International Journal of Social Science & Human Behaviour Study – IJSSHBS 2018
Copyright © Institute of Research Engineers and Doctors , SEEK Digital Library
Volume 4 : Issue 2- [ISSN : 2374-1627] - Publication Date: 25 June, 2018

Regional Policy Variables and Local Employment Growth

Evidence from Korea

[Iltae Kim and Jihye Choi]

***Abstract*— This paper examines the effects of regional policy variables on local employment growth using the panel data from 1998 to 2013 in Korea. The employment equation is derived from Constant Elasticity Substitution (CES) production function. Employment growth is specified as a function of wage rate, output, local public expenditure, and local R&D expenditure. The research and development expenditure is the proxy variable of technological innovation. The demand for labor takes into account dynamics since the cost of adjustments in the demand for labor will be induced in the long-run. A Dynamic Panel Regression Model is employed considering the effect of lagged employment using regional panel data. The results show that public expenditure has positive effects on local employment growth and that the effect of public expenditure in manufacturing sector is more elastic than that of service sector. A one percent increase in public expenditure increases industrial employment in manufacturing sector by 0.14 percent and industrial employment in service sector by 0.04 percent. Total gross value added per capita (labor productivity) has a positive effect on employment growth in manufacturing sector and a negative effect on the same in service sector. The total fixed capital formation has positive effects on total industrial employment and industrial employment in service sector. The effects on wage rate on employment growth in all industry sectors are negative.**

***Keywords*— Regional Economic Variables, Local Employment Growth, Dynamic Panel Regression Model**

I. Introduction

Job creation and economic growth are important and sensitive issues considered in global economic policy. Korea recently experienced low economic growth without employment growth. A number of studies have been carried out that consider economic variables such as Research & Deveopment (R&D), specialization of public finance and industrial complexes, and size of employment growth as variables that constitute employment growth. Dynamic Panel GMM (Generalized Moment) analysis was one of the common approaches adopted in previous studies.

Iltae Kim/Chonnam Natnional University
Department of Economics / Chonnam National University
South Korea

Jihye Choi/Chnonnam National University
BK21+ Graduate Program for Economics / Chonnam National University
South Korea

For example, Van Reenen, (1997) showed that the innovation[1] on the demand for labor is positive using panel data of 598 UK firms over the period 1976-1982. Similarly Lachenmaier and Rottmann, (2011) showed a positive effect of technological innovations on employment using the German manufacturing firms' data from 1982 to 2002[2]. Bogliacino *et al*. (2012) also examined the technological innovation effects using the R&D expenditure of European data. They found that the R&D expenditure is possible to affect the employment[3] and showed that the service sector has bigger positive R&D effect than manufacturing sector. Furthermore, they demonstrated that the effect of high-tech manufacturing sector is bigger than that of non-high-tech manufacturing sector.[4]

In agglomeration economy, Blien *et al*. (2006) and Kim and Min, (2010) investigated the effects of diversity and specialization for different industries at the local level. They set up the dynamic panel model and defined the explanatory variables such as sector specific effects, total regional size, specialization, diversity, and so on.

Lee and Kim (2014) used model of Blien et al. (2006) to find-out the impact of local variables on job creation in Korean industrial complex. They found that GDP growth, experts, size of firms, and facility operation rates had a positive or negative impact on job creation. And researchers suggest that entrepreneurship, government incubation is needed to boost company incubation and facility utilization. Kim and Min (2010) introduced long-term and short-term effects of cumulative variables on the growth of local industry employment by introducing the system GMM methodology. They showed that specialization has a positive impact on employment growth in most industries, particularly manufacturing, and diversity has a greater impact on the service industry in the short term. In the manufacturing sector, the effect of industrial diversity in the long term was more influential than in the service industry.

[1] Reenen (1997) matched innovations with the construction of a count of the number of innovations a firm commercialized.

[2] Lachenmaier and Rottmann (2011) classified the innovation input and innovation output and measured the innovation input as innovation expenditure (R&D expenditure) and the innovation output as patents.

[3] Bogliacino et al. (2012) explained that an increase of R&D is one of the main targets of European economy policy in 2010.

[4] High-tech manufacturing includes pharmaceuticals, electrical machinery and apparatus, measuring, analyzing, controlling, instrument, and so on. Non high-tech manufacturing includes food & kindred products, fabricated metal products, chemicals and allied products, and so on.

International Journal of Social Science & Human Behaviour Study – IJSSHBS 2018
Copyright © Institute of Research Engineers and Doctors , SEEK Digital Library
Volume 4 : Issue 2- [ISSN : 2374-1627] - Publication Date: 25 June, 2018

This paper examines the effects of regional economic variables on local employment growth in Korea in the context of the dynamic panel regression model using the panel data from 1998 to 2014 in Korea. These regional economic variables including R&D expenditure and local public finance are hypothesized to affect the local employment growth change.

II. The Model

To analyze the effects of regional economic variables on local employment growth, this paper proposed the employment equation model of Van Reenen, (1997) and Bogliacino *et al*. (2012) derived from CES production function. The behavior of profit maximizing firms in a perfectly competitive market was modeled. The CES production function was specified as follows;

$$\mathbf{Y = A[(\alpha L)^{\rho} + (\beta K)^{\rho}]^{\frac{1}{\rho}}} \quad (1)$$

where Y is the output and L and K are employment and capital respectively. *A* represents a potential Hicks-neutral technological change and α and β are the parameters of the reaction of labor and capital to the technological shock ($0 < \rho < 1$). The demand for labor can be written as follows;

$$\ln L = \ln Y - \sigma \ln \frac{W}{P} + (\sigma - 1)\ln \alpha \quad (2)$$

where $\sigma = 1/(1-\rho)$ is the elasticity of substitution between labor and capital. This equation can be rewritten in stochastic form as below[5].

$$l_{i,t} = \delta l_{i,t-1} + \gamma_1 gva_{i,t} + \gamma_2 w_{i,t} + \gamma_3 r\&d_{i,t} + \gamma_4 k_{i,t} + \varepsilon_i + \mu_{i,t} \quad (3)$$

The lower case letters mean natural logarithms. l is employment (number of employees), gva is output(total gross value added)[6], w is real wage (average monthly wage), $r\&d$ is technological innovation (R&D expenditure), k is investment (total fixed capital formation) at the local level. ε_i is unobserved region-specific time-invariant effect which might be correlated with the explanatory variables but not with the usual error term $\mu_{i,t}$. The equation (3) includes the 1 lagged value of dependent variable and is called dynamic panel regression model.

Equation (3) is switched to the first differences in order to remove the unobserved regional specification ε_i and is presented as (4).

$$\Delta l_{i,t} = \delta \Delta l_{i,t-1} + \gamma_1 \Delta gva_{i,t} + \gamma_2 \Delta w_{i,t} + \gamma_3 \Delta r\&d_{i,t} + \gamma_4 \Delta k_{i,t} + \Delta \mu_{i,t}. \quad (4)$$

However it still has an endogeneity problem, i.e., the correlation between $\Delta l_{i,t-1}$ and $\Delta \mu_{i,t}$.
The equation (4) is estimated using Difference Generalized Method of Moments (GMM-DIF) estimation which was proposed by Arellano and Bond (1991) to resolve endogeneity issue. This estimation uses the lagged value of dependent variables, *i.e.*, $l_{i,t-2}$, $l_{i,t-3}$,$\cdots$ as the Instrument Variables (IV) of the explanatory variable, $\Delta l_{i,t-1}$.
In this model, $\Delta l_{i,t-1}$ is interpreted as the potential persistence toward equilibrium in the process of adjustment and shows the speed of employment growth in that region[7].
If $0 < \delta < 1$, then the growth of local employment regresses to mean in the long-run and if $\delta > 1$, then the employment grows explosively[8].
R&D expenditure may or may not affect employment in Korean regional model because Korean R&D investment focused on the economic growth not the employment, on the other hand, public expenditure such as social welfare expenditure focused on the employment growth. Local public expenditure can affect local employment. For that reason, this paper uses the public expenditure as an additional variable. The effect of public expenditure will be uncertain because there are large gaps between the service industry and manufacturing industry in terms of fiscal policy such as tax reduction or financial support. This paper classifies the dependent variable (number of employees) as a whole, manufacturing sector, service sector, and the total gross value added for each sector were chosen as explanatory variables.

Accordingly, the following model was used for estimation;

$$\Delta l_{i,t} = \delta \Delta l_{i,t-1} + \gamma_1 \Delta gva_{i,t} + \gamma_2 \Delta w_{i,t} + \gamma_3 \Delta r\&d_{i,t} + \gamma_4 \Delta pe_{i,t} + \gamma_5 \Delta k_{i,t} + \Delta \mu_{i,t} \quad (5)$$

where pe is the public expenditure. The equation (5) is divided into three models. Each model classifies the dependent variable by industry sector, and chooses the total gross value added for the explanatory variables by industry sector.

<Table 2> shows the common sample statistics of data. Korean regional data is provided from Korean Statistical Information Service (KOSIS) was used for the estimation. The panel number is 16 (7 metropolitan councils and 9 provinces), time range was 1998 to 2013, and annual data was gathered[9]. The dependent variable is the number of regional employees and explanatory variables are general accounts of public expenditure, R&D expenditures[10], total gross value added, average monthly wage, and fixed capital formation at the regional level. The data was converted to per capita basis and transformed into logarithm.

[5] See Bogliacino *et al*., (2012).The model is augmented by including innovation

[6] Bogliacino *et a*l., (2012) added the output variable(sales) to one of explanatory variables in the employment equation introduced by Van Reenen (1997) to verify the business stealing effect of rival firms.

[7] See Jiwattanakulpaisarn *et al*., (2009).They explained that the potential persistence for equilibrium employment is reflected by the parameter δ.

[8] Kim and Min, (2010) explained that$l_{i,t-1}$can estimate the persistence of region-industry over time and it can capture the current and past impact of region-industry specialization.

[9] The Ulsan metropolitan city was promoted in 1998, and thus this paper uses the yearly data from 1998 to 2013.

[10] R&D expenditures sum to regional firms and government.

TABLE 1. COMON STATISTICS

variable	Mean	Max	Min	Std. Dev.	Obs	period
employment	1,411,759	5,923,000	243,000	1,353,149		
manufacturing sector	264,522	1,130,000	8,000	275,906		
service sector	1,029,664	4,726,000	163,000	1,114,581		
total gross value added per capita	40,293,326	96,827,174	22,002,447	14,904,744		
manufacturing sector	74,631,168	299,631,260	10,209,047	58,637,273		
service sector	35,896,953	57,175,270	24,874,159	6,329,978		
average monthly wage	1,966,487	2,920,092	1,291,953	382,258		
R&D expenditure per capita	485,582	3,520,882	42,173	597,982		
public expenditrue per capita	1,940,748	5,313,087	593,948	1,003,658		
fixed capital formation per capita	15,291,592	41,574,261	6,283,482	5,662,495		
log(employment)	13.855	13.744	15.594	0.729	256	1998-2013
log(manufacturing sector)	11.990	13.938	8.987	1.080		
log(service sector)	13.488	15.369	12.002	0.767		
log(total gross value added per capita)	17.459	17.398	18.388	0.309		
log(manufacturing sector)	17.858	19.518	16.139	0.736		
log(service sector)	17.382	17.862	17.029	0.168		
log(average monthly wage)	14.473	14.480	14.887	0.195		
log(R&D expenditure per capita)	12.645	15.074	10.650	0.955		
log(public expenditrue per capita)	14.351	14.301	15.486	0.506		
log(fixed capital formation per capita)	16.485	17.543	15.653	0.330		

III. Result of The Estimation And Discussion

Three version of equation (5) are estimated to examine the effect of regional economic variables on employment growth. <Table 2> reports the impacts of regional economic variables using dynamic panel GMM (GMM-DIF) approach considering the IVs of explanatory variable[11], $\Delta l_{i,t-1}$, as $l_{i,t-2}$and $l_{i,t-3}$.[12]

The results show that the local public expenditure has a positive effect on local employment growth and that the effect of public expenditure in manufacturing sector is more elastic than that of service sector. If public expenditure increases by one percent, then industrial employment in manufacturing sector reacts by increasing the same by 0.14 percent and industrial employment in service sector by 0.04 percent. Total gross value added per capita, i.e., labor productivity, has a positive effect on local employment growth in manufacturing sector and a negative effect on that in service sector. The total fixed capital formation has positive effects on total industrial employment and industrial employment in service sector. However the wage has negative effects on local employment growth like previous researches.

<Table 2> shows that the parameter δ ranges from 0.218 to 1.012. The parameter estimate of the lagged dependent variable implies a potential persistence to reach for employment equilibrium 13 . The growth of regional employment is expected to regress to average in the long-run and manufacturing sector's employment persistence is bigger than that of service sector.

IV. Concluding Remarks

This paper examines the effects of regional economic variables on the employment growth using the panel data from 1995 to 2013 in Korea and analyzes relationships between local employment growth and regional economic variables such as public expenditure, wage, technical innovation, total gross value added, and total fixed capital formation. This paper also estimates dynamic relationships among regional panel data using Dynamic Panel Regression Model which considers the endogeneity of explanatory variable.

[11] This paper makes allowance for yearly data of time series, so the lag is 2.

[12] If the dependent variable follows the random walk, then the GMM-DIF estimation will be inefficient. To identify the existence of random walk, this paper tests the unit root of the dependent variable, rejects the null hypothesis which the dependent variable follows random walk and uses the GMM-DIF estimation.

[13] See Jiwattanakulpaisarn *et al*., (2009),

TABLE 2. RESULT OF DYNAMIC PANEL GMM ESTIMATION

	Dynamic panel -GMM		
	Model (1) Total industry	Model (2) manufacturing	Model (3) service
log(employment -1)	1.012***	0.739***	0.218***
	(0.044)	(0.055)	(0.080)
log(total gross value added per capita)	-0.026		
	(0.034)		
log(manufacturing sector)		0.408**	
		(0.093)	
log(service sector)			-0.547***
			(0.040)
log(average monthly wage)	-0.134***	-0.684***	-0.076*
	(0.020)	(0.092)	(0.039)
log(R&D expenditure per capita)	-0.003	0.004	-0.001
	(0.006)	(0.022)	(0.006)
log(public expenditure per capita)	0.057***	0.135**	0.044***
	(0.017)	(0.068)	(0.013)
log(fixed capital formation per capita)	0.043***	-0.021	0.030*
	(0.013)	(0.055)	(0.014)
J-statistic (H_0: IV are over identified)	35.081	43.214	39.012

Note: ( ) standard error
*** is statistically significant in the level 1%.

This paper shows that local public expenditure has a positive effect on local employment growth in all industrial sectors and that the effect of public expenditure in the manufacturing sector is more elastic than that of service sector. In the Korean economic growth, tax incentive, infrastructure, and financial support policy have been concentrated on the manufacturing industry sector. Since the productivity of manufacturing sector is larger than that in the service sector, it is easy for the manufacturing sector to create the added value. For example, tax reduction covers all types of business in the manufacturing industry but only knowledge basis business in service industry. The gap of fiscal support between manufacturing industry and service industry exist during economic growth. This implies that the financial support or tax incentive enhances the job creation and employment growth in service sector. The gap of fiscal support between manufacturing industry and service industry exist during economic growth. This implies that the financial support or tax incentive enhances the job creation and employment growth in service sector.

This study also shows that the gross value added per capita (or labor productivity) has positive effect on manufacturing sector employment growth, but negative effect on service sector. The R&D expenditure does not have significant effects on employment growth. As the aforementioned earlier, the productivity of service sector is quite small. This implies that the productivity of service industry has negative effect on employment since its productivity is too low even though the expenditure on R&D is increased. The R&D expenditure in service industry can be used as a sunk cost because it is difficult for the service production technology innovation to commercialize. In addition, the R&D variable acts as endogenous variable of the labor productivity. Thus, it needs a new approach to control other endogenous problem.

The total fixed capital formation has positive effect on total industrial employment and industrial employment in service sector. However, wage rate has a negative effect on employment growth like previous studies. The lagged variable of employment has positive effect on current employment. This shows that, in the long-run, the potential persistence exists to go employment equilibrium and that the speed of employment growth in manufacturing industrial sector is faster than that of service sector.

These results imply that central or local government should consider policy mix in terms of fiscal support such as financial aid and tax deduction for R&D activity which improves the productivity to promote local employment growth.

References

[1] Arellano, M., and Bond, S. (1991), "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," The Review of Economic Studies, 58(2), 277-297.

[2] Blien, U., Suedekum, J., and Wolf K. (2006), "Local employment growth in West Germany: A dynamic panel approach," Labour Economics, 13(4), 445-458.

[3] Blundell, R., and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models," Journal of Econometrics, 87(1), 115-143.

[4] Bogliacino, F., Piva, M., and Vivarelli M. (2012), "R&D and employment: An application of the LSDVC estimator using European microdata," Economics Letters, 116(1), 56-59.

[5] Jiwattanakulpaisarn, P., Noland, R. B., Graham, D. J., and Polak J.W. (2009), "Highway infrastructure investment and county employment growth: A dynamic panel regression analysis," Journal of Regional Science, 49(2), 263-286.

[6] Kim, K., and Min I. (2010), "The effect of Agglomeration Economy on the Growth of Local-industry Employment: Using System GMM estimators," The Journal of Korea Planners Association, 45(2), 227-246.

[7] Lachenmaier, S., and Rottmann H. (2011), "Effects of innovation on employment: A dynamic panel analysis," International Journal of Industrial Organization, 29(2), 210-220.

[8] Lee, W., and Kim S. (2014), "An Empirical Research on the Impact of Growth in a National Industrial Complex on Job Creation," Journal of the Korean Regional Development Association, 26(2), 79-100.

[9] Van Reenen, J. (1997), "Employment and technological innovation: evidence from UK manufacturing firms," Journal of Labor Economics, 255-284.

About Author (s):

ILTAE KIM is a Professor in Department of Economics, Chonnam National University, Korea. He obtained Ph.D. degree of Economics from the University of Georgia at Athens, USA in 1989. He joined Chonnam National University in 1990 as faculty member, had served as Dean of College of Business Administration and as a visiting research professor at the University of Georgia and Purdue University in USA for several years. Several papers were published in famous journals (SSCI) which studies various economics fields such as the Economics of Risk and Uncertainty, Labor Economics, and Public Economics: "The Effect of Uncertainty on the Voluntary Private Provision of Impure Public Good," ***Singapore Economic Review***, 54(1), 2009, pp.61-73, "The Private Provision of Public Goods under Uncertainty: A Symmetric-Equilibrium Approach," ***Journal of Public Economic Theory***, 8(5), 2006, pp.863-873, "Employment Risk and the Substitution between Saving and Unemployment Insurance," ***The Manchester School***, 74(5), 2006, pp.617-625, "Portfolio Choice for Increases in Risk and Prudence Revisited," ***Journal of Economics***, 86(3), 2005, pp. 293-300(with coauthor), "Left-Side Strong Increases in Risk and Their Comparative Statics," ***Theory and Decision***, 57(1), 2004, pp. 59-68(with coauthor), "Tax-Rate Uncertainty, Factor Supplies, and Welfare," ***Economic Inquiry*** 33(1), January 1995, pp. 159-169(with coauthors) and more.

JIHYE CHOI is a post-doc research fellow in BK21+ Graduate Program for Economics Chonnam National University and she studies regional economy in Korea. She has three published papers on regional economy which are joint studies with Dr. Kim in the past three years.