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Article

Sustaining Regional Advantages in Manufacturing: Skill Accumulation of Rural-Urban Migrant Workers in the Coastal Area of China

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Abstract: Extant research pays little attention to migrant workers' skill accumulation/upgrading from the perspective of the labor supply. This paper takes China as an example to explore the factors influencing skill accumulation of rural-urban migrant workers (RUMWs), with a purpose to discover how to sustain or reshape regional competitive advantage through improving RUMWs' skill accumulation. Structured questionnaire surveys were adopted for data collection in Suzhou City, Jiangsu Province and Taizhou City, Zhejiang Province located in the Yangtze River Delta in the east of China. 900 questionnaires were issued and 491 effective questionnaires were recovered totally. This paper takes a perspective of global production networks, and gets a broad viewpoint containing intra-firm coordination, inter-firm partnership and extra-firm bargaining with non-firm actors, beyond what the extant literature on laborers' human capital focuses on. The finding indicates that firms' skill-oriented preference, which concerns about employees' skills and innovation ability and stimulates them to learn initiatively, have a significant influence on RUMWs' skill accumulation. In terms of collective efficiency based on co-competitive relationship between local firms, the more intensive interactions are, the more opportunities of skill accumulation RUMWs get. The accessibility of local institutions and favorable policies benefit RUMWs' skill accumulation. Besides, the place itself, as a synthesized space of labor-management relations inside a firm and inter-organization relations, exerts an influence on and cause the regional differences in RUMWs' skill accumulation.

Keywords: skill accumulation; regional advantages; rural-urban migrant workers; global production networks; upgrading

1. Introduction

Human capital growth or skill accumulation/ upgrading of labor [1]have influencing industrial transformation, upgrading and reconstruction, as well as sustaining the competitive advantage of developing countries. The existing research mainly discusses the relationship between skill accumulation/ upgrading and productivity improvement, export growth, and foreign direct investment (FDI) of a certain country or region [2-6]. It indicates that product export or foreign investment encourages firms to hire workers with higher level of skills, which leads to skill upgrading and so further sustains competitive advantages in developing economies [7]. Much research takes the perspective of labor demand instead of the supply side. Although the findings show the proportion

[1]For ordinary laborers, skills and competencies are crucial components of human capital, and they can generate productivity, and in turn drive the economic growth [1]. Therefore, in this paper, the authors regard workers' human capital as vocational skills.

of workers with higher skills has significantly increased, little evidence indicates whether this improvement has been a consequence of workers' skill accumulation or that of the replacement of low-skill workers with high-skill workers.

Global production networks (GPN) and global value chains (GVC) research extends the interest from industrial upgrading in less developed countries (LDCs) to social upgrading. The later issue focuses on workers and concerns about whether or not they can obtain actual benefits from industrial upgrading, such as income growth, improvement of life quality and decent work conditions [8] and improvement of rights guarantee [9]; however, it does not pay much attention to workers' skill accumulation/ upgrading [10]. Actually, workers' skill upgrading not only is an indispensable aspect of industrial upgrading, but also has a close connection with social upgrading. Without opportunities for skill upgrading, labors with low level of skills may be replaced with those with high level of skills, and eventually become the victim of industrial upgrading. The experiences from some LDCs indicate that integration into a global production system could not help them realize industrial upgrading, let alone workers' skill upgrading. Furthermore, the process of globalization is believed to be beneficial to skillful workers as a whole, while it had an opposite effect on unskilled workers [11]. Besides, compared with accepting FDI, export trade cannot significantly promote skill upgrading for firms [12], which means different ways of integration into the global economy may cause difference in workers' skill upgrading between different countries and regions However, the discussion in this regard is not sufficient yet [9].

Skill upgrading of "rural-urban migrant workers (RUMWs, labor with census register in rural area and migrated to cities for employment)" in China is worth discussion. In coastal areas in particular, the local industrialization process has been accelerated, and foreign trade and FDI have been rapidly developed since reform and opening up. Consequently, abundant RUMWs have swarmed into such areas, and become the main force of city industries [13]. According to the national rural-urban migrant monitoring and investigation data of 2013, the number of RUMWs in secondary industries and the tertiary industries already exceeded half the number of the total employed population [14]. However, due to the restrictions of the urban-rural dual structure, low education backgrounds and low labor skills, most RUMWs have engaged in physical work with low technology and low wage level for a long time, and therefore live in the bottom level in the cities [15]. With transference of labor-intensive industries to other countries in recent years, the coastal area has begun to reconstruct its competitive advantage relying on more the high quality of human capital than the great quantity of labor. Compared with increasing demand for high-level skilled workers, the competition of low-skill posts has become serious, and many RUMWs are facing the crisis of unemployment. As a result, a structured labor shortage has emerged [16]. Under such circumstance, improving RUMWs' vocational skills cannot only sustain industrial upgrading of developed regions but also help these workers adapt to the economic transformation and ensure the sustainability of their urban lives. The Chinese government has already realized the importance of improving the RUMWs' vocational skills, and has successively adopted policy initiatives such as "Spring Breeze Action" and "Sunshine Project" since 2004, especially put this issue into the *National New Urbanization Planning (2014-2020)*. Furthermore, the Rural-Urban Migrant Work Leading Group of the State Council discussed and deployed the implementation of "Rural-Urban Migrant Vocational Skill Improvement Plan" for annual training of more than 20 million people nationwide since 2014[17]. However, most of the current research focuses on the social integration of RUMWs into cities, and fails to discuss their skill upgrading or accumulation. A small amount of research mainly focuses on the restraints in a macro viewpoint such as the urban-rural dual barrier and the household registration system, but lacks in a survey of medium and micro-factors concerning firms and regions. Therefore, this paper selects the Chinese eastern coastal area and uses analytical framework of GPN theory to discuss main factors influencing RUMWs' skill accumulation from three levels, namely, Intra-firm coordination, inter-firm relations, and relations with non-firm institutions.

2. Literature Review and Main Hypotheses

2.1 Labor Migration and Human Capital Growth

Human capital growth can be achieved through some certain investments in medical treatment and health care, on-the-job training, regular education, and non-business adult education, which can obtain a return such as increase of income [18-20]. It is considered laborers' individual factors, including age, gender, education background, work experience, and career goals, etc. influence an investment intention and capacity of human capital, and so further influence human capital growth [21-23]. Migration is regarded to improve the human capital level through two promoting effects, i.e. forward stimulation before migration and subsequent acquisition of relearning opportunity after migration [24]. In respect to the former effect, for example, if the opportunities for transfer of employment to foreign countries increase, the workers in underdeveloped regions will be stimulated to initiatively improve their human capital to improve the possibility of transfer of employment [25]. In terms of the latter effect, for example, the peasants transferred from agriculture in the rural to non-agricultural industry in the cities and their human capital could be increased through "learning by doing" and on-the-job training [26]. Meanwhile, the employment experience in cities forms a certain degree of integration of various kinds of capabilities and competence so as to improve their human capital. As a result, the urban-rural labor flow is regarded as an important source of economic development of urban area [27], and the returnee of RUMWs can be considered as an engine driving the development of their hometowns through their accumulation of financial capital and human capital acquired during migration [28].

However, another line of literature in China agues the flow into a city can hardly help floating population to get skill accumulation. The discrimination of wage, employment, and welfare against RUMWs exists in urban labor market as a result of the urban-rural dual system2. Marginalization of employment and living and instability of flow brings certain decomposition to the RUMWs' human capital after migration to cities [29]. Meanwhile, the new-generation of RUMWs has more opportunities to choose jobs, they can make more preparations for vocational skills before migration, and so they are more adaptive to the city, compared with their elder generation. However, due to frequency career choice and employment flow, it is not beneficial for them to make sustainable investment in human capital and get the accumulation of vocational skills [30]. Besides, there is a dispute on the influence of immigration-targeted cities on RUMWs' human capital growth or skill accumulation. A line of literature believes that RUMWs in big cities have more opportunities of human capital growth or skill accumulation than those in small cities because of the favorable employment environments and various service facilities in big cities [31]. Another line of literature holds the view that it difficult for RUMWs to enjoy such treatments and so to promote skill accumulation in big cities due to the restrictions of their leisure time and financial capital and the low accessibility of urban public resources [32].

2.2 RUMWs' skill accumulation from the perspective of GPN2.0 theory: Analysis Framework and Main Hypotheses

As mentioned above, GPN research has paid attention to the social upgrading of workers in developing countries. Some research takes the trade union as an agency of worker groups and discusses the function or influence of the trade union on industrial upgrading. However, workers' skill upgrading is rarely directly involved and the discussion of unorganized labor, especially migrant workers beyond the mainstream labor market is not sufficient yet. The GPN theory pays attention to the actor-relationship analysis. The updating GPN2.0 theory takes consideration of competition trends (e.g. optimized cost-capacity ratio, market rules and financial disciplines) and changes of risk environment, deepens the analysis of inter-firm partnership and control, and concerns about intra-firm coordination, as well as extra-firm bargaining, namely, the supportive and

[2]Household registration system, education system, employment system, insurance system, labor system, etc. formed on the basis of urban-rural separation administration system.

cooperative relationship between firms and non-firm actors (such as state governments, international organizations, labor unions, and so on) [33]. These dynamics and actor-specific strategies can be used to explain industrial upgrading and sectoral transformation, and regional development, which in this research can provide broader perspectives for exploitation beyond the viewpoint that the human capital growth of laborers benefits from investment from various investors ranging from governments, firms, non-government organizations (NGO), and to individual laborers [1]. Therefore, the authors discuss the influencing mechanism of RUMWs' skill upgrading by utilizing analytical framework of GPN2.0 theory.

(1) Intra-firm Coordination and Skill Accumulation of RUMWs

Intra-firm coordination refers to internalization and integration of relevant activities of value chain by firm, e.g. outsourcing production activities, launching internationalized strategies and adopting technological and organizational innovation [34]. When launching foreign trade or accepting foreign investment, firms adopt technologies, imported materials, or hire skillful workers through concession agreement, thus resulting in skill upgrading [35-36]. Chinese experience shows that the investment of state-owned firms in employees' human capital is obviously higher than that of private and foreign-funded firms. Besides, state-owned firms and private firms intend to invest in employees' general human capital, while foreign-funded firms intend to invest in employees' exclusive human capital [37]. With the increase of scale and the increase of training investment by firms, workers have more opportunities to take part in various training programs and thus acquire skill accumulation.

Meanwhile, the acceleration of technological progress and intensification of international competition promote the transformation of firms' competition strategies. Firms originally relying on large-scale manufacturing technologies and implementing low-cost strategy become dependent on technological innovation and therefore adopt a differentiation strategy and turn to flexible manufacturing system with high efficiency [38]. Accordingly, the intensity of vocational skills increases. Pine holds the viewpoint that the low-cost strategy emphasizes operational efficiency, and workers are only a part of production process. In this production system, workers are not required to be innovative, and they are trained just to engage in standardized and simple labor. It is difficult for them to obtain the opportunities of skill accumulation or upgrading. On the contrary, the differentiation strategy emphasizes process efficiency, pays attention to improvement of workers' learning ability and creativity, and encourages them to make the continual enhancement and improvement of production process and overall efficiency [39]. For this reason, firms not only provide more opportunities for education and skill training but also advocate "learning by doing" and "team learning", which has promoted the accumulation of workers' skill-oriented talent to a certain extent [40]. In particular, "learning by doing" has been discovered as an effective approach for Chinese RUMWS to accumulate their skills and experience, thus lightening the payment restrictions of human capital investment [35]. However, relevant literature concerns great about the relations between skill accumulation and firm characteristics as mentioned above, but fails to pay attention to the effects of such intra-firm strategies on RUMWs' skill accumulation.

The authors define the behaviors of firms emphasizing and utilizing workers' skills and creativity as skill-oriented preference and assume that such preference would promote RUMWs' skill accumulation by providing them with training and other incentive measures. Based on the analysis conducted above, the skill-oriented preference of firms in efficiency improvement is measured from three aspects, namely, provision of on-the-job training, encouragement of "learning by doing", and encouragement of "team learning", and the following hypothesis is put forward:

H1: The skill-oriented preference of a firm is positively correlated with RUMWs' skill accumulation.

(2) Inter-firm Partnership and Control and RUMWs' Skill accumulation

Inter-firm partnership and control reflect input-output linkages, technical connections and bargaining power between firms. Western literature shows that transnational level of activities such as foreign trade and FDI benefit skill upgrading of workers. However, the experience from some LDCs indicates transnational companies would adopt technical blockage, increase product

standardization, and take other control measures to make their original equipment manufacturers (OEMs) in LDCs be locked in the low-end process with low added value in the GVCs [41]. It is argent that the national value chains (NVCs) rather than GVCs is a practical way of industrial upgrading for emerging economies [42].

If looking inside a region in a country, inter-firm partnership and control reflects the cooperative, competitive and controlling relationships among local firms in the upstream and downstream of the local value chains. Such relationships are the source of "collective efficiency" [43] mentioned in industrial cluster literature, i.e. competitive advantage generated by local external economy and joint action. Firstly, firms of the same trade have similar worker skill demands. This benefits workers to stably and continuously make skill investments and lead to formation of a labor team with professional skills. Human capital serves pricing and rewards skills [20]. Industrial access and promotion space influence vocational development opportunities of RUMWs. These local market environments have a certain effect on the return on the human capital investment of RUMWs [44] so as to influence the growth of human capital. Secondly, the geographical agglomeration of firms of the same trade also makes it convenient for workers to acquire technologies, knowledge and information through approaches such as personnel flow and interpersonal relations, thus increasing the opportunities to learn skills. Thirdly, inter-firm cooperation is accompanied with personnel flow and information communication. The effects of knowledge transfer are influenced through the influence of a social relationship between dispatched technical personnel and employees of technical receiving firms, so as to increase employees of the enterprise to acquire opportunities to learn, communicate or train cooperative firms [45-46]. Besides, in order to control product quality, local leading firms usually select and assign technical personnel to conduct quality supervision of contracted firms and provide necessary technical training and guidance. Degree of severity of requirements of leading firms for quality specification will urge contracted firms to enhance technological innovation and quality management and finally promote the extension of product supply cooperation to technical R&D cooperation between downstream supplies and upstream customers. The single-way technical output is transformed to two-way technical communication, so as to promote the growth of human capital of employees of the firms of the two parties [47]. The first two points are related to the external economy, while the second two points involve inter-firm joint action.

The author pays attention to enterprise cooperation or control on a regional scale instead of global scale. Enterprise cooperation or control in this regard reflects collective efficiency of local production organizations. In this paper, that whether such relationship has a significant influence on RUMWs' skill upgrading will be discussed. The following hypothesis is put forward by referring to relevant researches and selecting aspects such as enterprise cooperation, enterprise competition and local labor market to measure inter-firm collective efficiency (factor selection is shown in Part 4):

H2: Collective efficiency among local firms is positively correlated with RUMWs' skill accumulation.

(3) Extra-firm bargaining and Skill Upgrading of RUMWs

GPN2.0 theory pays attention to extra-firm bargaining, the role of non-firm actors [33]. The relationship of RUMWs with these organizations may be direct individual-organization contact or indirect inter-organizational relationship with such organizations through the firms the RUMWs work in.

Government

As a kind of investor of human capital, local governments improve RUMWs' skill accumulation through human resources development project, institutional environment design and public services/facilities [44]. With the increasingly serious scarcity of skilled labors and great concerns of central government about RUMWs' human capital, local governments pay attention to life and employment circumstance improvement for floating population.

NGOs

NGOs targeted at RUMWs have emerged in China since the late 1990s. They mainly help RUMWs receive legal assistance and maintain legitimate rights and interests, and collaborate with local government, firms, training organizations, and volunteers to raise funds and provide training services for RUMWs [48]. However, due to dispute on the legality of their identities, some NGOs are lacking of sufficient resources, and encounter the difficulties in obtaining government support. Their effects on RUMWs' skill accumulation are not significant yet.

Vocational Training Organizations (VTOs)

Vocational education and training is considered as an alternative to regular academic education and satisfies the RUMWs' demands of career development in China [27]. These organizations provide professional knowledge and skill training so as to improve RUMWs' employability and enhance their willingness of self-learning [49]. However, it is doubted that a large number of VTOs provide low-level skill training which cannot satisfy the demand of firms, while the training fees are too high for RUMWs.

Labor Unions

Labor unions are of importance to improve workers' welfare, policy consulting, labor legislation, and supervision and coordination of labor-capital relations in China. As far as skill accumulation, labor unions provide workers with employment information and vocational training by establishing service agencies such as employment agencies and training agencies [50]. Meanwhile, through communication with firms and training organizations, labor unions organize employees to receive well-targeted training to improve their vocational skills. However, the extant literature mentions little about whether RUMWs can be involved into local labor unions and obtain opportunities of skill accumulation.

Rural-urban Migrant Communities

Rural-urban migrant communities, as informal organizations, become indispensable to RUMWs' daily life and career development. These communities not only can solve accommodation problems, but also provide employment information, offer job opportunities, safeguard economic interests of RUMWs and solve labor-capital disputes. Moreover, social relationships based on similar career experience as RUMWs or fellow townsman associations also provide RUMWs with platforms to learn skills and enhance their ability to negotiate with firms to realize increases in income and improvements in work and living conditions [51]. However, due to lack of elites, such communities have a limited effect on the improvement of RUMWs' human capital.

To sum this up, only when local non-firm organizations can provide skill-related services, will RUMWs get opportunities to promote skill accumulation. The authors borrow the concept of "accessibility" to represent the possibility or convenience of establishing contacts with non-firm organizations and so acquiring relevant services (including regulations and policies formulated by local governments) and put forward the following hypothesis:

H3: Accessibility of local non-firm institutions is positively correlated with RUMWs' skill accumulation.

3. Research Areas and Data Collection

3.1 Research Areas

This paper selects Suzhou City, Jiangsu Province and Taizhou City, Zhejiang Province located in the Yangtze River Delta in the east of China as research areas (see Figure 1) for the following reasons. Firstly, the Yangtze River Delta is one of the manufacturing agglomerations of China, and

two rural industrialization models, namely, "South Jiangsu Model" and "Wenzhou Model" [3], emerging in the late 1970s when China implemented planned economy. Suzhou and Taizhou are respectively typical regions of the two models. Secondly, in recent years, the two models have been going through dramatically changes. South Jiangsu has developed into the transfer destination of international industries and has possessed abundant foreign-funded firms. Suzhou Industrial Park (SIP) is viewed as a typical example of "New South Jiangsu Model" [53]. Wenzhou Model has quickly spread to its neighboring regions (especially adjacent Taizhou) and entered the era of the "Wenzhou-Taizhou Model". Based on the location advantage of geographical adjacency with Wenzhou (see Figure 1), Yuhuan County of Taizhou becomes a region that has benefited from the industrial outflow of Wenzhou in relatively early stage and becomes a representative region of "Wenzhou-Taizhou Model". A group of family-owned firms has turned to make transformation to modern corporate and blend into GPN mainly through foreign trade, but generally, they rely on the international market less than those in Suzhou. The permanent resident population of Yuhuan County is equivalent to that in SIP, its gross regional production and industrial added value are respectively near 1/5 of those in SIP, but its economic indexes concerning foreign trade and foreign investment is by far lower than those in SIP (see Table 1). Thirdly, both of research areas are conglomeration places of RUMWs, who used to sustain local development and reshape local competitive advantage through skill upgrading. The data obtained from the sixth demographic census indicated that the floating population of SIP approached 50% of the permanent population in 2010, while that of Yuhuan reached 38%.

Figure 1 Geographical Locations of Research Areas

[3] The two models represent different ways of rural industrialization in China in the late 1970s. "South Jiangsu Model" originated from the southern area of Jiangsu Province in the 1960s, including Suzhou, Wuxi, Changzhou, Yixing, Zhenjiang, and Nanjing. Local rural communes or production teams built up firms with collective ownership, promoted the development of local economy, and speeded up the process of industrialization in the rural area. "Wenzhou Model" also emerged at the same time, but relied on family-owned factories and used local rural markets as invigorate circulation channels to promote the level of local industrialization [52].

Table 1 Main Social and Economic Indexes in SIP and Yuhuan in 2014

	SIP	Yuhuan	SIP: Yuhuan
Permanent resident population (10,000 persons) *	69.53	61.63	1.13：1
Gross Regional Production (GRP, 100 million RMB)	2059.95	438.67	4.70：1
Industrial added value (100 million RMB)	1111.71	226.85	4.90：1
Fixed-asset investment (100 million RMB)	611.82	163.55	3.74：1
Regional gross import (100 million USD)	390.84	1.05	372.22：1
Regional gross export (100 million USD)	405.12	34.09	11.88：1
Ratio of net export in regional GRP	0.7%	7.5%	0.09：1
Foreign investment in actual use (USD 100 million)	16.00	0.11	145.45：1
Number of foreign-invested and Hong Kong, Macao and Taiwan industrial firms above designated size**	693	51	13.59：1
Number of private industrial firms above designated size**	113	705	0.16：1

Notes: (1) *The data were obtained from the main data bulletin of the sixth demographic census in 2010. (2) ** The data were obtained from statistical yearbooks of Suzhou and Taizhou in 2015. (3) Other data were obtained from statistical data of Suzhou Industrial Park in 2015 and statistical bulletin of national economic and social development of Yuhuan County in 2015.

3.2 Questionnaire Survey

The authors adopted a structured questionnaire survey for first-handed data collection. The questionnaire covers RUMWs' basic information, work changes before and after migration, vocational skills accumulation, nature of the firm they work for, its competition and cooperation with other firms, employee training and incentives, local policies, cultural facilities, and skill training services from relevant organizations, etc. The survey was conducted in SIP and Yuhuan County from July to September 2015 in succession. As RUMWs need to go through 3-6 months of apprenticeship or internship after entering into firms, this survey selected these RUMWs who have worked in SIP or Yuhuan for at least more than half a year. It was difficult to get the permission to make the survey inside a firm in both of research areas. The authors learned from local residents the conglomeration places where RUMWs live, dine, entertain, and go shopping, and then launched the survey. In order to avoid the little coverage of questionnaires in a handful of firms, only one RUMW is selected each time among the RUMWs having the same type of work or position in the same firm.

The authors issued 900 questionnaires and recovered 491 effective questionnaires in the two areas totally. In SIP, the authors issued 400 questionnaires and recovered 388 questionnaires with recovery rate of 97%. There were 235 effective questionnaires with effective rate of 60.56%. In Yuhuan, the authors issued 300 questionnaires in total and recovered 280 questionnaires with recovery rate of 93.33%. There were 256 effective questionnaires with effective rate of 91.43%.

3.3 Characteristics of Effective Samples

Basic information of effective samples is shown in Table 2. To sum up, these samples generally have the following characteristics.

(1) Demographic Characteristics

Among total samples, the proportion of male to female is 7:3. Compared with Yuhuan, SIP has more male samples. According to the survey, SIP focuses on electronic product processing and manufacturing and machinery manufacturing, which are more suitable for male workers. The number of new-generation RUMWs aged below 35 takes up approximately 88% of the total samples; compared with Yuhuan, the age structure of RUMWs in Suzhou is younger.

The number of unmarried migrants in the total samples is higher than that of married migrants. The ratio between married migrants and unmarried migrants reaches 6:4 in Yuhuan, while this ratio in SIP is nearly 3:7.

The RUMWs surveyed mainly have an education background of secondary school, taking up 77.2% of the total. Those with an education background of junior high school take up about one third of the total, while those with an education background of senior high school, vocational school and technical secondary school exceeds 20% of total survey objects. Compared with SIP, The RUMWs surveyed in Yuhuan have a relatively low educational background, and those with education background of junior high school and below takes up 55.47%, being 38% higher than those in SIP. In terms of the survey, the firms in SIP are mostly foreign-funded and have relatively high requirements of the initial education level of employees; while, most privately-run firms or family-owned workshops in Yuhuan have relatively low requirement.

(2) Conditions of Occupations and Skills before and after Migrant Work

More than 1/3 of the RUMWs surveyed were in-school student before migration; 27.3% of them were engaged in agriculture before migration; 23.8% of them worked in a firm previously. 26.68% of them have worked in the immigrating place for 1-3 years, 21.59% of them have worked there for 3-5 years, and 20% of them have worked there for 5-10 years. Compared with Yuhuan, The length of the RUMWs surveyed moving to Suzhou is generally short. The RUMWs with length of service above 5 years in SIP takes up 19.57%, being 9.55% lower than that in Yuhuan. About 80% of the RUMWs surveyed are ordinary workers and about 10% of them are group leaders. More than half of the RUMWs surveyed have no vocational skill qualification certificates. As for this index, the situation of SIP is much better than that of Yuhuan.

(3) Characteristics of Firms RUMWs surveyed work for

58.25% of the RUMWs surveyed work in medium-sized firms with 101-300 employees (according to national standard of firm scale), and 26.88% of them work in small firms with 21-100 employees. Almost half of the firms RUMWs surveyed work for in Yuhuan were small-scale firms with no more than 100 employees, while nearly 70% of in SIP are large and medium-sized. Furthermore, most firms RUMWs surveyed work for in SIP are foreign-funded or joint-ventures-funded; while Yuhuan is dominated by private firms and undergoing the transformation of traditional industries.

Table 2 Basic Information of Effective Samples in SIP and Yuhuan

		Classification	SIP		Yuhuan		Total samples	
			Qty	Ratio	Qty	Ratio	Qty	Ratio
Demographic characteristics	Gender	Male	199	84.68	143	55.86	342	69.65
		Female	36	15.32	113	44.14	149	30.35
	Age	16-25	154	65.53	110	42.97	264	53.77
		26-35	75	31.91	93	36.33	168	34.22
		36-45	6	2.55	44	17.19	50	10.18
		Above 45	0	0.00	9	3.52	9	1.83
	Marriage	Yes	63	26.81	152	59.38	215	43.79
		No	172	73.19	104	40.63	276	56.21
	Education	Primary school and below	2	0.85	18	7.03	20	4.07
		Junior high school	39	16.60	124	48.44	163	33.20
		Senior high school	58	24.68	56	21.88	114	23.22
		Professional high school or technical secondary school	72	30.64	30	11.72	102	20.77
		Junior college and above	64	27.23	28	10.94	92	18.74
Vocations and skills before and	Work before labor immigration	Farming	44	18.72	90	35.16	134	27.29
		Worker	64	27.24	52	20.71	117	23.83
		Self-employment venture	16	6.81	13	5.08	29	5.91

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after labor immigration		In-school student	95	40.43	86	33.59	181	36.86
		Others	16	6.81	14	5.47	30	6.11
	Length of service in this place	<1 year	59	25.11	52	20.31	111	22.61
		1-3 years	68	28.94	63	24.61	131	26.68
		3-5 years	62	26.38	44	17.19	106	21.59
		5-10 years	40	17.02	58	22.66	98	19.96
		>10 years	6	2.55	39	15.23	45	9.16
	Current position	General staff	184	78.30	211	82.42	395	80.45
		Group leader	30	12.77	20	7.81	50	10.18
		Department supervisor	19	8.09	18	7.03	37	7.54
		Department manager	2	0.85	7	2.73	9	1.83
	Holding of professional skill certificate or not	None	89	37.87	171	66.80	260	52.95
		Preliminary	61	25.96	53	20.70	114	23.22
		Medium	63	26.81	28	10.94	91	18.53
		Senior	22	9.36	4	1.56	26	5.30
Basic characteristics of firms	Staff size	<10 persons	7	2.98	33	12.89	40	8.15
		10-20 persons	7	2.98	26	10.16	33	6.72
		21-100 persons	59	25.11	73	28.52	132	26.88
		101-300 persons	153	65.11	120	46.88	286	58.25
		>300 persons	9	3.83	4	1.56	13	2.65
	Type of ownership	State-owned	19	8.09	9	3.52	28	5.70
		Collective	6	2.55	18	7.03	24	4.89
		Foreign-funded	133	56.60	21	8.20	154	31.36
		Privately-owned	53	22.55	196	76.56	249	50.71
		Other	24	10.21	12	4.69	36	7.33
Total			235	100	256	100	491	100

Note: "Junior college and above" does not include RUMWs with original education of underground and postgraduate.

4 Selection of Variables and Model and Analysis of Results

4.1 Selection and Measurement of Variables

The International Labor Organization defines skills into four aspects, namely, basic skills, core work skills, technical or vocational ability, and entrepreneur and operation management capacity [4][2]. This research defines RUMWs' skills as "core work skills" and "vocational ability", and use "skill accumulation" as dependent variable, which is specifically interpreted in the questionnaire as "improvement of vocational skills after migration to current place". The respondents may make a judgment based on their own condition, including acquisition of a vocational qualification certificate, promotion of working post grade, and income increase due to skill accumulation. The Likert 5-score method is adopted for assignment (detailed in Table 3 below).

Three independent factors, namely, "firm attributes and intra-firm coordination", "inter-firm partnership and control" and "extra-firm bargaining", containing 14 variables in total, are selected. Individual attributes are used as control variables. Meanwhile, "regional factor" is introduced as a control variable to exam whether or not the two research areas have any differences in RUMWs' skill

[4]Basic skills refers to basic language and computing power as well as application of such capacities in specific environments, work skills refers to general capacity increasing the possibility of employment in labor market, and technical and vocational ability means ability enabling individuals to complete specific tasks, such as carpentry, basket fabrication, metal work, forging, etc.

accumulation. Name of each variable, selection basis, meaning and method of measurement are shown in Table 3.

4.2 Model Selection and Results

Based on the related data of 491 valid samples, the authors used the "Backward gradual regression", with the factors of "regional factor" and "individual factors" being involved in the three models as the control variables. Model Ⅰ, Ⅱ, Ⅲ are set up to discuss respectively the relationships between RUMWs' skill accumulation and the three kinds of factors, namely "firm attributes and intra-firm coordination", "inter-firm partnership and control", and "non-firm institutions" respectively, and then all variables are involved in Model Ⅳto discuss which variables influence RUMWs' skill accumulation when all factors are considered. The results are shown in Table 4.

All the five variables concerning the factor, "firm attributes and intra-firm coordination", are involved in Model Ⅰ, they pass the significance testing, and the F-test value is 14.204 under the level of 0.01 of the multiple regression equation, which means that the whole equation is significant. It indicates that this factor has a significant effect on RUMWs' skill accumulation. To be specific, INF3, INF4 and INFC5 have significant positive correlation under the levels of 0.01. They represent "on-the-job training inside the firm", "encouragement of learning by doing" and "encouragement of team learning" respectively, and belong to the incentives of firms to promote RUMWs' skill accumulation. It also proves that H1 is tenable, namely, the skill-oriented preference of a firm is positively correlated with RUMWs' skill accumulation.

Firm size presents negative correlation with RUMWs' skill accumulation under the level of 0.05, indicating that the bigger the firm size is, the less RUMWs skill accumulation will be. It is opposite to the result much literature finds. According to some respondents' view in the questionnaire survey, the reason may be because large firms rely on advanced machineries and equipment and RUMWs usually engage in simple manual labor, while small firms with limited financial capital depend on sophisticated labor instead of such machines. The ownership of a firm has negative correlation with RUMWs' skill accumulation under the level of 0.1, indicating that the RUMWs' skill accumulation in private firms is less than that of state-owned and foreign-funded firms, which is consistent with the existing research findings.

All the four variables concerning the factor, "inter-firm partnership and control", are involved in Model Ⅱ The F-test value is 15.751 under the level of 0.01 of the multiple regression equation, which means that the whole equation is significant. The four variables present significant positive correlation with RUMWs' skill accumulation. ITFC1 and ITFC2 present significant positive correlation under the levels of 0.01, while they represent "inter-firm cooperation" and "inter-firm competition" respectively, indicating the influence of the inter-firm relationship is more significant than that of intra-firm factors. When firms compete for technical workers, RUMWs will have more motives to enhance their vocational skills; meanwhile, abundant firms in the same sector can conduct economic and technical cooperation to benefit the flow of different kinds of knowledge and skills among firms and further increase the opportunities of RUMWs to learn skills. It proves that H2 is tenable, that is to say, the collective efficiency among local firms is positively correlated with the skill accumulation of RUMWs. ITFC3 and ITFC4 also present significant correlation under the level of 0.1 and 0.05, which means that more job opportunities and the higher local skill demand as a result of geographical agglomeration of firms in the related sectors contribute to RUMWs' skill accumulation; in other words, external economies and consistency in demand for higher-skilled labor in the local labor market promote RUMWs' skill accumulation.

All the five variables concerning "extra-firm bargaining" are involved in Model Ⅲ, and NFR1, NFR2, NFR4 and NFR5 present significant positive correlation under the level of 0.05 and 0.01. The F-test value is 16.933 under the level of 0.01 of the multiple regression equation, which means that the whole equation is significant. This result indicates that the non-firm institutions, include the public cultural facilities, local government incentive policies, VOTs and fellow townsman communities, help RUMWs accumulate vocational skills. However, NFR3 fails to pass significant testing. As NGOs are still in development in the two research areas, few RUMWs could be benefited

from such organizations. In general, Model Ⅲ proves H3 is tenable, namely, the accessibility of local non-firm institutions is positively correlated with RUMWs' skill accumulation.

The control variable "regional factor" is significant under the level of 0.01 in Model Ⅰ, Ⅱ, Ⅲ, and its regression coefficient is positive. Since the measurement of this index takes Suzhou as benchmark, it means regional difference is significant and RUMWs' skill accumulation in Yuhuan is higher than that in Suzhou. The result of questionnaire survey also proves this point. 261 respondents believe that their skills are significantly improved (the assignment of skill improvement is ≥4), taking up 53.2% of the total respondents. This ratio in Yuhuan is 62.1%, being much higher than that in Suzhou (only 43.4%). 114 respondents believe that their skills are not significantly improved (the assignment of skill improvement is ≤2), taking up 23.2% of the total respondents. This ratio in Yuhuan is 17.9%, being significantly lower than that in Suzhou (28.9%). It seems "Wenzhou-Taizhou Model" centering on private capital is superior to "New South Jiangsu Model". In addition, the three variables concerning "individual factors" fail to pass significant testing in Model Ⅰ-Ⅲ, indicating that these variables statistically show no significant to the RUMWs' skill accumulation.

In Model Ⅳ, all variables are involved in the regression model first, and 10 of 18 variables, including RG, INFC1, INFC2, INFC3, INFC4, INFC5, ITFC1, ITFC2, NFR4, NFR5, pass the significance testing after backward gradual regression. The F-test value is 15.157 under the level of 0.01 of the multiple regression equation, which means that the whole equation is significant. These 10 significant variables are also significant respectively in Model Ⅰ, Ⅱ, Ⅲ, but the other four variables, ITFC3, ITFC4, NFR1 and NFR2, which present significant correlation in Model Ⅱ and Model Ⅲ, fail to pass the significance testing in Model Ⅳ. Among these 10 significant variables, RG, NFR5, ITC2, and INF4, belonging to regional factor, extra-firm bargaining, inter-firm partnership and control, and firm attributes and intra-firm coordination, are the top four factors influent RUMWs' skill accumulation, and their regression coefficient are 0.431, 0.219, 0.201, and 0.194 respectively. Compared with intra-firm factors, local non-firm institutions (especially local fellow townsman communities) and inter-firm co-competitive relationship contribute more to the RUMWs' skill accumulation. It implies that the 'place' as a space of various kinds of relationships has an important role in the laborers' skill accumulation besides the economic entities themselves.

Table 3 Selection of Factors and Indexes Influencing Skill accumulation of New-generation RUMWs

Factor	Variable	Name	Description of meaning/definition	Quantitative Criteria
Dependent variable	Y	Skill accumulation	Significant improvement of vocational skills	5 for "Strongly Agree"; 4 for "Relatively Agree"; 3 for "Generally Agree"; 2 for "Relatively Disagree"; 1 for "Strongly Disagree".
Regional factor	RG	City	-	1 for Yuhuan; 0 for SIP
Individual factors	ID1	Gender[23]	-	1 for male; 0 for female
	ID2	Education [22]	Education level before migrant work	1 for primary school and below; 2 for junior high school; 3 for regular senior high school; 4 for professional high school or technical secondary school; 5 for junior college and above
	ID3	Length of service[26]	Length of RUMWs' service in the migrating place	1 for less than 1 year; 2 for 1-3 years; 3 for 3-5 years; 4 for 5-10 years; 5 for more than 10 years
Enterprise attributes and intra-firm coordination	INFC1	Firm size [54]	Number of employees of the firm RUMWs work for	1 for <10 employees; 2 for 10~20 employees; 3 for 21~100 employees; 4 for 101~300 employees; 5 for >300 employees
	INFC2	Firm ownership [37]	The ownership of the firm RUMWs work for	1 for state-owned; 2 for collectively-owned; 3 for foreign trade; 4 for privately-owned; 5 for other forms
	INFC3	On-the-job training[38]	The firm often provides employees with on-the-job skill training.	Likert scale method is adopted. Scoring is implemented according to the agreeing degrees: 5 for "Strongly Agree"; 4 for "Relatively Agree"; 3 for "Generally Agree"; 2 for "Relatively Disagree"; 1 for "Strongly Disagree".
	INFC4	Encouragement of "learning by doing" [26]	The firm encourages "learning by doing" to improve employees' skills.	
	INFC5	Encouragement of "team learning" [40]	The firm encourages its employees to learn from their colleagues to improve their skills.	
Inter-firm co-	ITFC1	Inter-firm cooperation[45]	There are many local firms of same trade and the economic and technical cooperation is frequent.	

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cooperation and control	ITFC2	Inter-firm competition[46]	Local firms of same trade often compete for technical workers.
	ITFC3	Job opportunity[44]	Local job opportunities for RUMWs with higher vocational skills increase.
	ITFC4	Local skill demand[22]	The local requirements for vocational skills of RUMWs are generally raised.
Extra-firm bargaining	NFR1	Supply of public cultural facilities[31]	Local cultural facilities can be utilized to improve individuals' education level or vocational ability.
	NFR2	Government incentive policy[55]	Those with education background or certain vocational technical qualification certificates can easily obtain local permanent registered residence.
	NFR3	NGO[48]	There are local NGOs improving vocational skills of RUMWs.
	NFR4	Vocational training organization[49]	There are local private organizations providing vocational skill training for RUMWs.
	NFR5	Fellow townsman community[51]	Fellow townsmen working in different firms can often learn from each other to improve their vocational skills.

Table 4 Backward Gradual Regression Results on the Factors Influencing RUMWs' Skill Accumulation

Variable	Model Ⅰ	Model Ⅱ	Model Ⅲ	Model Ⅳ
RG	0.463***	0.435***	0.424***	0.431***
	(0.119)	(0.112)	(0.112)	(0.114)
ID1				
ID2				
ID3				
INFC1	-0.129**			-0.106*
	(0.063)			(0.061)
INFC2	-0.122*			-0.111*
	(0.064)			(0.061)
INFC3	0.148***			0.115***
	(0.037)			(0.036)
INFC4	0.313***			0.194***
	(0.060)			(0.059)
INFC5	0.114***			0.084**
	(0.044)			(0.043)
ITFC1		0.203***		0.174***
		(0.064)		(0.061)
ITFC2		0.199***		0.201***
		(0.055)		(0.051)
ITFC3		0.107*		
		(0.062)		
ITFC4		0.157**		
		(0.061)		
NFR1			0.132**	
			(0.062)	
NFR2			0.155***	
			(0.050)	
NFR3				
NFR4			0.19***	0.132**
			(0.062)	(0.055)
NFR5			0.243***	0.219***
			(0.051)	(0.050)
Constant	2.183***	0.887***	1.017***	0.306
	(0.444)	(0.321)	(0.285)	(0.492)
R^2	0.150	0.140	0.149	0.24
F	14.204***	15.751***	16.933***	15.157***
DW	2.009	1.988	1.945	2.004

Note：Standard errors are in parentheses. ***，**，*indicate significance at the level of 0.01, 0.05 and 0.1 respectively.

5. Conclusions and Discussion

GPN theory and rural-urban migrant research pays little attention to migrant workers' skill accumulation/upgrading, and skill upgrading literature generally takes the perspective of the demand side instead of the supply side. Focusing on RUMWs, this paper takes China as an example to explore the factors influencing their skill accumulation, which contributes to a deeper understanding of industrial and social upgrading of developing countries and that of how to sustain or reshape their competitive advantage through improving workers' skill accumulation.

Furthermore, this paper takes a new perspective of GPN2.0 theory, and gets a broad viewpoint containing intra-firm coordination, inter-firm partnership and extra-firm bargaining with local non-firm actors, beyond the role of five kinds of investors on labors' human capital that the extant literature mainly focus on. Especially, it finds that inter-firm partnership, representing collective efficiency of local value chains, is beneficial to promote RUMWs' skill accumulation and so further to maintain the sustainability of local development, which is little mentioned in the extant literature. Besides, the place itself, as a synthesized space of labor-management relations inside a firm and inter-organization relations, exerts an influence on and cause the regional differences in RUMWs' skill accumulation. It suggests that collective coordination and efficiency of local production systems (beyond that of local value chain mentioned above) should be taken into account for designing and implementing regional skill-upgrading-related policy, which is another practical contribution of this paper.

This research also draws some conclusions. Firstly, firms' skill-oriented preferences, which concerns about employees' skills and innovation ability and stimulates them to learn initiatively, have a significant influence on RUMWs' skill accumulation. It means that industrial upgrading depending on advanced technologies and equipment cannot necessarily guarantee workers to get opportunities of skill accumulation. Secondly, collective efficiency based on co-competitive relationship between local firms has a significantly influence on RUMS' skill accumulation. That is to say, the more intensive interactions between local firms are, the more learning opportunities and knowledge spillovers to promote skill accumulation RUMWs get. Thirdly, the accessibility of local institutions and favorable policies is benefit for RUMWs to improve skill accumulation. Especially, training programs from local VTOs and mutual learning inside local communities of RUMWs are two important channels of skill accumulation. In addition, just as indicated by the extant research, foreign investment has a more significant influence on skill upgrading than private firms. However, the domestic-SMEs-dominating cluster in this research is superior to the clustering area of foreign firms in terms of RUMWs' skill accumulation of labor. It also shows the importance of the place as a synthesized space of multiply factors.

However, this paper also has some defects as follows. Firstly, the research focuses on RUMWs in the manufacturing industry and the findings should be further tested in other sectors. For example, the positive influence of the "regional factor" in Suzhou is less than that in Yuhuan, which is confirmed in the latest communication with local experts in Suzhou. However, it is also learned that the service quality and personnel quality of tertiary industries in Suzhou have been quickly improved for the in-flowing of abundant foreign investments and the effect far exceeds the manufacturing industry. Secondly, variable selection and connotation definition in the questionnaire should be further improved. For example, standards in the three aspects are set up in the paper to assist the respondents in measuring "skill improvement" in a quantified way. However, there exist some certain of subjectivity. Global relationships are excluded in this research, and the depiction of inter-firm partnership fails to subdivide as relations with upper and lower streams of value chain and peer firms respectively. In addition, the questionnaires were issued in two areas, and the number of large firms involved in effective questionnaires is still few. The research findings should be verified in other regions and through an increase of sample coverage.

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