The impact of fiscal decentralization on economic performance in Indonesia

F Setiawan¹ and A F Aritenang¹

¹ Urban and Regional Planning Department, Institut Teknologi Bandung, 40132, Indonesia

Email: setyawanfreda@gmail.com

Abstract. Regional studies literature argues that neighboring regions could impact each others’ economic performance through trade, technology diffusion, capital flow, and political stability. However, the emergence of decentralization has put the above argument into a new context. This study aims to explain the impact of fiscal decentralization on economic. The study analyse the impact of fiscal decentralization using lag value and ignores the existence of spatial dependency between regions. Our study concludes that the fiscal decentralization has a significant effect on economic performance at a lag value of 3 years, implying that public budgeting will have a significant impact on increasing economic performance on 3 years later. In addition, the paper provides evidence that regions with similar economic performance are located nearby suggesting the presence of spatial dependence.

1. Introduction
In general, decentralization is the transfer of power or authority from the central government to local governments [1,2,3,4]. One of the important dimensions of decentralization for local governments is fiscal decentralization. This policy is related to the submission of fiscal authority including revenue and expenditure of local governments [5,6,7]. The implementation of this policy is expected to increase the allocation and efficiency of the provision of public goods [2,8]. This efficiency can drive local and national economic growth [4].

The view of classical fiscal federalist theory does not explicitly explain the relationship between fiscal decentralization and economic performance [7]. However, research on this field has become very relevant after large-scale decentralization in socialist countries such as the Soviet Union, China, Eastern Europe in the 1980-1990s. As studies found inconclusive findings on the relations that theoretical and empirical justification is required to examine the relationship between decentralization and economic performance [6,7,9,10].

Studies at both regional and state perspectives show contradictory results. For instance, Xie and Zou [9] and Stansel [11] found that fiscal decentralization promotes economic growth. The paper by Zhang and Zou [9] answers this by showing that fiscal decentralization could effect to economic performance through the efficiency of resources allocation in the public sector. In addition, since the local government as a key actor in providing public goods and services to the community, this has made it increasingly important to know the impact of fiscal decentralization on the economic, social and political aspects [7]. Meanwhile, other studies negative and insignificant effects [7, 12,13].

So far the research that analyzes the impact of fiscal decentralization still ignores the impact of other regions. The paper by Oates recognized that the assumption of decentralization ignored the potential...
impact of cross-regional public goods supply [8]. Another assumption was no mobility of cross-regional economic units, implying that individuals do not move between regions. However, there should still be a possibility for someone to move locations. This may influence the selection of fiscal variables in this study. In addition, Ramirez and Loboguerrero argue that in the literature on economic growth still ignores spatial dependence between regions [14]. The existence of spillover effects between regions is important for economic growth. Thus, spatial linkages cannot be ignored in the analysis of regional economic performance because modeling can be biased.

In the Indonesian context, there are several studies that examine the empirical relationships between fiscal decentralization and economic performance [15,16,17,18,19] and the study on spatial dependences of economic performances [20,21,22,23,24,25]. However, these studies ignored the potential impact of spatial dependence on fiscal decentralization of neighboring regions. Hence, this study attempts to examine to which extent the spatial dependence impact of fiscal decentralization on economic performance in districts in Indonesia. The paper uses econometrics analysis and compares traditional OLS and spatial models.

The paper is organized as follows; the following section discuss the data and research methodologies and followed by the analysis results and discussion section. The last section provides research conclusion and policy implications.

2. Data and research methods

This study uses a quantitative approach using secondary data. These data include locally-generated revenue (PAD), general allocation funds (DAU), special allocation funds (DAK), revenue sharing funds (DBH), capital expenditure, percentage of people in poverty. The period of these data from 2008 until 2011. These data were obtained from the websites of Ministry of Finance of (MoF), the Indodapoer (Indonesia Database for Policy and Economic Research), and the Central Bureau of Statistic (Badan Pusat Statistik/BPS).

The method of data analysis uses spatial regression by weighting in the form of a matrix that describes the closeness of the relationship between observations or known as spatial weight matrix. In his seminal book on spatial regression, Anselin (2006) explains that spatial regression analysis is related to specifications, estimates and examinations of regression models that combine spatial effects [26]. According to Matthews (2006) the existence of spatial dependencies has 2 (two) important implications [27]. First, spatial autocorrelation can be disruptive. Second, if it is intended to find spatial interaction, the spillover nature of spatial dependencies can be considered as a substantive part. Therefore, ignoring spatial correlation can cause estimates to be inefficient [27,28]. In the analysis, the data is processed every year so that it is cross section.

The spatial weighting into 3 (three) types, namely intersection, distance, general. In the analysis of Spatial Lag Model (SLM) and Spatial Error Model (SEM) it only works for spatial weights that correspond to continuity relationships symmetrically [26]. In other words, the spatial weighting that can be used is rook, queen, bishop, distance band contiguity but not for k-nearest neighbors. This study uses a spatial weighting matrix based on distance. This is because observations in Indonesia consist of several scattered islands so that there are limitations when using contiguity.

Spatial regression analysis is related to specifications, estimates and examinations of regression models that combine spatial effects. These effects are affected by measurements at other locations. This causes spatial data to be less suitable for the smallest regression analysis. First, Spatial Lag Model (SLM) is a spatial regression model whose dependent variable is spatial correlation, meaning that this model has a dependency between one observation in an area with other observations in its neighboring region [29]. SLM does not only discuss the effect of uncountable independent variables but also considers the value of the dependent variable on other objects [27]. Second, the Spatial Error Model (SEM) shows the relationship of errors. The spatial error model evaluates the extent to which grouping of outcome variables is not explained by measurable independent variables. This model captures the influence of independent variables that are not measurable or errors [29].
3. Result and discussions
This section provides the research analysis of relationship between fiscal decentralization to economic performance, spatial dependency model and a discussion of the results. The analysis is displayed in the following table (Table 1). The Locally-generated revenue (Pendapatan Asli Daerah/PAD) is a regional income derived from the ability of the region to multiply its potential. The sources of PAD consist of local taxes, regional retributions, the results of the separated management of regional assets, and other legitimate sources. While General Allocation Fund (Dana Alokasi Umum/DAU) is a balancing fund to cover regional financial capacity inequality measured by basic allocation and fiscal gap. In principle, the regions with the largest spending and the smallest taxes will receive the largest transfer funds. Because the function of this fund is to cover the gap horizontally.

The Special Allocation Fund (Dana Alokasi Khusus/DAK) is an state revenue and expenditure budget allocated to regions to fund specific activities that are in line with national priorities. DAK is usually to finance the needs of basic service facilities and infrastructure that have not reached certain standards to encourage the acceleration of regional development. With the allocation of this balance, the areas that are still left behind can do development. This development will later be able to meet basic needs as well as the needs of supporting economic activities so that it can help increase regional fiscal capacity in order to reduce the degree of underdevelopment.

The Revenue Sharing (Dana Bagi Hasil/DBH) is a fund from the state revenue and expenditure budget that is distributed based on a certain percentage according to the applicable provisions. This fund consists of tax components and natural resources. While the capital expenditure is a form of investment expenditure related to procurement, improvement of regional assets. This asset procurement plays an important role in helping community activities, especially those related to economic activities.

First, the table shows evidence of spatial autocorrelation as indicated by the Moran’s I test of residual (residual or error) regression. The Lagrange Multiplier test for Lag and Error also shows indications of spatial autocorrelation. The Ordinary Least Square (OLS) regression using lag value of 1 year, 2 years, 3 years. The results show that all the main components of fiscal decentralization consisting of PAD, DAU, DAK, DBH have a significant impact on alpha <0.05 with a lag value of 3 years. This finding implies that fiscal allocation in year t will have a significant impact on t + 3. The discussion of each component of fiscal decentralization is as follows.

**Table 1. The Comparison Result of OLS and Spatial Regression Model**

| Dependent Components | Gross Domestic Regional Product (GRDP) | OLS | Spatial Regression |
|----------------------|---------------------------------------|-----|--------------------|
|                      | Lag 1 | Lag 2 | Lag 3 | Lag 1 | Lag 2 | Lag 3 |
| Moran’I              | 0.0495 | 0.01913 | 0.06908 | - | - | - |
| Robust (LM-Lag)      | 0.00155 | 0.00041 | 0.05067 | - | - | - |
| Robust (LM-Error)    | 0.4804 | 0.00029 | 0.48339 | - | - | - |
| PAD                  | 0.000026* (33.66) | 0.0000335* (30.32) | 0.00003* (39.26) | 0.0000263* (34.61) | 0.0000338* (31.26) | 0.0000037* (39.88) |
| DAU                  | 0.00001* (5.17) | 0.000002* (2.87) | 0.000016* (9.61) | 0.000011* (5.69) | 0.0000019* (2.86) | 0.0000016* (9.16) |
| DAK                  | -0.000015*** (1.09) | 0.0000062*** (0.71) | -0.00006* (5.54) | -0.000016*** (-1.184) | 0.00000628* (-0.73) | -0.000006* (-5.32) |
| DBH                  | -0.000019*** (-1.69) | 0.00000004 (0.327) | 0.000004* (2.67) | -0.0000002** (-1.917) | 0.0000001 (0.11) | 0.000004* (2.50) |
| BM                   | 0.00002* (7.47) | 0.000012* (4.95) | -0.000005* (-1.75) | 0.0000201* (7.52) | 0.000012* (4.99) | -0.0000052** (-1.65) |
| PR                   | -88073.1* | -50335.4* | -29804.5*** | -76004.3* | -38485.3*** | 24234*** |
First, the PAD variables tend to have a consistent impact on lag-1, lag-2, and lag-3. But when compared to the coefficient and t-statistic values, PAD contributes the most to economic performance at a lag of 3 years. This is presumably because it takes a span of time for the construction of public services in advance so that it can later move the economy. The PAD variable have a positive and significant impact on economic performance. The result suggest that PAD contributes positively as increased of local taxes and levies through the authority of taxing power. This local revenues act as an incentive instrument for development allocation. The greater the revenue size, the higher economic growth found in the region.

Another component that might be the source of PAD is public savings in banking. This deposit consists of demand deposits, time deposits, savings, and foreign exchange exchanges. The source of income is included in other legal income. This shows that the increasing public savings in the form of demand deposits, savings accounts, foreign exchange, the more legitimate other income components. The role of banking can be realized as an institution that brings together debtors and creditors. With deposits in banks can provide capital assistance so that it can move the economy.

Second the DAU shows the direction of positive and significant relationships in each testing year. However, after comparing the coefficient value, the test on the lag of 3 years contributes (in terms of coefficient value) which is greater than other year lags. This shows that at 3 years lag, DAU contribution is very important for regions with low fiscal capacity. After economic activity develops, the DAU contribution begins to decrease because the regional fiscal capacity begins to develop. This is indicated by the reduced coefficient of DAU and on t-statistics.

The DAU component has a positive effect allegedly due to budget allocations for employees that affect the level of employee consumption. Employee spending is also possible to increase regional productivity. For example, an additional amount of the teacher salary expectedly improve teachers’ wellbeing and thus, improve teaching capacities that may lead to student competencies and regional productivity.

Third, DAK variable indicates the direction of an inconsistent relationship. However, the role of DAK is very significant in the 3 years lag. This shows that it plays an important role for regions with low fiscal capacity. This means that regions with low economic performance tend to receive greater DAK allocations. This DAK contribution turned out to be significant in driving the economy in the area. After an increase in fiscal capacity, the role of DAK began to decrease in significance. This can be shown in the lags of 1 year and 2 years which tend to be insignificant towards economic performance, which implies that regions are increasingly autonomously fiscal.

| Dependent Components | Gross Domestic Regional Product (GRDP) | OLS | Spatial Regression |
|----------------------|--------------------------------------|-----|-------------------|
|                      | Lag 1 | Lag 2 | Lag 3 | Lag 1 | Lag 2 | Lag 3 |
| Dummy Metropolitan   | (-3.34) | (-1.96) | (-1.23) | (-2.92) | (-1.53) | (-1.00) |
| Dummy Java           | 202427* | 298488* | 164238* | 187895* | 277565* | 159524* |
|                      | (3.26) | (4.43) | (2.43) | (3.09) | (4.21) | (2.39) |
| Lag Coefficient      | 137131* | 320787* | 175494 | 762617*** | 237318* | -160851 |
|                      | (2.26) | (5.519) | (0.27) | (1.23) | (3.87) | (-0.24) |
| Lambda Coefficient   | - | - | - | 0.109* | 0.127* | 0.07* |
|                      | - | - | - | (3.45) | (3.69) | (2.13) |
| R-Square             | 0.95 | 0.95 | 0.95 | 0.96 | 0.9519 | 0.95 |
| Observation          | 450 | 450 | 450 | 450 | 450 | 450 |

Note: PAD: Locally-Generated Revenue, DAU: General Allocation Fund, DAK: Special Allocation Fund, DBH: Total Revenue Sharing, BM: Capital expenditure, PR: Poverty Rate
* significant at α < 0.05, ** significant at α < 0.1, *** significant at α < 0.5
 t-statistics are reported in parentheses
While the DBH variable has a significant impact on the lag of the 3rd year. In lag 1, and 2 years, this DBH contribution is not significant enough to economic performance. This means that the DBH allocation in 2008 had a significant impact on the regional economy in 2011. DBH components show a significant influence on economic improvement. This fund has a significant impact on GRDP after 3 years because this fund can be allocated for development which does not directly impact the increase in GRDP. This DBH plays a role in covering the fiscal gap vertically, but not horizontally. If an area is economically developed, it is suspected that there are regions that are still lagging behind so that the role of DBH is less significant to improve economic performance.

The capital expenditure component has a very significant role in economic performance at a lag of 1 year and 2 years. However, if the review of the variable coefficient shows a greater coefficient value at 1 year lag. The capital expenditure component plays a significant role in the 1 year lag. This means that the role of spending on lags 2 and 3 years is less significant. This is presumably because the regional fiscal capacity is still low so that the allocation for development expenditure is still low. After fiscal capacity begins to grow, the contribution of capital expenditure is increasingly significant because of the greater budget allocation for development.

This means that the capital expenditure component plays an important role in regional economic performance because it provides faster benefits. This capital expenditure can also be a form of government consumption so that it directly impacts the increase in GRDP.

3.1. Control variables: Poverty Rate, Dummy of Metropolitan, and Dummy Java

The relationship of control variables to economic performance also shows different results. Variable percentage of poor people has a significant negative relationship only at year lag. This means that regions with a high percentage of poor people can have implications for the decline in economic performance. Poor people tend to have lower levels of education and skills which have implications for regional productivity and low economic performance.

Metropolitan dummy variables tend to show a significant positive relationship. This means that regions in the metropolitan area tend to have higher economic performance. The metropolitan area has a rapid economy due to industrial concentration. This is because there are information flow factors and knowledge exchange. Economic performance is also influenced by the greater fiscal capacity of the metropolitan area because of the potential tax base.

Java dummy variable shows a positive and significant relationship at 1 year and 2 years lag on economic performance. This means that the regions in Java tend to have a higher GRDP compared to other islands. This is because the condition of Java Island is more advanced when viewed from accessibility, availability of infrastructure that supports productivity of economic activity.

4. Discussion

Taking into account the effect of spatial dependencies causes the model to be more specific. The best spatial regression model produced is Spatial Lag Model. This model shows that dependencies occur on the dependent variable, meaning that the performance of a region's GRDP is also influenced by the performance of fiscal decentralization of the surrounding area. The use of spatial regression analysis influences model specifications. In testing with a lag of 1 year, several coefficients from independent variables showed an increase such as PAD, Capital Expenditures, although this increase was not significant.

Similarly with a lag of 2 years, there was a change in the coefficient on PAD, DAK, percentage of poverty. Whereas in the 3-year lag test, shows that there is a change in the PAD coefficient, Capital Expenditures. In table 1, the lag coefficient for each test shows positive and significant. This means that there is a grouping of regions with similar characteristics. An area with high GRDP is surrounded by areas with high GRDP, and vice versa. This positive relationship occurs spatial dependence meaning that an area also needs other areas to complement each other.

Another important finding is the importance of DBH as the fund potentially causes regional inequality due to differences in resources. The study from Waluyo (2007) suggest that DBH is
considered only benefits resource-rich regions, following higher tax revenue sharing, and large urban districts that earns higher revenue from property tax. Allocation of revenue sharing funds for key sectors can increase regional economic growth. The greater the DBH, the greater the allocation for the development of public services. For that reason, if an area wants to receive a high DBH, it must be able to explore the potential of regional wealth.

The existence of a spatial dependency phenomenon shows that in planning it is necessary to consider the externalities generated in other regions. For example, tax policy in an area will also affect the surrounding area. Although local taxes are needed to boost PAD, the determination also considers the surrounding area. explains that the authority to collect taxes in the regions potentially leads to unfair competition between regions that may cause a poor investment climate [30]. This can later affect the regional economic performance. Therefore, Ramirez and Loboguerrero (2002) suggest collaborating that provides economic benefits across regions [14].

5. Conclusion
In general, fiscal decentralization has an impact on the economic performance of districts/cities in Indonesia. In terms of revenue, fiscal decentralization has the most significant impact on year 3 lag. This means that government investment and consumption of public services will have an impact on economic improvement in the span of 3 years after its establishment. This implies that investment in financing is needed in order to improve economic performance in order to encourage the creation of fiscal independence.

This study also shows that there are spatial dependencies in the relationship of fiscal decentralization to economic performance. This provides a lesson that analysis with panel data is not enough to analyze economic performance due to the phenomenon of spatial dependence. The results of this study support the statement of Oates (2006) which reveals an effect of fiscal decentralization on neighboring area [8]. This provides an important lesson that development in an area also has implications for adjacent areas.

The implication of the finding is that the regional autonomy policy has changed the paradigm of local governments to act more inward looking [2,31]. This is a challenge when dealing with cross-regional development that has spatial dependency, thus development need to be carried out in an integrated manner to have more effective impacts through cooperation between regions. Accordingly, decentralization could lead to the need to work together or establish partnerships with neighboring cities/districts [2] and shaping metropolitan industrial landscapes that reflect the socio-political and economic dynamics at national levels [32].

6. References
[1] Hammond, G W. Tosun, M S. (2009). The Impact of Local Decentralization on Economic Growth: Evidence from U.S Countries. IZA: Germany
[2] Firman, T. (2014). Inter-local-government partnership for urban management in decentralizing Indonesia: from below or above? Karmantul (Greater Yogyakarta) and Jabodetabek (Greater Jakarta) compared. Space and Polity. Vol. 18, No. 3, 215-232
[3] Devkota. 2014. Impact of Fiscal Decentralization on Economic Growth in the Districts of Nepal. International Center for Public Policy. Andrew Young School of Policy Studies. USA
[4] Martinez-Vazquez, et.al. (2015). The Impact of Fiscal Decentralization: A Survey. Governance and Economic research Network (GEN).
[5] Zhang, Tao and Zou, Heng-fu. (1998). Fiscal Decentralization, Public Spending, and Economic Growth in China. Journal of Public Economics.
[6] Schneider, Aaron. (2003). Who gets what from whom? the impact of decentralisation on tax capacity and pro-poor policy. IDS Working Paper 179
[7] Yushkov, Andrey. (2015). Fiscal decentralization and regional economic growth: theory, empirics, and the russian experience. Russian Journal of Economics 404-418.
[8] Oates, Wallace E. (2006). On the Theory and Practice of Fiscal Decentralization. IFIR Working Papers. College Park: University of Maryland.
[9] Xie, D and Zou, Heng-fu. (1999). Fiscal Decentralization and Economic Growth in the United States. Journal of Urban Economics 45, 228-239.

[10] Martinez-Vazquez. (2011). The Impact of Fiscal Decentralization: Issues in Theory and Challenges in Practice. Phillipines: Asian Development Bank.

[11] Stansel, Dean. (2005). Local Decentralization and Local Economic Growth: A cross-sectional examination of US metropolitan areas. Journal of Urban Economics 55-72

[12] Rodriguez-Pose, Andres & Ezcurra, Roberto. (2010). Is fiscal decentralization harmful for economic growth? Evidence from the OECD countries. Journal of Economic Geography No.11, 619-643.

[13] Thiessen, Ulrich. (2001). Fiscal Decentralization & Economic Growth in High-Income OECD Countries. European Network of Economic Policy Research Institutes.

[14] Ramirez, M. T. and Loboguerrero, A.M. (2002). Spatial Dependence and Economic Growth: Evidence from a Panel of Countries

[15] Booth, A, 2005, The Evolving Role of the Central Government in Economic Planning and Policy Making in Indonesia. Bulletin of Indonesian Economic Studies, 41 (2), pp. 197-219.

[16] Brodjonegoro, B., 2003, The Indonesian Decentralization after law revision: Toward a better future?, Department of Economics, University of Indonesia.

[17] Brodjonegoro, B., 2009. Fiscal Decentralization and Its Impact on Regional Economic Development and Fiscal Sustainability. In: C. J. Holtzappel & M. Ramstedt, eds. Decentralization and Regional Autonomy in Indonesia: Implementation and Challenges. Singapore: ISEAS, pp. 196-221.

[18] Dartanto, T. & Brodjonegoro, B. P., 2003. Dampak Desentralisasi Fiskal di Indonesia Terhadap Pertumbuhan Ekonomi dan Disparitas Antar Daerah: Analisa Model Makro Ekonomietik Simultan. Jurnal Ekonomi dan Pembangunan Indonesia, 4(1), pp. 17-38.

[19] McCulloch, N. & Sjahir, B. S., 2008. Endowments, location or luck ? evaluating the determinants of sub-national growth in decentralized Indonesia, Jakarta: World Bank.

[20] Aritenang, A.F., 2014., The spatial effect of fiscal decentralisation on regional disparities: the case from Indonesia. Indonesian Journal of Geography, 4 (1). pp 1-11

[21] Aritenang, A.F. (2016). The Impact of Decentralisation and ASEAN FTA on Indonesia’s Regional Economic Convergence. Institute of Southeast Asian Studies Publications, Singapore

[22] Aritenang, A. and Sonn, J.W. (2018). The Effect of Decentralization and Free Trade Agreements on Regional Disparity in a Developing Economy: The Case of Indonesia, 1993–2005. International Journal of Urban Sciences

[23] Karmaji, (2010), Analisis Spasial untuk Identifikasi Lokasi Pemusatan Potensi Pertanian, in Reinvensi Pembangunan Ekonom Daerah, Penerbit Esensi

[24] Puspitasari, M., Nurmalasari, V., and Sjafii, A., (2010), Investigating the Economic Growth Impact on Poverty Reduction in East Java, in Priyarsono, D.S, and Ernan, R. Regional Development in Indonesia. Crestpent Press: Bogor, Indonesia

[25] Syabri, I. (2003). Explanatory Spatial Data Analysis for Flow Data: Exploring the Error Term of Spatial Interaction Models, Jurnal Perencanaan Wilayah dan Kota 14(2): 49-68.

[26] Anselin, Luc. (2006). Spatial Regression. Spatial Analysis Laboratory, Department Geography, University of Illinois

[27] Matthews, Stephen A. (2006). GeoDa and Spatial Regression Modeling. Population Research Institute

[28] Di Rienzo, Cassandra. Fackler, Paul. Goodwin, Barry K. (2000). Modeling Spatial Dependence and Spatial Heterogeneity in County Yield Forecasting Models. AAEA Conference, Tampa Summer 2000. Session 8

[29] Anselin, Luc. (2003). Spatial Weights. Urbana-Champaign, University of Illinois

[30] Seknas Fitra (2012). Kupas Tuntas Hubungan Keuangan Pusat Daerah. Jakarta Selatan

[31] Tarigan, A. (2009). Kerja sama Antar Daerah (KAD) untuk Peningkatan Penyelenggaraan Pelayanan Publik dan Daya Saing Wilayah. Jakarta: Bappenas
[32] Hudalah, D. and Aritenang, A. (2017). *Industrial economies on the edge of Southeast Asian metropoles: from gated to resilient economies* in Andrew McGregor, Lisa Law, Fiona Miller (Eds). Routledge Handbook of Southeast Asian Development. London: Routledge.

[33] Karlinda, Elizabeth. (2015). *Optimalisasi Fiskal bagi Pertumbuhan Ekonomi: Peran Belanja Operasional dan Belanja Modal dalam APBD*. Laporan Penelitian. KPPOD