1. Introduction

In general, wage differential is recognized as an important factor in migration, which is crucial to an economy. It is a key issue, especially in Korea, which faces "mono-centric development" around the capital area. Therefore, the purpose of this paper is to identify the determinants of inter-city and intra-city wage differentials and to identify some implications in regional policy.

Since 2003, Korea has taken regional policy more seriously; because the over-concentration issue has been gaining more attention not only in

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academic side but also in terms of its social effects. As regional disparity between the capital area and non-capital area has increased, balanced development has been come more into focus. In order to analyze regional disparity across regions and within regions, we need to first identify income levels. However, there was no appropriate measurement to compare regional economies except Gross Regional Domestic Product(GRDP), which deals with the production side. This measure may not reflect individual behavior in choosing their location. Therefore, it is not an appropriate proxy for regional income level. On the other hand, wages, the cost of living, and amenities are the most important factor in choosing resident location according to the Roback model. Therefore, it is necessary to determine the wage level across regions. For that, city boundaries are supposed to be delineated in terms of economic geography, which is different according to administrative district in general. Since metropolitan areas are usually defined by commuting flow, Korean Metropolitan Statistical Areas(MSAs) delineated by Kim et al.(2008)[1] has been used here to determine the economic spatial range of cities.

This research contributes to regional economic analysis comparing wage

differentials among and within cities in Korea in that this is a first attempt to compare wages across cities. Further, inter-city wage differentials were measured by average wage in the MSAs and intra-city wage differentials was measured by the wage ratio of high income occupations to low income occupations. Then, the determinants of those wage differentials were analyzed for regional policy implications.

2. Literature Review

The most well known study on wage differentials is the Roback model.[2] According to her model, people move to maximize their utility which consists of average wage level, the cost of living, and amenities in a specific location. Therefore, the general wage is supposed to compensate for the higher living costs as long as amenities do not differ across regions. In other words, higher nominal wages in larger cities could be interpreted as a compensation for higher living costs, such as higher rent. At an equilibrium where people moved voluntarily to maximize their utility, the indirect utilities (V) across regions are the same as shown in following equation.

$$V_i\,(w_i, p_i\,;\,a_i) = V^* = V_j\,(w_j, p_j\,;\,a_j) \tag{1}$$

, where w_i is average wage in the region i, p_i is cost of living in the region i and a_i is amenity level in the region i.

O'Sullivan (2008)[3] paid attention to the agglomeration effect of urbanization. According to him, not only nominal wage increases with city size, but also real wage increases as well, due to the spillover effect of an agglomeration economy. On the other hand, Kim et al. (2009)[4] pointed out that real wages

1) Kim, Dongsoo, Huh, Mungu, and Lee, Doohee(2009), "Analysis of the Regional Economy Competitiveness and Characteristics based on newly Constructed Korean MSAs", *Journal of the Economic Korea Planners Association*, 44(1):181-196.
2) Roback, Jennifer(1982), "Wages, Rents, and the Quality of Life", *the Journal of Political Economics*, 90(6): 1257-1278.
3) O'Sullivan, A(2009), Urban Economics, seventh ed. McGraw-Hill, Boston.

may not increase much with city size, noting that nannies in larger cities may not have the specialties comparing to nannies in small towns. Therefore, it could be simply compensation for higher living costs. Addario and Patacchini(2008)[5] also showed that the agglomeration effect did not seem significant with Italian micro data, even though wage levels increased by 0.1% with an increase of 100 thousand in city population. Krashinsky(2011)[6] also showed that increases in wages to city size are not significant when family characteristics are considered. Cobes, Duranton, and Gobillon(2008)[7] identified a determinant of spatial wage differential, "the skill composition of the workforce" from French data. This means that skilled workers could be sorted to city size.

There are a couple of Korean studies regarding wage differentials. Lee(2002)[8] found that spatial wage differentials especially among the 7 metropolitan cities is determined by individual characteristics such as education and experience. Jang and Lee(2001)[9] stated that wage increases by 3% as the number of years of education increases by 1 year. However, Lee(2002) said that only skilled workers with advanced degrees gain these positive effects from migration. Therefore, in this paper, more appropriate wage differentials are measured across cities and within cities. The following sections are for newly defined cities based on economic geography and regional wage analysis using that city concept.

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4) Kim, Dongsoo, Liu, Feng, and Yezer, Anthony(2009), "Do Inter-city Differences in Intra-city Wage Differentials Have Any Interesting Implications?", *Journal of Urban Economics*, 66: 203-209.
5) Addario, Sabrina Di, and Patacchini, Eleonora(2008), "Wage and the City. Evidence from Italy", *Labour Economics*, 15: 1040-1061.
6) Krashinsky, Harry(2011), "Urban Agglomeration, Wages and Selection: Evidence from Samples of Siblings", *Labour Economics*, 18: 79-92.
7) Cobes, Pierre-Philippe, Duranton, Gilles, and Gobillon, Laurent(2008), "Spatial Wage Disparities: Sorting Matters!", *Journal of Urban Economics*, 63: 723-742.
8) Lee, Wonho(2002), "Wage Determination Process and Income Disparity in Korean Metropolitan Cities", *Journal of Economic Geographical Society of Korea*, 5(2):187-207.
9) Jang, Soomyung and Bunsong Lee(2001), "Distribution of Human Capital Across Korean Cities and Industries, and External Economies of Human Capital", *Korean Labour Economics*, 24(1):1-33.

3. Delineation of Korean Metropolitan Statistical Areas

The first step to analyze wage differentials in inter-city wide and/or intra-city wide, the definition of city is supposed to be defined. In this paper, Korean Metropolitan Statistical Areas(MSAs) newly defined by Kim et al.(2009) are used in the economic context of a city. The definition of a city is crucial to compare any statistical indicators across cities. Nevertheless, only a few researchers have attempted to define a city but not many of those analyzed statistical data across cities in Korea. Unfortunately, the administrative districts used in Korea(the 16 Provinces or 232 Counties) have been used thus far. There was little research which clearly defined metropolitan areas, as with MSAs in the United States. Therefore, Korean MSAs are first delineated in this section(Kim et al., 2008). Counties are the basic geographic classification in defining MSAs in Korea. For cross-commuting rates, commuting flow data from the National Census for workers and students over 12 years old was used. The criteria for delineating MSAs are as follows:

① Central city:
   any metropolitan cities or general cities with over 50 thousand people
② Peripheral city:
   i) any adjacent *Si-Gun-Gus* over 100people/km² in terms of population density to a central city AND
   ii) commuting rates of any *Si-Gun-Gus* to or from a central city are over 10%

Based on the criteria, a total of 50 MSAs are shown in Table 2, which cover 44% of the total land area and about 95%(43.3 million) of the total population in 2005. Among those 50 MSAs, there are 14 MSAs that consist of more than two counties. The Seoul MSA includes 18 counties in Gyeonggi-do. The population of the Seoul MSA was about 16.7 million in 2005, which is much smaller than that of the capital area, Seoul-Incheon-Gyeonggi, but much larger than that of the Seoul Metropolitan City.[10] The Busan MSA, including Gimhae

and Yangsan is the second largest MSA, but its population is only about 4.2 million which is about one-fourth of the Seoul MSA. The third largest MSA, the Daegu MSA, with Gyeongsan, has a population of 2.7 million, which is about one-seventh that of the Seoul MSA.

In Table 1, the population growth in the Seoul MSA from 2000 to 2005 is higher than the average population growth of all MSAs. However, there were population decreases in the Busan MSA and Daegu MSA during that time period. In the mid-sizes MSAs, the Suwon-Hwaseong-Osan MSA, Ulsan MSA, and Cheonan-Asan MSAs have experienced population increases, while the population in the Changwon-Masan-Jinhae MSA has changed very little. In small MSAs of less than 300 thousand people, only the Wonju MSA, Geoje MSA, and Dongducheon MSA had population growth at a higher than average rate. In short, the MSAs with higher concentrations of manufacturing industries have population increases. In particular, the employment rate in the manufacturing industry in the Gwangju MSA and the Daejeon MSA are 15.7%

Figure 1. Korean Metropolitan Statistical Areas

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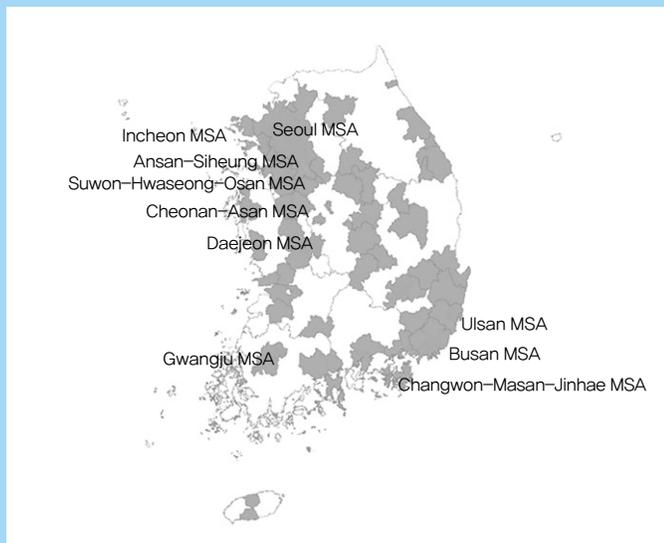
10) Population is about 23 million in Seoul-Incheon-Gyeonggi and 10 million in Seoul Metropolitan City in 2005.

Table 1. Korean MSAs

Korean MSAs	pop 2000	pop 2005	pop growth(%)
Seoul MSA	15,765,399	16,627,149	1.09
Busan MSA	4,186,838	4,172,514	−0.07
Daegu MSA	2,708,784	2,706,844	−0.01
Incheon MSA	2,461,831	2,519,009	0.46
Daejeon MSA	1,532,781	1,599,887	0.88
Gwangju MSA	1,452,330	1,504,928	0.72
Suwon−Hwaseong−Osan MSA	1,238,868	1,465,363	3.66
Changwon−Masan−Jinhae MSA	1,079,359	1,079,837	0.01
Ansan−Siheung MSA	1,014,428	1,071,228	1.12
Ulsan MSA	868,188	1,049,177	4.17
Cheonan−Asan MSA	598,598	730,302	4.40
Jeonju−Gimje MSA	719,057	713,950	−0.14
Cheongju−Jeungpyeong MSA	615,933	671,577	1.81
Pyeongtack−Anseong MSA	478,727	537,636	2.46
Pohang MSA	515,714	489,698	−1.01
Jinju−Sacheon MSA	450,869	444,093	−0.30
Suncheon−Gwangyang MSA	398,569	398,001	−0.03
Gumi MSA	341,550	383,786	2.47
Jeju MSA	279,996	311,281	2.23
Iksan MSA	323,687	308,144	−0.96
Wonju MSA	268,352	284,360	1.19
Yeosu MSA	303,233	277,995	−1.66
Gyeongju MSA	275,842	267,872	−0.58
Chuncheon MSA	252,547	260,887	0.66
Gunsan MSA	272,715	250,011	−1.67
Mokpo MSA	250,480	244,888	−0.45
Gamgneung MSA	228,232	221,329	−0.60
Chungju MSA	217,927	204,800	−1.20
Geoje MSA	168,022	196,481	3.39
Icheon MSA	179,719	188,556	0.98
Andong MSA	182,098	169,788	−1.35
Seosan MSA	143,154	144,091	0.13
Gimcheon MSA	147,855	135,923	−1.61
Jecheon MSA	143,710	132,864	−1.51
Gongju MSA	130,376	127,076	−0.51
Tongyeong MSA	123,842	121,555	−0.37
Jeongup MSA	129,152	115,760	−2.07
Yeongju MSA	126,507	114,081	−1.96
Miryang MSA	115,962	105,966	−1.72
Sangju MSA	116,493	105,937	−1.81
Yeongcheon MSA	111,392	104,012	−1.33
Boryeong MSA	109,535	97,176	−2.26
Donghae MSA	96,679	93,183	−0.72
Namwon MSA	94,926	86,052	−1.87
Sokcho MSA	87,985	84,908	−0.70
Donducheon MSA	73,502	80,277	1.84
Seoguipo MSA	80,860	78,369	−0.62
Mungyeong MSA	90,846	70,926	−4.39
Samcheck MSA	75,647	68,116	−1.99
Taebaeck MSA	54,196	55,344	0.42
MSA Total	41,683,292	43,272,987	0.76
Total	46,136,101	47,278,951	0.50

Source : Kim et al. (2008).

and 12.2% in 2005, which are much less than the national average rate of 19.7%. This is evidence that over-concentration in the Seoul MSA is an issue not only from the primary city but also large cities.

4. Inter-City Wage Differentials and Determinants

For the analysis of wage differentials across MSAs, Korean Occupational Employment Statistics(OES) were used, which is a unique wage data set for counties in Korea. The data set has been used since 2001. As shown in Table 2, the total number of employees(respondents) in the 2009 survey is 101,674. However, because their monthly wage varies, the data was truncated. The outliers below the minimum wage and more than 20 times of the minimum wage have been removed from the sample. The minimum wage in 2009 from the Minimum Wage Council was about 4 US Dollar. Therefore, average monthly wages below 640 USD or over 12,800 USD are excluded in this study. As a result, 80,371 observations were used in 2009.

The average wages were measured in two ways: One is the average monthly wage and the other is the average hourly wage. Table 3 shows the average hourly wages in the MSAs from 2001 through 2009. The highest hourly wage in 2009 is 14.12 USD, which is in the Yeosu MSA, where the population was about 278,000 in 2005. Yeosu is well known as a traditional

Table 2.   Korean Occupational Employment Statistics

	Number of households	Number of employees	Number of samples
2001	49,559	65,193	51,204
2002	51,519	71,360	53,471
2003	51,008	71,790	53,715
2004	51,182	70,016	51,128
2005	51,121	70,254	51,994
2006	75,999	100,129	79,753
2007	76,377	103,813	76,561
2008	76,594	101,617	77,903
2009	75,735	101,674	80,371

Table 3.   Inter-City Hourly Wage Differentials in Korean MSAs

Unit : USD

MSAs	2001	2002	2003	2004	2005	2006	2007	2008	2009
Seoul	7.81	8.59	8.94	9.40	9.64	11.62	11.63	12.62	12.65
Busan	6.40	6.95	6.66	7.34	7.73	8.80	9.34	10.39	9.93
Daegu	6.36	6.79	7.18	7.30	7.72	9.33	8.92	10.20	10.02
Incheon	7.03	8.38	8.43	8.91	9.53	10.62	10.41	11.05	11.27
Gwangju	7.01	8.30	8.22	8.24	8.69	9.43	9.89	10.92	11.06
Daejeon	7.09	8.21	8.12	7.92	8.56	9.44	9.96	11.62	10.83
Ulsan	8.12	9.26	8.59	9.80	10.23	12.43	12.25	13.95	13.32
Suwon	7.06	8.59	8.71	8.76	8.58	9.84	11.12	12.63	11.98
Pyeongtaek	5.41	7.86	8.26	8.31	9.76	8.89	10.88	11.25	11.74
Dongducheon	5.88	7.07	7.39	6.63	7.78	7.17	8.04	8.37	8.40
Ansan	6.85	7.34	7.43	8.44	8.66	9.41	10.38	11.11	11.15
Icheon	7.46	5.43	5.65	7.63	7.72	9.36	10.52	12.84	8.60
Chuncheon	6.04	7.04	8.16	6.75	7.57	10.67	9.12	9.59	11.24
Wonju	8.91	7.97	8.59	7.36	8.17	9.44	9.21	10.70	12.06
Gangneung	7.71	7.83	7.80	7.96	9.48	7.27	9.75	10.08	9.46
Donghae	8.63	7.58	8.03	8.71	10.20	9.18	9.70	11.51	14.75
Taebaek	5.29	9.02	8.38	9.20	9.71	10.91	10.42	11.78	10.70
Sokcho	5.18	6.36	5.54	7.09	6.14	10.14	9.37	8.29	8.74
Samchek	7.37	7.24	6.86	8.90	9.82	8.11	8.85	11.11	12.86
Cheongju	7.61	7.78	8.41	8.95	9.05	9.60	11.92	12.53	11.83
Chungju	5.15	6.76	6.58	7.46	8.09	9.28	8.95	8.43	9.48
Jecheon	4.83	6.99	7.90	8.14	8.60	10.48	10.64	11.63	8.58
Cheonan	6.51	8.18	8.67	8.81	9.69	9.69	11.04	9.79	10.68
Gongju	6.01	6.66	7.40	7.90	7.77	9.07	8.83	10.22	9.18
Boryeong	6.12	6.60	7.08	8.20	8.22	9.09	10.72	8.49	8.52
Seosan	6.45	8.70	10.29	8.93	9.54	10.81	13.22	9.32	11.75
Jeonju	6.64	8.18	8.76	8.07	10.75	10.96	11.24	11.13	10.68
Gunsan	5.66	6.51	7.10	7.89	8.53	10.74	10.85	10.35	9.66
Iksan	6.05	7.45	7.13	7.37	8.56	8.34	9.00	9.97	12.31
Jeongeup	5.72	7.27	8.17	8.74	8.91	6.68	7.32	8.68	7.56
Namwon	7.04	7.11	7.83	7.19	7.86	7.54	9.33	8.88	8.24
Mokpo	7.44	7.75	7.35	7.48	8.32	9.07	9.28	10.46	9.76
Yeosu	6.74	9.16	8.23	8.82	8.85	10.51	14.46	12.69	14.12
Suncheon	6.74	8.04	8.22	9.97	10.63	11.98	13.55	14.04	13.62
Pohang	7.24	8.17	8.86	9.37	10.97	8.72	13.23	11.92	12.22
Gyeongju	6.97	7.37	8.44	8.01	8.93	9.79	10.54	11.70	10.03
Gimcheon	6.50	6.15	7.82	6.36	7.48	6.72	6.87	7.80	10.51
Andong	6.90	6.51	7.70	7.66	6.47	9.26	8.85	9.07	8.63
Gumi	9.28	6.40	7.00	7.60	8.09	9.76	9.65	10.32	10.27
Yeongju	5.26	6.85	5.56	6.06	8.38	9.74	10.14	9.53	8.82
Yeongcheon	5.08	5.62	7.20	7.97	8.03	9.05	7.60	7.42	9.06
Sangju	7.01	6.79	6.82	5.40	9.47	8.66	7.44	7.24	9.24
Mungyeong	7.49	6.12	7.47	9.82	8.40	6.75	9.02	6.32	8.74
Changwon	7.49	7.42	8.46	7.88	8.52	10.38	10.72	11.71	12.59
Jinju	6.17	7.60	8.19	8.48	9.38	9.37	9.79	11.36	9.95
Tongyeong	6.96	8.00	6.65	7.19	8.62	11.58	9.14	8.81	9.14
Milyang	5.38	7.28	7.02	6.63	6.45	6.95	7.37	8.66	7.41
Geoje	8.12	8.59	7.71	8.77	10.19	12.67	11.18	16.55	12.77
Jeju	7.10	6.94	7.60	7.18	8.36	9.05	9.21	9.50	9.82
Seogwuipo	7.50	5.81	7.17	7.29	8.02	8.63	10.22	8.22	12.81

manufacturing city where chemical industries have been heavily concentrated since 1960s. The second highest hourly wage is 13.62 USD in the Suncheon MAS adjacent to the Yeosu MSA. The Suncheon MSA with a population of 398,000 in 2005 is the second largest port (Gwangyang Port) city in Korea. The third highest hourly wage is 13.32 USD in the Ulsan MSA, which is well known as the home to the Hyundai Automobile Co. The population of Ulsan MSA in 2005 was about 1.05 million. In general, the mid size cities having specialized localization economies have higher wages. The hourly wages in larger MSAs of over one million people vary from 9.93 USD to 13.32 USD. Among them, the Busan MSA has the lowest hourly wage. It is not very consistent with the theory of the Roback model, because wages are supposed to compensate for higher living costs, which are positively related to city population size.

Now, the determinants of wage differentials across MSAs are based on the Roback model. The regional wages are expressed as a function of the cost of living (C) and amenities (A). In this paper, wages are measured in two ways: One is by monthly wage and the other is by hourly wage.

$$w = f(C,A) = \alpha + \beta_1 pop + \beta_2 rent + \beta_3 commute + \beta_4 api + \varepsilon \qquad (2)$$

In Table 3, the two columns are regressions of the average hourly wage. First of all, the city population size (log of population) is positively related with wages, which is coincident to the theoretical model. Average wages in larger cities are more likely to be higher. Second, housing prices or rent prices are also positively related with wages. It also means that wages are partial compensation for the costs of living. The third is that amenities are not as important, because the land area in Korean is limited and thus there is little variation in amenities except for congestion and pollution. The regression results showed that the wage level is higher, as the air is more polluted. Working time varies across MSAs from 46.5 hours per week in the Donghae MSA to 58.9 hours per week in the Suwon MSA in 2005. Accordingly, it is expected that the hourly wages are slightly different from the monthly wage.

Table 4.   Determinants of Inter-City Wage Differentials in Korean MSAs

indep.var.	hourly wage	hourly wage
log(population)	7.0658	6.6216
	[4.99]	[5.73]
Housing price	0.0115	
	[0.04]	
Rent price		0.0277
		[0.09]
Commuting time(min)	−0.6343	−0.5698
	[1.17]	[1.12]
Air pollution index	0.0208	0.021
	[0.06]	[0.06]
Observations	50	50
R−squared	0.14	0.14

Note : Standard errors in brackets; *** $p<0.01$, ** $p<0.05$, * $p<0.1$

However, the regressions for the wage differential determinants showed indifferent results. This is because working time is not as important to Korean workers. In many cases, overtime work is neither special, nor considered a burden. In addition, since housing prices are more often considered as the price of an asset, and not the cost of living, the rent price was substituted for housing price. Again, the results are not much different. To conclude, the significance level is not as high but still, the costs of living, amenities and city size are important factors of regional wages.

5. Intra-City Wage Differentials and Determinants

To analyze intra-city wage differentials, it is necessary to define the wage differentials(gap) first. There is a common way to measure wage differentials within a city, which is the wage ratio of skilled labor to unskilled labor within a city. Then, the definition of skilled labor and unskilled labor is to be defined. In this paper, they are categorized as high income occupations and low income occupations, as shown in Table 4. In general, managers and doctors are high wage occupations, while nurses and child care teachers are considered low wage occupations.

Table 5.   High Income(Wage) and Low Income(Wage) Occupations

High Income (Wage) Occupation	Low Income (Wage) Occupation
Administrative Managers	Secretaries
Manager in Constructions	Child Care Teachers
Managers in IT industry	Nurses
Sales Managers	Physical Therapist Helper
Managers in Environments	Barbers
Accountants and Appraisals	Ticket Seller
Financials in Banking and Insurance	Sales Person
Doctors and Pharmacists	Security Guards
Computer Programmers	

Source : Korean National Statistical Office.

$$wage\ differentials = \frac{average\ wage\ in\ higher\ income\ occupations}{average\ wage\ in\ lower\ income\ occupations} \qquad (3)$$

The intra-city wage differentials in Seoul MSA decreased in the early 2000s right after the Asian Financial Crisis in 1998 and then increased again. The highest intra-city wage differential was reported in the Jeonju MSA in 2009 with 714,000 people in 2005. However, the intra-city wage differential in the largest Seoul MSA is only about 3.01. In general, larger cities have more variety in their human resources, which means intra-city wage differentials are bigger in larger cities.

What makes the wage differentials within a city? These determinants of intra-city wage differentials are analyzed in more detail in the following regression. The intra-city wage differentials are composed of city population size(P), industrial structure(I) and human capital structure(H) shown in equation(4). More precisely, the industrial structure could be measured with the employment rate and employment ratio of knowledge-based manufacturing industries to knowledge-based service industries. Human capital could be measured by "advanced human capital", which is the ratio of workers with a master's degree or higher. The population is also measured by the total population and the old age index, the elderly being over 65 and young being below 15.

Table 6.   Intra–City Wage Differentials in Korean MSAs

MSAs	2001	2002	2003	2004	2005	2006	2007	2008	2009
Seoul	2.54	2.29	1.93	2.64	2.40	2.67	3.01	2.89	3.01
Busan	2.35	2.75	1.81	2.90	1.71	3.06	3.48	3.38	3.05
Daegu	3.33	2.38	2.09	2.98	1.71	2.89	2.86	3.28	3.10
Incheon	2.46	2.55	2.10	3.01	3.13	3.15	3.40	3.03	3.30
Gwangju	2.48	2.18	2.07	2.64	2.13	2.36	3.09	3.48	2.78
Daejeon	2.14	2.48	2.36	2.75	1.74	2.18	3.27	2.99	3.57
Ulsan	2.62	2.80	2.96	2.91	2.66	3.41	3.37	4.02	4.21
Suwon	2.47	2.56	1.56	2.68	2.61	2.24	3.03	2.48	3.48
Pyeongtaek	1.76	2.34	1.48	2.26	3.04	2.70	3.89	2.61	4.24
Dongducheon	1.09	1.15		4.18		1.58	2.53	2.37	2.66
Ansan	2.06	2.09	1.71	1.65	1.67	2.67	2.57	2.92	2.52
Icheon	5.89	3.13		4.60	0.97	1.93	2.34	1.89	3.17
Chuncheon	2.21	2.51	1.74	1.88		3.78	3.39	2.72	3.46
Wonju	2.67	1.75	2.50	2.03	1.98	3.54	3.33	2.31	3.52
Gangneung	1.80	2.41	2.55	3.06	1.55	3.00	3.13	3.05	1.92
Donghae		1.66		3.52		1.51	2.12	2.68	3.79
Taebaek							3.33	3.96	4.58
Sokcho	1.28	1.56	1.80	3.72		2.03	4.08	4.73	2.07
Samchek	3.13			1.56			1.46	2.35	2.26
Cheongju	2.28	2.04	1.23	3.13	1.97	2.54	2.84	2.80	3.15
Chungju	1.99	3.37		1.78		4.69	4.29	3.63	2.60
Jecheon	2.12	2.01				2.27	3.02	2.41	2.73
Cheonan	1.60	2.42	2.30	3.15	2.22	2.71	3.38	3.23	3.39
Gongju	2.19	4.90		2.86		1.99	3.29	3.04	3.39
Boryeong	2.36	1.92		2.89		2.65	3.24		3.03
Seosan	1.81	3.02	2.01	3.71		2.18	4.17	3.11	4.20
Jeonju	3.64	3.05	1.38	2.71	3.37	2.78	3.17	3.72	4.87
Gunsan	2.23	3.17	5.42	1.47	1.63	2.64	3.98	4.73	4.24
Iksan	2.28	2.20	2.34	2.00		2.73	3.25	2.26	3.70
Jeongeup	1.44		3.75	2.06		1.54	2.91	2.21	4.82
Namwon	1.96	1.53		2.76		2.00	5.69	2.75	3.78
Mokpo	2.58	3.07	1.38	2.27		2.40	3.44	3.39	3.90
Yeosu	3.45	1.94	1.67	2.76	4.46	3.21	5.16	6.88	4.46
Suncheon	1.22	1.42	2.51	2.36	2.53	3.33	2.88	2.12	2.96
Pohang	2.19	1.69	1.77	3.71	3.08	2.37	3.48	3.03	3.08
Gyeongju	2.13	2.52		2.15	0.88	2.09	2.73	3.27	3.06
Gimcheon	3.14	2.33		1.60	4.54	4.94	4.78	2.44	3.19
Andong	2.33	2.80	1.50	2.61	2.35	2.64	3.21	2.40	3.13
Gumi	1.88	2.61	1.83	4.84	2.27	2.71	2.48	3.19	3.73
Yeongju	2.01	2.99		1.68		7.03	2.86	3.44	4.85
Yeongcheon	1.32	0.95		1.44	1.76	2.21	3.06	3.98	3.31
Sangju	3.01			1.13		1.66	2.44	3.58	2.92
Mungyeong	3.19					2.34			3.21
Changwon	2.67	2.55	1.81	2.73	2.85	3.18	3.52	3.19	2.93
Jinju	2.33	2.15	1.65	3.65	2.67	2.26	3.25	2.87	3.81
Tongyeong	1.71	1.90	1.38	3.46		9.09	3.82	2.15	4.10
Milyang		1.86		1.27		1.94	4.74	3.17	4.07
Geoje	3.13	2.19	1.39	3.05		1.71	6.35	4.99	3.77
Jeju	3.01	2.34	1.70	3.05		2.28	2.52	3.08	3.52
Seogwuipo	1.47			1.20			2.14	2.45	3.60

Table 7. Determinants of Intra-City Wage Differentials in Korean MSAs

indep. var.	wage gap	wage gap	wage gap
log(population)	0.1636	0.1991	0.1458
	[0.27]	[0.35]	[0.35]
employment rate	0.025	0.0258	0.025
(knowledge based mfg)	[0.04]	[0.04]	[0.04]
employment rate	−0.0613	−0.063	−0.0586
(knowledge based service)	[0.22]	[0.22]	[0.22]
ratio of master+	−42.5619	−40.1844	−44.2053
	[51.89]	[54.42]	[56.35]
Old to Young	−0.0105	−0.0103	−0.0105
	[0.01]	[0.01]	[0.01]
emprate05	−9.5403*	−9.3458*	−9.6659*
	[4.93]	[5.12]	[5.23]
log(housingprice)		−0.1866	
		[1.12]	
log(rentp)			0.1041
			[1.29]
Observations	48	48	48
R−squared	0.10	0.10	0.10

Note : Standard errors in brackets; *** p<0.01, ** p<0.05, * p<0.1

$$wageratio = f(P,I,H) = \alpha + \beta_1 pop + \beta_2 rent + \beta_3 emp + \beta_4 indus + \beta_4 humancap + \varepsilon \quad (4)$$

The regression results Table 5 show that population size is still positively related to the wage gap within cities, even though it is not much significant. In other words, larger cities are tend to have wider wage gap. In addition, the intra-city wage differential is getting smaller, when more people get employed. However, the employment rate in knowledge based manufacturing industries has negative relationship with intra-city wage. It means that differences in wage within a city goes down, when manufacturing industries are more restructured toward knowledge base.

6. Conclusion and Policy Implications

In conclusion, there are a couple of important findings from the empirical

work regarding wage differentials and their determinants. First, inter-city wage differentials and intra-city wage differentials are larger in large cities in general, which coincides with the Roback model. Second, wages do not seem reflective of the economy, which means wages are substitutable not only for the cost of living but other factors as well. Wages are not differentiated across cities enough. Korea almost has a uniform wage system. In addition, larger cities such as the Seoul MSA have immeasurable attraction, because the average wage is not enough to compensate for the high living costs. The third, intra-city wage differentials have a negative relationship with the employment in knowledge-based manufacturing industries. As the industrial structure is concentrated more on manufacturing, the intra-wage differential (gap) lessens.

Since 2003, the goal of regional policy in Korea has been "Balanced Development across Regions". This is because of social conflict from the mono-centric development around the capital area. Not only physical capital, but also human capital has been concentrated. Thus, regional disparity has grown and balanced development has been fostered. Hopefully, this research gives some policy implications to both the central government and local governments on how to create a balance.

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