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6

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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Fiscal decentralization, economic growth, and human development: Empirical evidence

Nguyen Thanh ${\rm Hung^{1\star}}$ and Su Dinh ${\rm Thanh^{2}}$

Abstract: The objective of this paper is to examine the simultaneous relationship between fiscal decentralization, economic growth, and human development using the panel data of 18 countries over the 2011–2017 period. 3SLS-GMM (Three Stage Least Squares—Generalized Method of Moments Estimator) and GMM-HAC (Generalized Method of Moments—Heteroskedastic and Autocorrelation Consistent estimator) are employed to obtain unbiased coefficients in the system of equation. The results indicate that the significant relationship does exist between fiscal decentralization, economic growth, and human development from different directions. Specifically, economic growth and human development are positively and negatively affected by fiscal decentralization, respectively. These results hold true with alternative estimation methods and sub-indexes of decentralization. Interestingly, economic growth is fostered by human development index, as justified by the statistical evidence of the studied sample, but these results are found to be consistent as well when it comes to expenditure-based decentralization. However, in the opposite direction, the impact of human development on economic arowth is ambiguous and only remains significant in the case of expenditure decentralization purposefully utilized as an explanatory variable. Thirdly, economic growth does not give rise to the efficiency of fiscal decentralization, yet could reduce human development instead. The results provide several plausible implications to policy makers.

Subjects: Economics; Political Economy; Public Finance

Keywords: Fiscal decentralization; income inequality; economic growth; GMM-HAC; 3SLS-GMM

1. Introduction

Over the last decades, several countries around the world, from the developed countries to the emerging ones, have experienced economic, political, and administrative decentralization (Garman et al., 2001; Hooghe et al., 2010). Of the factors fostering unequal economic growth between regions, fiscal decentralization patterns could be viewed as one of the most important drivers for the growth of each country (Martinez-Vazquez & McNab, 2003), and the expenditure or revenues of fiscal decentralization could be transferred by the authorities from national to local levels. The extent of decentralization relies mainly on the local capacity of government to navigate the independent revenue and expenditure budgets for local citizens in accordance with distinct geographical features without the central government's intervention (Martinez-Vazquez & McNab, 1997). Moreover, the degree of fiscal decentralization varies by institutional politics, economic and social factors, and national history. Fiscal decentralization has therefore always been a global trend over the last three decades (Lessmann, 2009).





Figure 1. Relationship between revenue decentralization, economics growth, and human development (Source: UNDP and IMF).

AND REVENUE DECENTRALIZATION Economics Growth Human Development Index Revenue decentralization 3 22 TRADE OPENNESS (% GDP) 21.5 2.5 21 2 20.5 1.5 20 19.5 1 19 0.5 18.5 0 18 2011 2012 2013 2014 2015 2016 2017 YEAR

ECONOMICS GROWTH, HDI

Figure 2. Relationship between expenditure decentralization, economics growth, and human development (Source: UNDP and IMF).

ECONOMICS GROWTH, HDI AND EXPENDITURE DECENTRALIZATION



Intensive discussion on the different implications of fiscal decentralization has led to the increasing interest in academic research relating to this topic. To date, a broad variety of potential impacts of fiscal decentralization in each nation have been addressed, including economic development, geographical disparities, stability of macroeconomies, corruption, and the scale of governments (Martínez-Vázquez et al., 2017). In addition, there are burgeoning studies on the relationship between the fiscal decentralization and economic growth; however, academic research has scarcely brought into focus the consequences of decentralization and unequal distribution of income. Moreover, in developed countries, the issue of the fiscal decentralizationincome inequality relationship conceivably attracts great scholars' attention while relevant studies with respect to developing economies remain scarce. Therefore, it is interesting to investigate the impacts of fiscal decentralization on the economic prosperity and well-being of a nation's population (Martínez-Vázquez et al., 2017).

The problem of human development has recently been considered as the final objectives of human activity, instead of economic growth. Economic growth primarily represents the nation's income, but human development reflects the overall economy covering the whole society, culture, or politics of the country. National income is only a means of human development; economic Figure 3. Relationship between tax revenue decentralization, economics growth, and human development (Source: UNDP and IMF).



ECONOMICS GROWTH, HDI

growth, thus, is a critical driver of, yet not sufficient prerequisite for, human development. Accordingly, fiscal decentralization features strategic policies to rearrange the operating activities of the public sector and make it more efficient when people's demands and preferences can be properly satisfied. The income per capita inequality of a province relative to national income per capita could be regarded as an achievement of the socio-economic framework where public policy is implemented (Sepulveda, 2010). Thus, observing the direct linkage proves more necessary than ever between fiscal decentralization and human development via the distribution of human development capital.

The main added values of this research to the literature are as follows. On the one hand, most empirical studies on the relationship between fiscal decentralization and economic growth, between economic growth and human development, or between fiscal decentralization and human development are conducted separately and mainly on individual markets (i.e. emerging or developed markets). Moreover, due to the differences in fiscal decentralization between countries, the effect of fiscal decentralization on economic growth and human development, and vice versa, are inconclusive. To fill this void, the research revisits earlier studies and provides empirical evidence on the simultaneous relationship between fiscal decentralization, economic growth, and human development with the diversity of economies in the studied sample that features panel data of 18 countries in the 2011-2017 period. This practice could shed further light on whether decentralization improves income inequality and economic growth. Furthermore, the database collected from reputable institutions such as UNDP, IMF, and GSO of Vietnam ensures a high level of reliability. On the other hand, to address the inter-dependence of the key variables under investigation, the methods such as 3SLS-GMM (Three Stage Least Squares-Generalized Method of Moments Estimator) and GMM-HAC (Generalized Method of Moments-Heteroskedastic and Autocorrelation Consistent Estimator) are employed to overcome econometric drawbacks in the single equation to yield unbiased coefficients stemming from the system of equations (Kyriacou et al., 2017). These methods are better than ordinary least square with several assumptions and two stage least square with incapacity to control heteroskedaticity issues.

The primary aim of this study is to examine the three-way relationship between fiscal decentralization factor, economic growth, and human development index, which remains unexplored in prior empirical studies. The results show that the significant relationship between fiscal decentralization, economic growth, and human development exists in different directions. Specifically, fiscal decentralization could negatively and positively affect economic growth and human development, respectively. These findings also reflect the similar directions across various estimation methods and sub-indexes of decentralization. In addition, there is a statistically positive link between human development and economic growth, which is found to be valid in the usage of expenditurebased decentralization. Moreover, economic growth is in negative association with fiscal decentralization and human development.

This paper is structured as follows. Section 2 reviews the theory and empirical evidence of the inconclusive relationship between the three variables principally employed in this study. Section 3 presents data and research methodologies, while Section 4 provides empirical results and discussion of these findings. Finally, Section 5 concludes the paper with policy implications suggested.

2. Literature review

The relationship between economic growth, fiscal decentralization, and income inequality has been extensively studied in economic theories, both theoretically and empirically (Aghion, 2002; Alesina & Rodrik, 1994; Benabou, 1996; Kakwani & Son, 2008; Kuznets, 1955, 1963; Persson & Tabellini, 1994; Piketty, 2015; Ravallion, 1998); however, these results remain quite controversial. To make it more readable, we separate the literature into two strands relating to the mutual relationship, the economic growth—human development relationship, and the mutual linkages between fiscal decentralization, economic growth, and human development.

2.1. Economic growth and human development

There appears to be a common agreement on the key role that economic growth plays in reducing poverty and facilitating people's well-being. Economic growth could be defined as the wealth increasing over time, often measured by changes in Gross Domestic Product (GDP) and representing all the value added created in a country's boundaries within a given time. Accordingly, economic growth is commonly considered a measure of an economy's development in which varied economic factors, such as innovation and technology, financial capital, and human resources, together with other traditional drivers, such as investment and entrepreneurship, are associated (Aghion et al., 1998; Solow, 1956). Other characteristics, in addition, have also mainly contributed to determining economic growth; these include the enhancement of science and medicine, education and public health, trade and globalization, and stable governments and institutions (Roe, 2003; P. Romer, 2008; P. M. Romer, 1989).

The nexus between human development and economic growth is plausible due to supportive resources on which human development is based, which is driven by economic growth. To be more specific, human development is captured in the advancement in health and education improvement attributed to economic growth, leading to the increase in labor productivity. If economic growth contributes to an increase in the income of end-stage families, then it exerts a significant effect on human development. Economic growth appears to represent a stronger contribution to human development when poor families could enjoy its benefits and women could exercise their control over the income distribution of household expenditure, thus resulting in poverty reduction (Ranis et al., 2000). Moreover, Fields (1989), Deininger and Squire (1996), and Ranis et al. (2000) show that economic growth provides necessary resources for public expenditure, health, and education.

Human development could drive economic growth due to higher productivity through the provision of labor with skilled and managed characteristics. The workforce is shaped in the activities of secondary and higher education, translating into economic growth (Ranis et al., 2000). Some empirical evidence seems to suggest the relationship between human development and economic growth. The increases in human capital are expected to increase productivity of the workforce (Ranis et al., 2000). Higher social capital through education could be affected by economic growth (Dinda, 2014). In addition to the role of education, another aspect of human development is associated with health enhancement. Bloom et al. (2004) detect the real effect of health development that could improve the life expectancy for one year and contribute to the increase of 4% in the amount of productivity. The effects of education and health enhancement on

the growth of economy are so well-grounded in the economic literature that many authors refer to only human capital in both cases and that human capital contributes to economic growth at the same level as physical capital. On the contrary, Benhabib and Spiegel (1994) find the influence of human capital on total factor productivity but not on per capita growth, emphasizing the need for further investigation into these conflicting results.

In empirical analytical research, human development is limited to the extent "including the health and education of the people" (Ranis et al., 2000). Human development is defined as the ways of people's choices that help them obtain a longer, healthier, and fuller life. Clearly, a close relationship exists between economic growth (EG) and human development (HD). Specifically, EG provides resources to enable sustainable improvement in HD, and the high quality of workforce is a critical contribution to EG. This two-way relationship between HD and EG is widely accepted; however, the specific factors linking them have yet to be systematically explored. Therefore, the aim of this study is to provide better understandings of the factors relating to government's policy affecting such bidirectional linkage between HD and EG at both conceptual and empirical levels. This allows for an analysis of divergent priorities in implementing economic policy and reconsideration of the validity of the general assumption that EG has a significant impact on HD.

2.2. Fiscal decentralization, economic growth, and human development

National institutions and policy could further mediate the effect of the translation of economic growth into human development (Addison et al., 1990; Ranis et al., 2000; Stewart, 1987; Von Jacobi, 2014). In this regard, the different structure of institutions such as taxes management and the political representation of groups could mediate the causal link between economic growth and human development. The economic policy could be implemented in the view that the public resources generated by economic growth are mainly invested in human development. Furthermore, one of the key characteristics of human development, gender inequality, also plays an important role due to the fact that gender inequality in education directly affects economic growth by lowering average human capital. Therefore, economic growth is indirectly affected by the effects of gender inequality and the powers of government (Klasen, 2002).

And fiscal decentralization can have a positive (negative) impact on economic growth, resulting in narrowing (widening) income inequality in the region. It may reduce regional inequality since fiscal decentralization permits specific policies and better information (Oates, 1993). Tiebout (1956) shows that citizens' disclosure of their necessary preference for local public goods will improve the allocation of public spending to the supply of local public goods and services. Oates (1993) further explains that fiscal federalism brings local governments closer to their citizens due to sufficient information on people's preferences, therefore allowing them to implement spending plans for local public goods more efficiently than a given central government. At the same time, fiscal decentralization helps local governments with further specific information on people's needs so that they can adjust, or carry out, various policies in accordance with the interest of people of different social backgrounds (Oates, 1972). Furthermore, fiscal decentralization can promote competition for financial resources among local authorities and make the service delivery more efficient for the local public (Breton, 1996; Salmon, 1987). Thus, fiscal decentralization could be an effective policy for local economic development, reducing income inequality and improving the public's welfare across regions in the long run (Oates, 1993).

Richard Abel Musgrave (1939) identifies the main role of government in the economy, namely allocation, distribution, and stabilization. In the subsequent research of Richard A Musgrave (1956), the government's responsibility is to maximize the social welfare through fiscal decentralization whereas the allocation of the public goods is to be made by the sub-national government levels. This results in the public services and goods being effectively distributed at the lowest level of government (Silas et al., 2018). In this regard, public finance has a special role in the economy based on its basic functions of resource allocation, distribution of income and assets, and macro-economic stability (Richard A Musgrave, 1959). In this theory, fiscal decentralization refers to

transfer of fiscal powers and responsibilities from central government to subnational governments, highlighting the role of financial decentralization in the view that it could lead to the optimal supply of local public goods and could enhance human development and economic growth.

In addition to the relationship between economic growth and human development, one of the factors that could promote the inequality of economic growth between regions is the structure of fiscal decentralization in each region and country, which directly affects economic growth. Martinez-Vazquez and McNab (2003) finds that fiscal decentralization is the process of transferring powers and responsibilities of expenditure and revenue from the central to the local government. The scope of decentralization mainly depends on the capacity of the local level to make independent revenue and expenditure decisions within geography, for local people, and without the intervention of the central government (Martinez-Vazquez & McNab, 1997). Fiscal decentralization reflects the transferable responsibility from the central government to local governments to fulfill the public functions, improving the general welfare of community.

Given different theories predicting different effects of fiscal decentralization, the nexus between fiscal decentralization, economic growth, and human development is an empirical question. As discussed by Martínez-Vázquez et al. (2017) and Sorens (2004), the findings of empirical studies vary considerably on the impact of fiscal decentralization on economic growth, government performance, regional convergence, and regional disparities. One insight from these empirical studies is that institutional structure matters. In an empirical study on the effect of fiscal decentralization on economic growth covering the sample of OECD countries, Filippetti and Sacchi (2016) find that fiscal decentralization has a positive effect on economic growth and that tax decentralization accompanies administrative and political decentralization to make it active in actual implementation.

3. Methodology and data

3.1. Econometric specifications

To capture the effect of fiscal decentralization on economic growth and human development, the simultaneous equation models (SEM) are applied as follows:

$$EG_{it} = \mu_0 + \mu_1 EG_{it-1} + \mu_2 FD_{it-1+}\mu_3 HD_{it} + \mu_4 X_{1,it} + u_{1,it}$$
(1)

$$FD_{it} = \eta_0 + \eta_1 EG_{it} + \eta_l X_{2,it} + u_{2,it}$$
(2)

$$HDI_{it} = \lambda_0 + \lambda_1 EG_{it} + \lambda_2 FD_{it} + \lambda_3 X_{3,it} + u_{3,it}$$
(3)

where subscripts *i* and *t* denote country *i* at year *t*, respectively; *EG* is the average growth rate of real gross domestic product per capita (per capita GDP); *FD* refers to fiscal decentralization including the expenditure-based decentralization (*ED*), the revenue-based decentralization (*RD*), and tax revenue-based decentralization (*TRD*); X_{1},X_{2} , and X_{3} are vectors of variables accounting for other factors affecting economic growth, fiscal decentralization, and human development index as identified in the literature as potentially important determinants of economic growth, fiscal decentralization, and human development (Sala-i-Martin et al., 2004); $u_{1,ib}u_{2,it}$, and $u_{3,it}$ are the error terms for Models (1), (2), and (3), respectively.

The physical capital (*PC*) and human capital (*HC*) are measured as net capital per unit of GDP and percent of population of the level secondary education or higher (i.e. population aged over 25), respectively. The average growth of population (*PG*), net foreign direct investment inflows (*FDI*), and trade openness (TOP) are included as control variables affecting dependent ones. Moreover,

the observed relationship between fiscal decentralization and economic growth may be spurious due to the ignorance of the differences in public sector size in different countries (B. Qiao et al., 2008; Ram, 1986); this research, therefore, integrates into the models the additional control variable, public sector size (PSS), measured as a ratio of total public expenditure to GDP (Rodríguez-Pose & Ezcurra, 2011).

Apart from the Rights Index and Civil Liberties Index as mentioned in Grubaugh (2015), Freedom in the World (*FR*), as suggested by B. Qiao et al. (2008), is employed in the equations with FD and HDI intentionally used as dependent variables. FR is the standard-setting comparative assessment of global political rights and civil liberties, reflecting legal environment, political environment, and economic environment (Table 1).

3.2. Estimation methods

Given the potential mutual interaction among key variables in the model, an estimation method that can consider mutual effects is to be adopted to avoid bias problems during the analysis. Accordingly, the correlation between residuals and explanatory variables in system of equations could cause the regression coefficients to be invalid. Moreover, the residuals variance in simultaneous models might be heterogeneous across provinces or countries. To address these problems, SEM is employed to make the parameters in regression more reliable and efficient than the individual approach to each equation (Kyriacou et al., 2017).

The previous regression methods accommodating the endogenous issue and mutual relationship comprise two-stage least squares (2SLS), seemingly unrelated regression estimation (SURE), SURE with ordinary least square degree-of-freedom adjustment, and three-stage least squares (3SLS). Specifically, 3SLS estimation (a combination of two-step and SURE regression methods) is used for the systematic estimation of structural equations, each of which contains the residuals that are possibly correlated and endogenous variables that could exist (Zellner & Theil, 1962).

From the theoretical background above, it is shown that there exists a simultaneous relationship between fiscal decentralization, economic growth, and human development, so it is appropriate to use simultaneous estimation methods. Test of identification restrictions via J-Hansen statistic is used to check the validity of the model. The results of the study confirmed this simultaneous relationship. So, in this research, the 3SLS estimation (including 3SLS, GMM, and GMM HAC) is employed to estimate the possible interdependence between fiscal decentralization, economic growth, and human development through the *reg3 syntax* in Stata software. In addition to the endogenous variables in the model, the explanatory variables of each equation, considered strictly exogenous, are used as instruments for the endogenous variables in the respective equations.

3.3. Research data

Data for the study are yearly collected covering the period of 2011–2017 for a sample of 18 countries (see Appendix 1) from three main sources: IMF's Fiscal Decentralization Database, Human Development Database, and the United Nations Development Program (UNDP) or Human Development Report Office (HDRO) (for the collection of macro indicators). The raw data for fiscal decentralization and the size of public sector of Vietnam are provided by the Vietnam General Statistical Office (GSO).

The IMF's Fiscal Decentralization Database contains information on 36 indicators that is widely used by scholars and policymakers to assess the overall performance of government revenue and expenditure functions at both national and provincial levels. The dataset covers the countries that have reported fiscal data to the Government Financial Statistics Database (GFS) of the IMF for at least one level of local government. The IMF Fiscal Decentralization Database is updated annually with the latest 2018 version, reflecting through the GFS yearbook 2017. According to IMF (2019), decentralized variables are calculated as follows:

Revenue – based decentralization =	Subnational revenue – grants from other governments Consolidated general government revenue	(4)
		(1)
Revenue – based decentralization =	Subnational revenue – grants from other governments Consolidated general government revenue	(5)
Expenditure – based decentralization = $\frac{Subr}{2}$	national expenditure – transfer from subnational to central government Consolidated general government revenue	(6)

With respect to human development, the database is compiled from the United Nations Development Program (UNDP) and Human Development Reporting Office (HDRO) source, which provides an overview of key aspects of human development.

From the above data source, the descriptive statistics for all variables in the models are summarized in Table 2.

Table 2 shows the unbalanced panel data of 18 countries during the seven-year survey period from 2011 to 2017.

The relationship between growth, human development, and fiscal decentralization (represented as RD, ED and TRD, respectively) covering the period of 2011–2017 are illustrated as follows:

From the above data, the graphs show that the variables representing fiscal decentralization (RD, ED and TRD) tend to increase steadily over the years (except for the period 2013 and 2014). The economic growth rate over the years has changed markedly. Particularly, the HDI in this period did not change, even no change. Especially in the two years, 2013 and 2017, the economic growth margin increased with values of 0.78% and 0.43%, while the HDI marginal change increased very low at 0.01% and 0.01%. In contrast, in 2012, 2014, 2015 and 2016 economic growth decreased, but HDI not only showed no sign of decreasing, but also increased (but very low).

Table 1. Definitions and sources				
Variables	Name	Source		
HDI	Human Development Index	UNDP		
EG	Economics Growth (%)	UNDP		
RD	Revenue-based decentralization (%)	IMF		
ED	Expenditure-based decentralization (%)	IMF		
TRD	Tax revenue-based decentralization (%)	IMF		
PC	Physical capital (% of GDP)	UNDP		
HC	Human capital (% population age over 25)	UNDP		
PG	Population growth (%)	UNDP		
TOP	Trade openness (% of GDP)	UNDP		
FDI	Net Foreign Direct Investment Inflow(% of GDP)	UNDP		
PSS	Size of public sector (% of GDP)	UNDP		
FR	Freedom in the World Index	Freedom House		

Table 2. Descriptive statistics					
			Standard		
Variable	Observation	Mean	Deviation	Min	Max
Revenue-based decentralization	126	20.20	20.92	0.02	89.10
Expenditure- based Decentralization	126	27.15	18.89	1.78	81.63
Tax revenue- based Decentralization	126	23.29	24.27	0.00	99.75
Economics Growth	126	1.77	2.27	-4.35	6.94
Human Development Index	126	0.82	0.09	0.66	0.94
Physical Capital	126	23.03	2.95	15.00	31.10
Human Capital	126	79.03	18.45	38.60	100.00
Population Growth	126	1.00	0.89	-0.42	8.33
Freedom in the World	126	44.19	27.43	11.00	95.00
Trade Openness	126	80.83	46.28	23.90	200.40
Foreign Direct Investment	126	3.08	3.87	-8.00	30.00
Size of Public Sector	126	23.76	10.55	3.90	47.50

Source: Authors' calculation with Stata program.

4. Empirical result

The estimated results based on 3SLS-GMM and GMM-HAC methods in the cases of fiscal decentralization (RD, ED, and TRD) employed as a dependent variable are shown in Table 3. Theoretical review shows that there exists a concurrent relationship between fiscal decentralization, economic growth, and human development, so it is appropriate to use concurrent estimation methods. Test of identification restrictions via J Hansen statistic is used to check the validity of the model. With p-values (p-values are 0.81, 0.89, 0.85, 0.72, 0.80, and 0.83), respectively, the test of overidentifying restrictions of all models are much larger than 0.05, showing that the models are well defined. In addition, the use of both 3SLS—GMM and GMM—HAC estimators to increase the robustness of the model's results. The estimation results confirm a two-way relationship between fiscal decentralization, human development, and economic growth.

To be specific, fiscal decentralization (for all sub-indexes) has a negative impact on economic growth and *vice versa*, but has a positive effect on the improvement of the human development index (all of which are statistically significant at least at 5% level). For example, a one percentage point increase in fiscal decentralization (RD, ED, and TRD) in the previous year could lead to a fall in the current rate of growth of GDP per capita of 0.13, 0.12, and 0.10 percentage points on average, respectively, especially for the model estimated by GMM-HAC. This result is also found in M. Qiao et al. (2019). In contrast, a one percentage point increase in fiscal decentralization (for all sub-indexes) will contribute to an increase of 0.003, 0.003 and 0.002 points in the human development index in the model estimated by GMM-HAC.

As reported in Table 3, there are negative impacts of economic growth on fiscal decentralization and human development. On average, a one percentage point increase in current per capita GDP growth will reduce the human development index by 0.016, 0.015, and 0.014, respectively, for the

Fiscal			ſ	÷	1	
decentralization by	Reve	enue	Exper	nditure	Tax re	venue
Estimatior	3SLS -GMM	GMM—HAC	3SLS -GMM	GMM—HAC	3SLS -GMM	GMM—HAC
Economics growth equatio	L.					
Economics growth _{t-1}	0.214***	-0.179**	0.19***	-0.232***	0.204***	-0.218***
	(0.069)	(0.0689)	(0.0723)	(0.073)	(0.0692)	(0.0803)
Fiscal decentralization _{t-1}	-0.063***	-0.131**	-0.074***	-0.121***	-0.052***	-0.097**
	(0.0083)	(0.0536)	(600.0)	(0.0293)	(0.0068)	(0.0454)
Human Development	0.368	-6.436	6.379**	11.462***	-0.991	-9.413*
Index	(2.4341)	(4.0323)	(3.0342)	(4.3614)	(2.3296)	(5.206)
Physical capital	0.013	0.07	0.034	0.195***	0.008	-0.031
	(0.0476)	(0.0841)	(0.05)	(0.0749)	(0.0475)	(0.1195)
Human capital	0.005	0.054*	-0.012	-0.021	00.0	0.063*
	(0.0103)	(0.0293)	(0.0126)	(0.0225)	(0.0102)	(0.0351)
Trade openness	0.007**	0.01	0.008**	0.006	0.006*	0.012
	(0.0032)	(0.0079)	(0.0034)	(0.0044)	(0.0032)	(0.0081)
Foreign direct	-0.185***	-0.211**	-0.148***	-0.213***	-0.188***	-0.233**
investment	(0.0471)	(0.1016)	(0.0507)	(0.0465)	(0.0474)	(0.0963)
Public sector size	-0.16***	-0.262***	-0.14***	-0.228***	-0.156***	-0.252***
	(0.0191)	(0.0759)	(0.0185)	(0.032)	(0.0188)	(0.076)
Constant	5.244***	10.019***	1.241	-1.366	6.113***	13.391***
	(1.8894)	(3.2597)	(2.23)	(3.0277)	(1.8075)	(5.0467)
Fiscal decentralization equ	ation					
Economics growth	-8.853***	-5.555***	-8.449	-4.204***	-11.01***	-5.733***
	(1.7954)	(0.6755)	(2.0559)	(0.9476)	(2.1747)	(0.6871)
Human capital	0.243**	0.376***	0.162	0.326***	0.279**	0.424***
	(0.1057)	(0.1117)	(0.1177)	(0.1117)	(0.1277)	(0.1181)
Freedom in the World	0.006	0.079	-0.157**	-0.149**	0.064	0.061
	(0.0753)	(0.0627)	(0.0763)	(0.0676)	(0.0919)	(0.0703)
						(Continued)

Table 3. The simultaneous relationship between fiscal decentralizations, economic growth, and human development

I anie 3. (continuea)						
Fiscal decentralization by	Reven	a	Expendit	ure	Tax rever	aur
Trade openness	0.106**	0.079*	0.117***	0.086***	0.114**	0.091**
	(0.0408)	(0.0425)	(0.0434)	(0.0294)	(0.0494)	(0.0396)
Foreign direct	-2.126***	-1.242***	-1.708***	-1.549***	-2.653***	-1.425***
investment	(0.6548)	(0.4764)	(0.6355)	(0.3418)	(0.7917)	(0.4132)
Public sector size	-2.119***	-1.628***	-1.786***	-1.601***	-2.454***	-1.72***
	(0.2803)	(0.2109)	(0.2807)	(0.1651)	(0.3386)	(0.207)
Constant	62.993***	31.774***	71.85***	51.791***	72.932***	30.206***
	(14.4496)	(11.0337)	(15.8113)	(10.6333)	(17.4495)	(10.8791)
Human Development Inde	x Equation					
Fiscal decentralization	0.002***	0.003***	0.002***	0.003***	0.002***	0.002***
	(0.0002)	(0.0007)	(0.0003)	(0.0006)	(0.0002)	(0.0006)
Economics growth	-0.007**	-0.016***	-0.008**	-0.015***	-0.006*	-0.014***
	(0.0031)	(0.0035)	(0.0036)	(0.0023)	(0.0032)	(0.0036)
Population growth	-0.025***	0.032*	-0.035***	-0.037***	-0.018**	0.045**
	(0.0078)	(0.0165)	(0.0091)	(0.0074)	(0.0081)	(0.0201)
Freedom in the World	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.003***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
Constant	0.913***	0.854***	0.894***	0.879***	0.912***	0.858***
	(0.0108)	(0.0274)	(0.0141)	(0.0174)	(0.0112)	(0.0294)
Test of overidentifying restrictions	10.56	8.78	9.13	14.08	10.69	06.6
P-value	0.81	0.89	0.85	0.72	0.80	0.83
Source: Authors' calculation	with Stata program. Note: *, **,	and *** denote significance	levels of 10%, 5%, and 1%, re	spectively. Standard errors of	estimated coefficients in pare	entheses.

GMM HAC estimation. Additionally, a one percentage point increase in economic growth also leads to significant decrease in the human development index of 5.55, 4.20, and 5.73 percentage points on average for all cases of decentralization proxies.

In the opposite direction, the impact of human development on economic growth is ambiguous and consistent in the case of expenditure-based decentralization measurement.

Also, from the research, results show that Fiscal Decentralization has a negative impact on economic growth, this finding is contrary to the research results of Filippetti and Sacchi (2016). Marinez-Vazquez and McNab (2006), using a panel data set for 52 developing and developed countries for the period 1972–1997, examined the direct and indirect relationship between FD and EG. They found some evidence that decentralization can have a direct and negative effect on economic growth in higher-income countries, but this effect has been attenuated by the indirect positive effect of decentralization to growth through macroeconomic stability. However, the negative association between fiscal decentralization and economic performance could be a consequence, as noted in the theory section, of differences in the policy preferences of local governments, which can weaken the overall growth potential (Rodríguez-Pose & Ezcurra, 2011). The analysis shows that, at least in the case of the 18 countries in the sample, the value of the potential economic benefits of fiscal decentralization on economic performance is more than outweighed by the potential economic pitfalls of transferring ever greater resources to local levels of government.

Fiscal decentralization can still be an appropriate way to preserve and promote regional identity and culture, claiming that it will also bring some sort of economic gain that can be considered interesting (Rodríguez-Pose & Ezcurra, 2011). Specifically, fiscal decentralization has a positive impact on Human Development. In the expenditure hierarchy model, the research results have strong evidence that human development factors have a positive impact on economic growth. Meanwhile, economic growth has a negative impact on human development at the same time in three models of the two methods.

In this study, fiscal decentralization is represented by three variables: Revenue decentralization, Expenditure decentralization, and Tax revenue decentralization (Figure 1-3). All three variables have strong evidence to have a positive impact on human development. Thereby showing that, Financial Decentralization is a tool to promote human development. Decentralized fiscal policy implemented today has a positive effect on human development, but to finance local expenditures, local governments are increasingly dependent on central funds to finance banks. Regional policy (Ady Soejoto et al., 2015). Therefore, this policy of fiscal decentralization should be followed in line with effective decentralization efforts, in order to transfer capital to have a positive impact on poverty reduction, and from which improves people's quality of life (Grubaugh, 2015)

Thus, we have re-proved the existence of a relationship between HDI and EG, and that there is an iterative process between the ultimate goal of improving HDI and economic growth that is a necessary but not a necessary condition for economic growth. enough to achieve those improvements. Furthermore, by investigating the relative importance of the various links connecting HDI and EG, we have identified a policy direction that can be taken to strengthen such links. In particular, such policy orientations could be fiscal decentralization. According to Grubaugh (2015), Economic and social policy tends to focus favorably on the correct use of economic fundamentals as a necessary prerequisite for EG, while arguing that improving HDI must wait for that EG may not be appropriate. Our findings do not negate the importance of economic reform for economic growth in moving towards the ultimate HDI goal, but it should be emphasized that the focus of HDI must be included at the outset of any reform program. Economic growth by itself will not be sustained unless preceded or accompanied by improvements in the HDI (Ranis et al., 2000). Specifically, the study results have strong evidence that HDI consistently has a positive effect on EG.

Regarding research methods, compared with the separate equation approach of previous studies on the relationship between EG and HDI (Ranis et al., 2000), or the relationship between FD and EG by Kyriacou et al. (2017) and Sorens (2004), the simultaneous equations method can take into account the interactions between the main variables as well as achieve more reliable and efficient estimation results (Kyriacou et al., 2017). In the research model, endogenous variables are dependent variables that act as explanatory variables in the remaining equations. Specifically, it is the HDI variable in the equations of FD and EG, or FD in the equations HDI and EG, as well as the variable EG that will be endogenous in the equations FD and EG. The correlation of the confounding errors with these endogenous variables would violate the OLS hypothesis. Furthermore, because some of the explanatory variables are dependent variables of other equations in the system, the noise errors between the equations can be correlated. The 3SLS-GMM method was used to estimate this system of simultaneous equations (Davidson & MacKinnon, 1993, pp. 651-661; Greene, 2012, pp. 331-334). In addition, the GMM-HAC estimate is also used to verify the (robustness) results of the simultaneous relationship between Fiscal Decentralization, Economic Growth and Human Development. Therefore, the results ensure high reliability and consistency for the considered relationships.

5. Conclusion

In light of prior literature, this study defines the determinants of human development, fiscal decentralization, and economic growth as well as the potential interdependence between these key variables under consideration, which remains scarcely reported by empirical evidence. To accommodate the possibility of the simultaneous relationship between fiscal decentralization, human development, and economic growth, the SEM, 3SLS-GMM, and GMM-HAC estimation techniques are employed simultaneously to produce the unbiased coefficient associated with the endogenous variable in the system of three equations. With unbalanced panel data collected from 18 countries covering the period of 2011–2017, the study provides some primary interesting findings, extending the exsiting literature on the impact of fiscal decentralization across various countries.

First, an existence is comprehensively justified of the significant relationship between fiscal decentralization, economic growth, and human development in different directions. Specifically, the impact of fiscal decentralization on economic growth is statistically negative, yet the effect is positive in the case of human development. This result is robust with different estimation methods applied and sub-indexes of decentralization in use. Secondly, it is interesting to find that the human development index could foster economic growth through the statistical evidence of the study sample, but this result is solely consistent in the case of expenditure-based decentralization. Thirdly, economic growth do not raise the efficiency of fiscal decentralization, but could reduce the human development index indeed.

These results provide essential implications for policy-makers in a sense that they should be well informed of the dilemma accompanying policy implementation related to the increased level of fiscal decentralization, which could enhance human development, yet also slow down economic growth. In this regard, economic policies should focus on improving the aspect of human development including the quality of health care and education through fiscal decentralization strategies feasibly adopted in each country. More importantly, in line with the research of Dholakia (2003), economic growth could lead to decrease in human development, thus emphasizing the importance of policy making to navigate the negative impact of economic growth. Due to the difference in each country's fiscal decentralization and social background, the negative impact of fiscal decentralization on economic growth should be seriously considered in an attempt to solidify economic well-being and the principal sense of security.

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References

- Addison, T., Demery, L., Ferroni, M., Round, J., Grootgert, C., Marchant, T., & Noël, M. (1990). Making adjustment work for the poor: A framework for policy reform in Africa. World Bank.
- Ady Soejoto, Tjipto Subroto, W., & Suyanto. (2015). Fiscal decentralization policy in promoting Indonesia human development. *International Journal of Economics and Financial Issues*, 5(3), 763–771. https://www.econjournals.com/index.php/ijefi/article/ view/1314
- Aghion, P. (2002). Schumpeterian growth theory and the dynamics of income inequality. *Econometrica*, 70(3), 855–882. https://doi.org/10.1111/1468-0262.00312
- Aghion, P., Howitt, P., Howitt, P. W., Brant-Collett, M., & García-Peñalosa, C. (1998). Endogenous growth theory. MIT press.
- Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. The Quarterly Journal of Economics, 109(2), 465–490. https://doi.org/10.2307/ 2118470
- Benabou, R. (1996). Inequality and growth. NBER Macroeconomics Annual, 11, 11–91. https://doi.org/ 10.1086/654291
- Benhabib, J., & Spiegel, M. M. (1994). The role of human capital in economic development evidence from aggregate cross-country data. *Journal of Monetary Economics*, 34(2), 143–173. https://doi.org/10.1016/ 0304-3932(94)90047-7
- Bloom, D. E., Canning, D., & Sevilla, J. (2004). The effect of health on economic growth: A production function approach. World Development, 32(1), 1–13. https:// doi.org/10.1016/j.worlddev.2003.07.002
- Breton, A. (1996). *Competitive governments*. Cambridge Books.
- Davidson, R., & MacKinnon, J. G. (1993). Estimation and inference in econometrics. Oxford University Press.
- Deininger, K., & Squire, L. (1996). A new data set measuring income inequality. The World Bank Economic Review, 10(3), 565–591. https://doi.org/10.1093/ wber/10.3.565
- Dholakia, R. H. (2003). Measurement issues in comparing fiscal performance of states. *Economic and Political Weekly*, 38(10), 991–994. https://web.iima.ac.in/ assets/snippets/workingpaperpdf/2002-10-05RavindraHDholakia.pdf

- Dinda, S. (2014). Inclusive growth through creation of human and social capital. International Journal of Social Economics, 41(10), 878–895. https://doi.org/10. 1108/IJSE-07-2013-0157
- Fields, G. S. (1989). Changes in poverty and inequality in developing countries. *The World Bank Research Observer*, 4(2), 167–185. https://doi.org/10.1093/ wbro/4.2.167
- Filippetti, A., & Sacchi, A. (2016). Decentralization and economic growth reconsidered: The role of regional authority. Environment and Planning C: Government and Policy, 34(8), 1793–1824. https://doi.org/10.1177/ 0263774X16642230
- Garman, C., Haggard, S., & Willis, E. (2001). Fiscal decentralization: A political theory with Latin American cases. World Politics, 53(2), 205–236. https://doi.org/ 10.1353/wp.2001.0002
- Greene, W. H. (2012). Econometric analysis (7th ed.). Prentice Hall.
- Grubaugh, S. G. (2015). Economic growth and growth in human development. Applied Econometrics and International Development, 15(2), 5–16. https://www. usc.gal/economet/reviews/aeid1521.pdf
- Hooghe, L., Marks, G. N., & Schakel, A. H. (2010). The rise of regional authority: A comparative study of 42 democracies. Routledge.
- Jorge, M.-V., & McNab, R. M. (2006). Fiscal Decentralization, Macrostability, and Growth. Hacienda Pública Española /revista de Economia Publica, 179, 25-49.
- Kakwani, N., & Son, H. H. (2008). Poverty equivalent growth rate. *Review of Income and Wealth*, 54(4), 643–655. https://doi.org/10.1111/j.1475-4991.2008. 00293.x
- Klasen, S. (2002). Low schooling for girls, slower growth for all? Cross-country evidence on the effect of gender inequality in education on economic development. *The World Bank Economic Review*, 16(3), 345–373. https://doi.org/10.1093/wber/lhf004
- Kuznets, S. (1955). Economic growth and income inequality. The American Economic Review, 45(1), 1– 28. https://assets.aeaweb.org/asset-server/files/ 9438.pdf
- Kuznets, S. (1963). Quantitative aspects of the economic growth of nations: VIII. Distribution of income by size. *Economic Development and Cultural Change*, 11(2, Part 2), 1–80. https://doi.org/10.1086/450006
- Kyriacou, A. P., Muinelo-Gallo, L., & Roca-Sagalés, O. (2017). Regional inequalities, fiscal decentralization and government quality. *Regional Studies*, 51(6), 945–957. https://doi.org/10.1080/00343404.2016. 1150992
- Lessmann, C. (2009). Fiscal decentralization and regional disparity: Evidence from cross-section and panel data. Environment and Planning A, 41(10), 2455–2473. https://doi.org/10.1068/a41296
- Martinez-Vazquez, J., & McNab, R. (1997). Fiscal decentralization, economic growth, and democratic governance. International Center for Public Policy Working Paper Series, at AYSPS, GSU paper 9707, International Center for Public Policy, Andrew Young School of Policy Studies, Georgia State University, Washington, DC, October.
- Martinez-Vazquez, J., & McNab, R. M. (2003). Fiscal decentralization and economic growth. *World Development*, 31(9), 1597–1616. https://doi.org/10. 1016/S0305-750X(03)00109-8
- Martínez-Vázquez, J., Lago-Peñas, S., & Sacchi, A. (2017). The impact of fiscal decentralization: A survey. *Journal of Economic Surveys*, 31(4), 1095–1129. https://doi.org/10.1111/joes.12182

- Musgrave, R. A. (1939). The nature of budgetary balance and the case for the capital budget. *The American Economic Review*, 29(2), 260–271. https://www.jstor. org/stable/1803624
- Musgrave, R. A. (1956). A multiple theory of budget determination. *FinanzArchiv/Public Finance Analysis(H) New Series, Bd.* 17, H. 3(1956/57), 333– 343(11 pages). Mohr Siebeck GmbH & Co. KG. https:// www.jstor.org/stable/40909134
- Musgrave, R. A. (1959). The theory of public finance; a study in public economy. Kogakusha Co.
- Oates, W. E. (1972). Fiscal federalism. *Books*. Harcourt Brace Jovanovich, New York. https://www.worldcat. org/title/fiscal-federalism/oclc/654583008?referer= di&ht=edition
- Oates, W. E. (1993). Fiscal decentralization and economic development. *National Tax Journal*, 46(2), 237–243. https://doi.org/10.1086/NTJ41789013
- Persson, T. T., & Tabellini, G. (1994). Is inequality harmful for growth? American Economic Review, 84(3), 622–641. https://www.jstor.org/stable/2118070
- Piketty, T. (2015). About capital in the twenty-first century. American Economic Review, 105(5), 48–53. https://doi.org/10.1257/aer.p20151060
- Qiao, M., Ding, S., & Liu, Y. (2019). Fiscal decentralization and government size: The role of democracy. *European Journal of Political Economy*, 59(C), 316–330. https://doi.org/10.1016/j.ejpoleco.2019. 04.002
- Qiao, B., Martinez-Vazquez, J., & Xu, Y. (2008). The tradeoff between growth and equity in decentralization policy: China's experience. *Journal of Development Economics*, 86(1), 112–128. https://doi.org/10.1016/j. jdeveco.2007.05.002
- Ram, R. (1986). Government size and economic growth: A new framework and some evidence from cross-section and time-series data. The American Economic Review, 76(1), 191–203. https://econpapers.repec.org/scripts/redir.pf?u= http%3A%2F%2Flinks.jstor.org%2Fsici%3Fsici% 3D0002-8282%2528198603%252976%253A1% 253C191%253AGSAEGA%253E2.0.C0%253B2-N% 26origin%3Drepec;h=repec:aea:aecrev:v:76:y:1986: i:1:p:191-203
- Ranis, G., Stewart, F., & Ramirez, A. (2000). Economic growth and human development. *World Development*, *28*(2), 197–219. https://doi.org/10. 1016/S0305-750X(99)00131-X
- Ravallion, M. (1998). Does aggregation hide the harmful effects of inequality on growth? *Economics Letters*, 61(1), 73–77. https://doi.org/10.1016/S0165-1765(98) 00139-6
- Rodríguez-Pose, A., & Ezcurra, R. (2011). Is fiscal decentralization harmful for economic growth? Evidence from the OECD countries. *Journal of Economic*

Geography, 11(4), 619-643. https://doi.org/10.1093/ jeg/lbq025

- Roe, T. (2003). Determinants of economic growth: A cross-country empirical study. American Journal of Agricultural Economics, 85(4), 1087–1088. https://doi. org/10.1111/1467-8276.t01-3-00513
- Romer, P. M. (1989). Human capital and growth: Theory and evidence. Working paper No.3173, November 1989, National Bureau of Economic Research, 1050 Massachusetts Avenue Cambridge, MA02138.https:// doi.org/10.3386/w3173
- Romer, P. (2008). Economic growth. The concise encyclopedia of economics. Library of economics and liberty. Retrieved April 24, 2014 https://ugs.utexas.edu/sites/ default/files/documents/pdf/EconomicGrowth.pdf
- Sala-i-Martin, X., Doppelhofer, G., & Miller, R. I. (2004). Determinants of long-term growth: A bayesian averaging of classical estimates (BACE) approach. *American Economic Review*, 94(4), 813–835. https:// doi.org/10.1257/0002828042002570
- Salmon, P. (1987). Decentralisation as an incentive scheme. Oxford Review of Economic Policy, 3(2), 24–43. https://doi.org/10.1093/oxrep/3.2.24
- Sepulveda, C. F. (2010). Two essays on public economics: The consequences of fiscal decentralization on poverty and inequality, and the second best solution to the public expenditures Problem. Dissertation, Georgia State University. https://doi.org/10.57709/ 1299087
- Silas, M. P., Wawire, N. H., & Okelo, P. A. O. (2018). Effects of fiscal decentralization on poverty reduction in Kenya. International Journal for Innovation Education and Research, 6(1), 213–230. https://doi.org/10. 31686/ijier.vol6.iss1.937
- Solow, R. M. (1956). A contribution to the theory of economic growth. The Quarterly Journal of Economics, 70 (1), 65–94. https://doi.org/10.2307/1884513
- Sorens, J. (2004). Globalization, secessionism, and autonomy. Electoral Studies, 23(4), 727–752. https:// doi.org/10.1016/j.electstud.2003.10.003
- Stewart, F. (1987). Alternative macro policies, meso policies, and vulnerable groups. G.A Cornia, R. Jolly, & F. Stewart, (Eds.), Adjustment with a Human FACE, 1. Oxford: Clarendon Press.
- Tiebout, C. M. (1956). A pure theory of local expenditures. Journal of Political Economy, 64(5), 416–424. https:// doi.org/10.1086/257839
- von Jacobi, N. (2014). Meso-factors of development: The role of the context for human development achievements. PhD thesis. *Istituto Universitario degli Studi Superiori-IUSS*.
- Zellner, A., & Theil, H. (1962). 3-Stage least-squaressimultaneous estimation of simultaneous-equations. *Econometrica*, 30(1), 54–78. https://doi.org/10.2307/ 1911287

Appendix 1: List of countries in sample

IFS code	Country
193	Australia
122	Austria
912	Azerbaijan
124	Belgium
223	Brazil
156	Canada
233	Colombia
134	Germany
684	Mauritius
288	Paraguay
293	Peru
922	Russian Federation
199	South Africa
184	Spain
146	Switzerland
466	United Arab Emirates
111	United States
927	Uzbekistan



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