribution curve will shift more rightward.

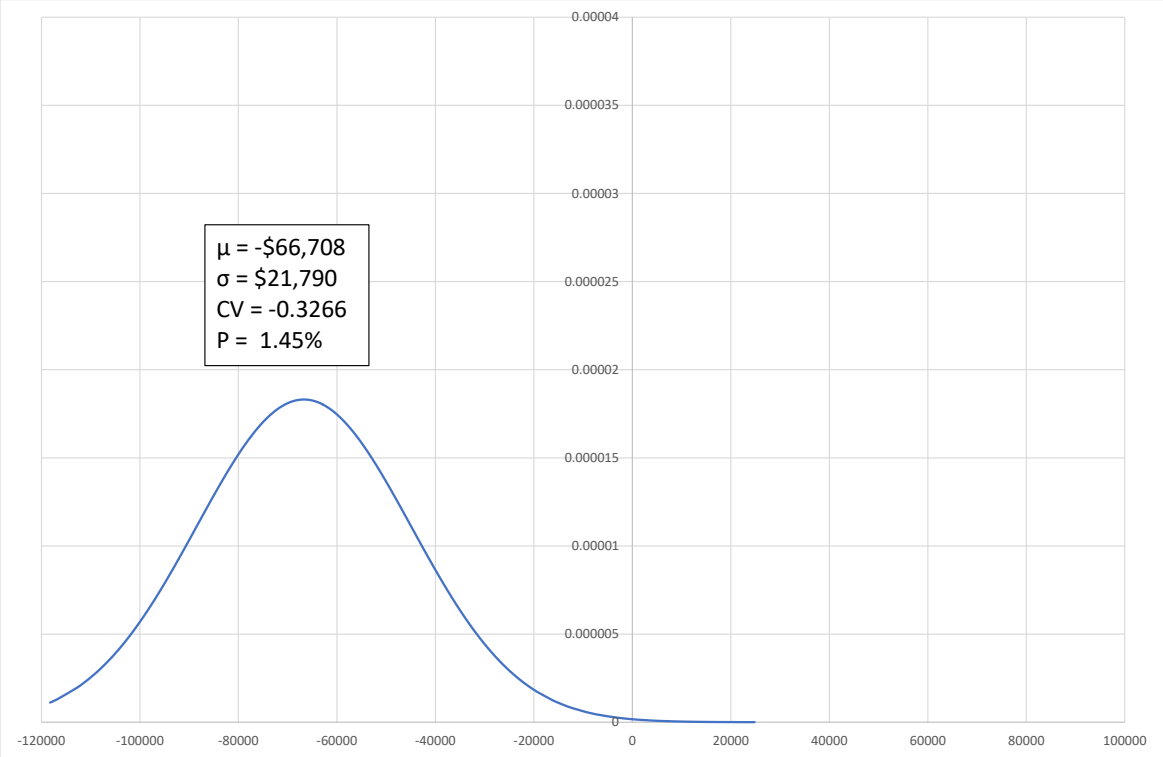

Figure 2. The Distribution of the Firm Value without Government's Assistance

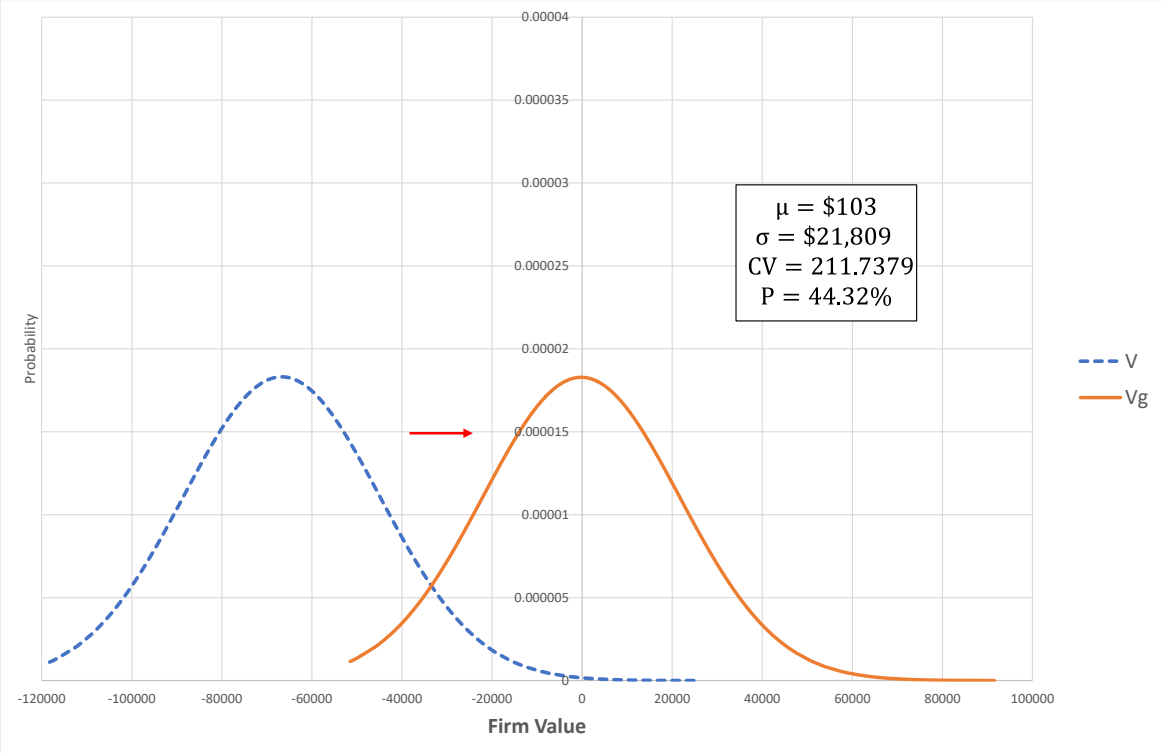

Figure 3. The Distribution of the Firm Value with Government's Assistance

Since the government's resource is limited, the government decides to take the new policy by setting the upper bound of 20% and the lower bound of -20%. This means that the SE will receive the sponsorship when their ROI hits -20% and the government will stop to sponsor when their ROI is greater than 20%. Figure 4 displays the effect under this new funding policy. As demonstrated in Figure 4, the new funding policy functions to shift the distribution to the right (a mean of -$2,908). More importantly, the standard deviation significantly decreases from $21,790 to $10,945 and the shape of the distribution curve appears to have a higher peak. The resulting effect under the new

funding policy is that the change in the distribution curve substantially reduces the operational risk of an SE.

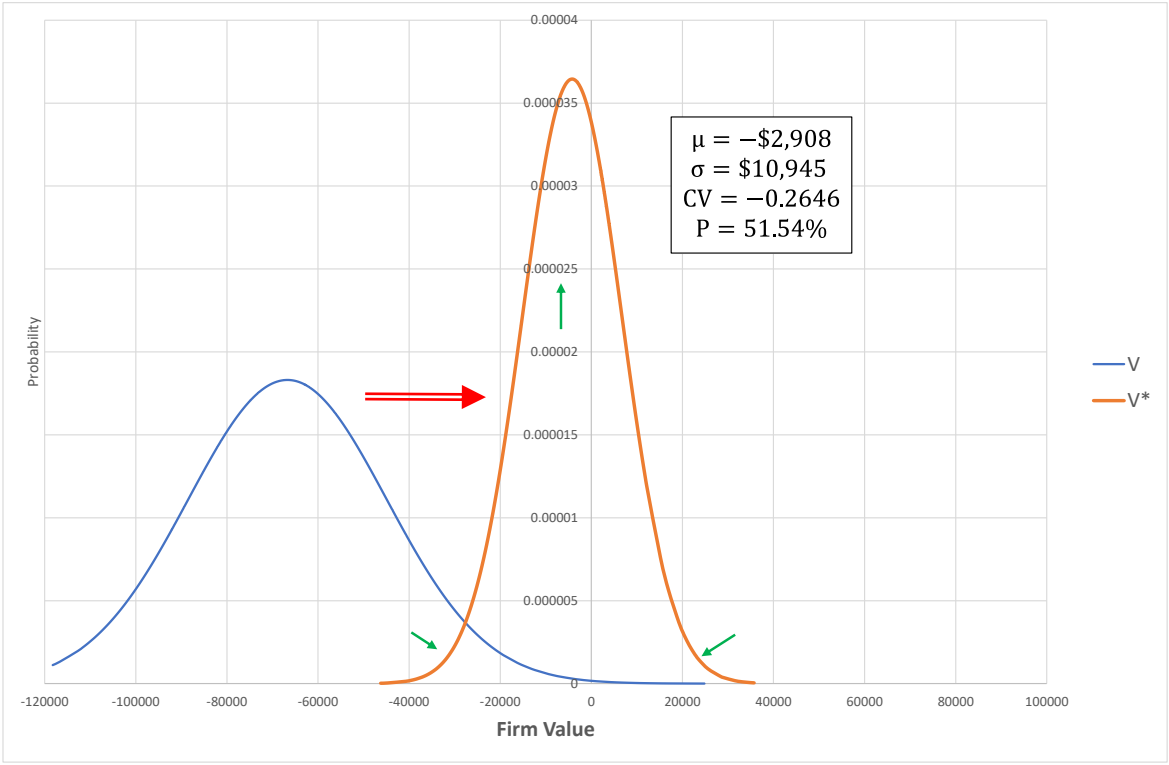

Figure 4. The Distribution of the Firm Value under the Proposed New Policy

The probabilities of success for the no subsidy policy, the subsidy policy, and the new policy are 1.45%, 44.32%, and 51.54%, respectively. This result indicates that the new funding policy can not only save government's resources, but also help to reduce operational risk of an SE, sponsor more SEs, and increase the success rate of an SE.

We then compare the distribution of the firm value under different upper and lower bounds. Figure 5 presents the value distributions under different funding policies (15%, -15%), (20%, -20%) and (25%, -25%), respectively, in which the left number in the bracket represents the upper bound and the right number does the lower bound. The firm value has a mean value of -$34,525 and standard deviation of $30,277 under the funding policy of (15%, -15%), while the firm value has a mean value of -$18,923 and standard deviation of $24,928 under the funding policy of (25%, -25%). The probabilities of success under the preceding alternative policies, i.e. (15%, -15%) and (25%, -25%), are 12.25% and 19.04%, respectively. Although the alternative funding policies still can help the SE to increase its firm value (i.e., higher mean value) and to reduce its operational risk (i.e. lower standard deviation), yet the respective net effects on the firm value are not as significant as the initial funding policy of (20%, -20%). In any case, the result indicates that the new funding policy can better help SEs than the traditional subsidy policy does.

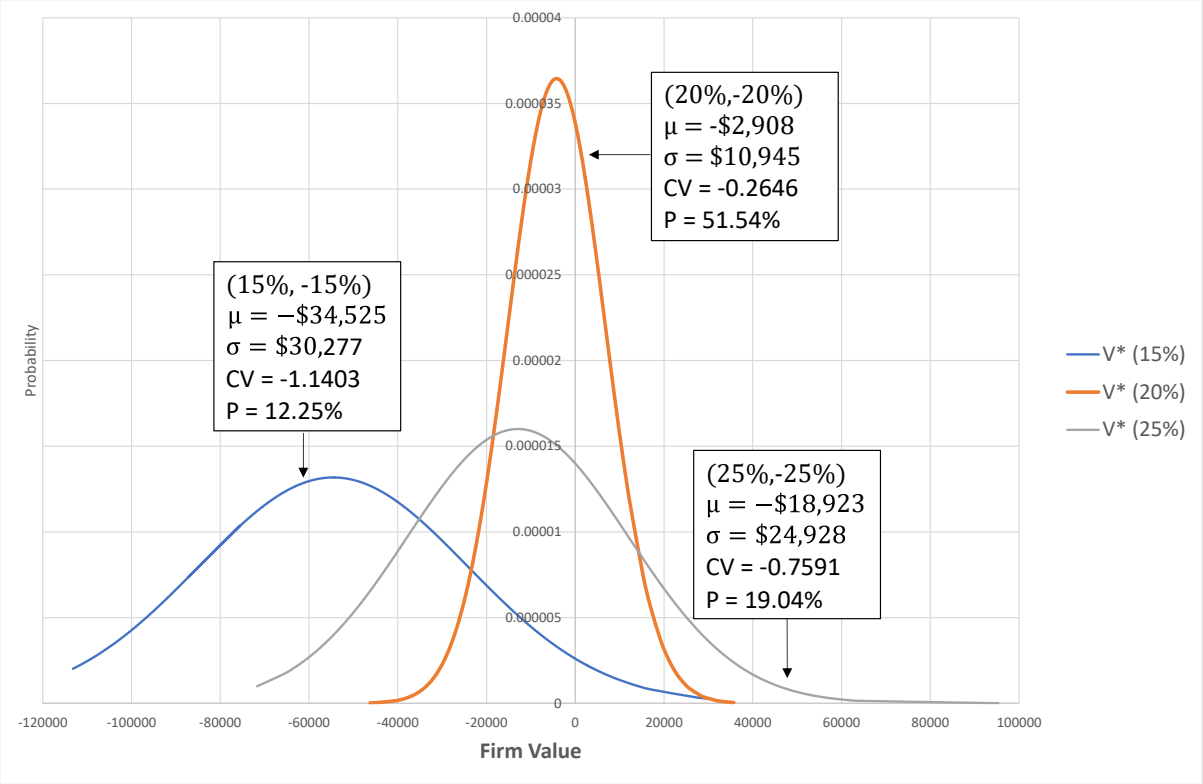

Figure 5. The Distribution of the Firm Value under the New Policy under Different Bounds

Sensitivity Analysis

With the method of Monte Carlo simulation and the measures of performance, the policy-maker can conduct a sensitivity analysis to determine the optimal funding policy under which the value distribution is desired. The major criterion to determine the optimal funding policy is to choose the one with the minimized positive CV and the maximized P. As revealed in Table 1, the policy with the bounds of (22%, -22%) has the smallest CV of 3.6936 and the largest P of 55.17%, thus resulting in the optimal funding policy.

Table 1. Sensitivity Analysis under Various Funding Policies

Policy	σ	μ	CV	P	
(15%, -15%)	$30,277	-$34,525	-0.8770	12.25%	
(16%, -16%)	$29,785	-$26,742	-1.1138	18.38%	
(17%, -17%)	$30,145	-$18,547	-1.6253	20.98%	
(18%, -18%)	$26,255	-$17,218	-1.5249	24.30%	
(19%, -19%)	$19,756	-$8,675	-2.2773	37.86%	
(20%, -20%)	$10,945	-$2,908	-3.7638	51.54%	
(21%, -21%)	$11,003	$1,574	6.9905	52.84%	
(22%, -22%)	$18,745	$5,075	3.6936	55.17%	*
(23%, -23%)	$24,564	-$11,854	-2.7743	34.05%	
(24%, -24%)	$25,615	-$16,832	-1.5636	25.43%	
(25%, -25%)	$24,928	-$18,923	-1.3173	19.04%	

*** represents the optimal policy.**

4.4 Some Issues for Consideration

As discussed in the previous section, the proposed funding policy helps to increase firm value of an SE, reduce corporate operational risk, and raise probability of success. Several related factors, however, need to be further addressed in order to make the funding policies more effective. The first factor which may affect the effectiveness of the proposed funding policy is regarding financial transparency of an SE. As the government's funding policy is based on the financial status of an SE, management may be tempted to manipulate financial reporting to maximize the fund the firm can

receive from the government. Consequently, financial transparency of an SE is particularly crucial under the new funding policy.

Secondly, the agency problem needs to be resolved for the new funding policy to achieve the best effect. Management may have incentives to conduct earnings management, which is defined as the practice of accounting techniques to manipulate business and financial activities so that a firm's financial reports can be used to meet certain purposes. In order for a funded SE to continuously receive funding or for an unfunded SE to receive funding, management may window-dress a firm's financial performance, i.e. sales revenues or earnings. In addition, management may be tempted to smooth out a firm's sales (or earnings) growth to maximize expected performance-based bonus. In this situation, auditing mechanism in the governmental procedure can come into effect in reducing occurrence of agency problems.

Thirdly, the risk source of sales revenues would significantly affect firm value. The characteristic of a GBM process is that the underlying variable (sales quantity in this paper) may significantly deviate from the starting point after a certain period of time. This assumption is feasible when the underlying variable does not possess a mean-reverting property. However, for an SE which has relatively stable sales revenues or contracts with the government, there may be less fluctuations with sales revenues. Since standard deviation of sales in this situation is smaller than a generalized GBM process, the assumption of a GBM process may appear to be unrealistic. Therefore, a mean-reverting process may be more suitable to describe the risk source. Wang (2011) shows that when the underlying variable has a mean-reverting property, the values of both project and real option appear to be smaller as the standard deviation of the underlying variable tends to be smaller. Therefore, for the purpose of practical appraisal, the assumption of risk source needs to be properly made.

Conclusion

This paper discusses two government's subsidy policies, i.e., grants and public procurement, to an SE and suggests a new funding policy to achieve sustainable development of an SE. Under the new funding policy, the government needs not sponsor the already profitable firms, while allocating the scarce resources to help more struggling SEs.

In this study a simplified firm value model is constructed and the source of corporate risk needs to be identified. To evaluate the proposed funding policy, we construct two performance measures, i.e., the probability of success and the coefficient of variation, to appraise the distribution of firm value. Our numerical analysis indicates that under the new funding policy an SE can increase its firm value and reduce standard deviation of value, hence lowering corporate risk. For the practical purpose, in the firm value model the related issues, such as earning management, agency problem, and stochastic process, need to be properly resolved in order to reach a better effect.

Development of SEs in many countries are still in the early stage. Political policy-makers should understand that an economy with prospering SEs can not only improve employment in an economy, but also can help the public sector to resolve some social issues. It is therefore necessary for a government to assist development of SEs to achieve the goal of a better society. As this paper discusses the financial funding policies in the area of sustainable finance, future research can be directed to explore the non-financial policies to better assist SEs.

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