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Building a Sustainable Future: Fostering Synergy Between Technology, Business and Humanity

Proceedings of the International Conference in Technology, Humanities and Management (ICTHM 2023), 12-13 June, 2023, Istanbul, Turkey

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About the Proceedings

The volume contains selected, peer-reviewed papers from the International Conference Technology, Humanities and Management, "Building a sustainable future: Fostering synergy between technology, business and humanity" (ICTHM 2023), which was held on 12-13 June 2023, Istanbul, Turkey.

ICTHM 2023 aimed to provide a platform for current debates, criticisms, and analysis in the fields of Humanities, Business and management and Technology. 149 full papers were subjected to a double-blind review process and 101 full texts were accepted for publication. The conference itinerary contained 8 keynote speeches and parallel sessions both as face to face and online which covered a wide variety of conference sub themes such as Interdisciplinary and Multidisciplinary Humanities, Communications and media Governance and Politics in Society, Internationalism, Globalism, Teaching and Learning, e-Learning, Religious Studies, Lifelong Learning, Blended Learning, Special Education, Teaching and Learning, Strategic Management in Education, Educational Management and Administration, Higher Education, Technical and Vocational Study and Quality Management in Education, Economics, Accounting, Banking, Entrepreneurship, Finance, Marketing, Supply Chain, Logistics, Transportation, Tourism, Hospitality, Health Care, Human Resource, Government, Administration, Management, Law, Organizational Growth, Market Share, Employee Development and Training, Leadership, Products and Services, Business Technology, Business Innovation, Customer Relationship, Employee Turnover, Turnover and Profit, Customer Service, Performance Levels Management, Business Sustainability and Management, Communication, Computer Science, Information Technology, Information System, Multimedia, IR 4.0, Big data, Artificial Intelligence, Computer software and applications, Computing, Data Mining, Internet and Social Media.

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BUILDING A SUSTAINABLE FUTURE: FOSTERING SYNERGY BETWEEN TECHNOLOGY, BUSINESS AND HUMANITY

Selected, peer-reviewed papers from
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Edited by:

Jamaliah Said , Dalila Daud , Naila Erum , Nor Balkish Zakaria ,
Salwa Zolkafilil , Nurhidayah Yahya 

Editor(s) Affiliation(s):

Jamaliah Said, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia

Dalila Daud, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia

Naila Erum, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia

Nor Balkish Zakaria, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia

Salwa Zolkafilil, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia

Nurhidayah Yahya, 

Accounting Research Institute (HiCOE), Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia



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Preface

The volume contains proceedings of the International Conference Technology, Humanities and Management, "Building a sustainable future: Fostering synergy between technology, business and humanity" which was held on June 12-13, 2023, in Istanbul, Turkey.

The main objective of ICTHM 2023 was to provide a platform for researchers, professionals, scholars and academicians to exchange and share their knowledge, information, new ideas and experience in person with their peers expected to join from different parts of the world. ICTHM 2023 explores the intersection of these three crucial fields and how they can work together to shape the future.

The conference aimed to provide a platform for current debates, criticisms, and analysis in the fields of Humanities, Business and management and Technology. The conference itinerary contained 8 keynote speeches and parallel sessions both as face to face and online which covered a wide variety of conference sub themes such as Interdisciplinary and Multidisciplinary Humanities, Communications and media Governance and Politics in Society, Internationalism, Globalism, Teaching and Learning, e-Learning, Religious Studies, Lifelong Learning, Blended Learning, Special Education, Teaching and Learning, Strategic Management in Education, Educational Management and Administration, Higher Education, Technical and Vocational Study and Quality Management in Education, Economics, Accounting, Banking, Entrepreneurship, Finance, Marketing, Supply Chain, Logistics, Transportation, Tourism, Hospitality, Health Care, Human Resource, Government, Administration, Management, Law, Organizational Growth, Market Share, Employee Development and Training, Leadership, Products and Services, Business Technology, Business Innovation, Customer Relationship, Employee Turnover, Turnover and Profit, Customer Service, Performance Levels Management, Business Sustainability and Management, Communication, Computer Science, Information Technology, Information System, Multimedia, IR 4.0, Big data, Artificial Intelligence, Computer software and applications, Computing, Data Mining, Internet and Social Media.

The microsoft conference management system was used for this conference. 149 submissions have been received, 101 accepted, and 86 papers were presented at the conference by participants from Malaysia, Indonesia, Brunei, Bangladesh, Russia, Oman, Pakistan, China, Maldives, and Saudi Arabia. Each author was allotted 15-20 minutes to present their paper. A total of 9 presenters are awarded with best presented award. The software program Turnitin was used for plagiarism detection. Each submission was subjected to a double-blind review process by two reviewers. The number of submissions received and reviewed was 149 and the number of submissions accepted was 101 indicating an acceptance rate of 67%. A total of 55 reviewers were involved in the review process.

We would like to extend our heartfelt gratitude to the collaborators, the keynote speaker, forum panelists, and participants for their contribution and participation in the conference. Last but not the least, a special thank you goes to the Rector of the Istanbul Medipol University, Prof. Dr. Gokhan Silahtaroglu, the organizing Committee, Technical Team, Moderators and Time-Keepers for their hard work and commitment in making this event a grand success.

21 August, 2023

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**PUBLIC SPENDING, CORRUPTION, AND HUMAN
DEVELOPMENT: EMPIRICAL EVIDENCE IN MIDDLE-INCOME
COUNTRIES**

Prayudha Ananta (a), Mohamad Ezrien bin Mohamad Kamal (b), Norhayati Mohamed (c)*

*Corresponding author

(a) Faculty of Economy and Business, Universitas Lampung, Bandar Lampung, Indonesia,
prayudha.ananta@feb.unila.ac.id

(b) Faculty of Accountancy, Universiti Teknologi MARA, Selangor, Malaysia, mohdezrien@uitm.edu.my

(c) Accounting Research Institute, Universiti Teknologi MARA, Selangor, Malaysia, norha614@uitm.edu.my

Abstract

This study investigates the role of corruption in the relationship between public spending and human development in Middle-Income Countries from 2012 until 2019. By using dynamic panel data with Two-Step System GMM, we examine the moderating effect of corruption in the relationship between public spending on health and public spending on education into human development. We find that in the aggregated Middle-Income Countries, the interaction between corruption-public spending on health and corruption-public spending on education significantly weakens human development. Furthermore, we also checked the income sub-level of Middle-Income Countries. There are different findings between Upper Middle-Income Countries and Lower Middle-Income Countries. In Upper Middle-Income Countries, the interaction between corruption and public spending on health has a negative and significant effect on human development, while interaction between corruption and public spending on education is negative but insignificant. In Lower Middle-Income Countries, interaction between corruption and public spending on health is negative and insignificant, while interaction between corruption and public spending on education is positive and significant.

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Keywords: Corruption, Human Development, Public Spending on Health, Public Spending on Education

1. Introduction

Improving human quality is the main target of economic development, which means that all resources needed in development must be managed to enhance human capabilities (ul Haq, 1995). Reaching a higher standard of living and preserving natural capital would be complementary rather than opposing objectives by mutually supporting a development and economic growth spiral upward. Human development should be the primary target of international development programs, whilst a rise in human well-being is required to give a pathway to sustainability (Costantini & Monni, 2008). Human capability approach to human development, the human capability to function is the core of human development (Acheampong et al., 2022), therefore in order to control their lives, people need to have improved capabilities. Having access to modern technologies, high-quality health care, and education at all levels, as well as being resistant to new shocks, are examples of enhanced capacities (UNDP, 2019). Furthermore, according to (Dervis & Klugman, 2011), the Human Development Index (HDI) is the most popular composite index of human development. Poor human development results in developing nations may be linked to slower economic growth, future uncertainties, lack of innovation, weak social cohesion, and distrust in institutions and the government that will lead to inadequate government policies which are vital in shoring up people's standard of living (Acheampong et al., 2022; Conceicao, 2022; UNDP, 2019). The rise of new generations of inequalities depicted by gaps in basic living standards comparable by nations and within countries denotes challenges in human development initiatives (UNDP, 2019). Further, such inequalities remain a critical issue in the 21st century, shaped by poverty, lack of opportunities for people and a person's status in the society. Therefore, to achieve stability in human development, the role of government is compulsory.

Furthermore, the role of government is very important to enhance human development. Through government procurement, the government will allocate public goods to be rejoiced by their peoples (Fonseca et al., 2020). The government allocates public goods through government spending. Since health and education are crucial as dimensions to construct human development, government spending on health and education also become principal. Edeme et al. (2017) in their research said that government spending such as education, health, agriculture, rural development, and water resources positively impacts human development. Especially for government spending on health and education, efficient and sufficient spending will encourage human development and decrease poverty (Clements et al., 2004; Craigwell et al., 2012; Psacharopoulos & Patrinos, 2004). Given that everyone has the right to quality healthcare, the government should invest more money in the healthcare industry to reduce the likelihood that people would go without medical care. In order to ensure universal health coverage, policymakers call for a cost- and time-effective strategy to use healthcare spending (Banik et al., 2023). Therefore, social public spending such as health and education are vital to boost human development.

However, there is corruption that becomes a plague that can detain the economy to develop. Today, corruption is a serious issue for every country. Corruption is the misuse of authority by an individual or group for personal benefit. Corruption scrapes trust, enervates democracy, hampers economic development, and aggravates inequality, poverty, social division, and even the environmental crisis (Transparency International, 2020). Corruption constantly becomes an economic problem and complex phenomenon that plagues many emerging economies and is generally known as a crucial

obstacle to development and welfare (Cieřlik & Goczek, 2018; d'Agostino et al., 2016; Sehrawat & Giri, 2019). Furthermore, corruption can also degenerate the infrastructure and increase the cost of doing business for both the government and private sector. The government has formulated many policies to stimulate economic aggregate expansion, but corruption will affect the implementation of these policies (Song et al., 2021). Therefore, whatever and however much government procurement there is, it will be useless because cronyism and corruption are still pervasive (Fonseca et al., 2020). According to Transparency International (2020), 25 percent of global health spending was lost to corruption.

Recently, there is an insufficient number of literatures that examines the relationship between corruption and human development. Akçay (2006) found that corruption has a significantly negative relationship to human development. Countries with low human development usually have a more severe level of corruption. In line with that result, d'Agostino et al. (2016) said that the nations that have high human development tend to have low corruption. Recently, Urbina and Rodríguez (2022) found that corruption affected human development negatively in all Latin American Countries. Therefore, the government should reduce corruption because it could distort the effectiveness of public spending to improve human development (Gupta et al., 2002; Murshed, 2018). However, while prior studies address the direct impact of corruption into human development, there is a lack of empirical literature which examines the indirect effects of corruption into human development. Hence, this study will focus on investigating the indirect relationship through the interaction of corruption with public spending to affect human development.

2. Literature Review

2.1. Public Spending on Human Development

Human development encompasses various facets of daily life, including enhanced health and longevity, education, a high standard of living, knowledge, and skills, as well as social, self-esteem, cultural, civil rights, and political freedom (Clark, 2013). The breakdown of government spending is an important factor in determining growth, poverty alleviation, and human development. Bigsten and Levin (2004) believe that when the government makes budgetary reforms, three different impacts should be considered. The first issue to consider is the relative influence on pricing, income adjustment, income distribution, and poverty. Second, the composition of government spending, which has an impact on sectoral productivity and therefore labor demand. Third, a shift in public spending on services like education and health that influences people's welfare.

Several studies have examined the relationship between public spending and human development. Edeme et al. (2017) used data from 20 states in Nigeria with panel approach. The findings reveal that spending on education, health, and rural development, agriculture, and water resources has a positive influence on human development. Meanwhile, negative impact to human development was found affected by spending on energy, housing, and environmental protection. In the same line, Qureshi (2009) did research to examine the influence of public expenditure on human development and economic growth with endogenous GDP formulation. This research used a system dynamics approach in Pakistan which found that demographic, human development, and economic indicators have strong relationships with

public expenditure. In line with this, Prasetyo and Zuhdi (2013) compared government expenditure per capita efficiency on health and education in 81 countries in 2006 until 2010 using the DEA Method. They also used subsidies and other transfers as predictors of HDI. The results reveal that countries who are superior in efficiency in health and education spending will improve HDI 76.8% per year.

Luqman and Antonakakis (2021) recently did research which discusses military expenditure, human development, and economic growth in Pakistan. They use time series data from 1965 to 2016. In their research, they argue that there are no studies mentioning the relationship between military expenditure and human development. Further, the result showed military expenditure has a negative influence on human development and economic growth, while control variables like food deficit and urbanization has a positive impact on it. They recommend that the government needs policy to reduce military expenditure and allocate it into social expenditure to increase Pakistan's HDI. This recommendation is fully validated by Sánchez and Cicowiez (2014) that investment in social like health and education will improve human capital and social outcomes, increasing worker productivity, and economic growth. Indeed, the process will take time, the kids or people need to go through more than one educational cycle, and be fully covered by maternal health. Gupta et al. (2002) used cross-sectional data from 50 countries in developing and transition economies. They prove that public spending will improve health and education indicators like attainment in schools and decrease mortality rates for infants and children. Thus, based on the literature, we developed some hypothesis for the relationship between government spending and human development.

H1 = Government spending on health is significantly related to human development

H2 = Government spending on education is significantly related human development

2.2. Corruption and Human Development

In the past, there was broad agreement among development researchers regarding the corrosive effects of corruption on the various dimensions of human development such as GDP per capita growth, domestic investment, Foreign Direct Investment (FDI), and trade policies (Gatti, 2004; Mauro, 1995; Wei, 2000). Even in the recent years, several studies have examined the link between corruption and some macroeconomics indicator like economic growth or FDI (d'Agostino et al., 2016; Erum & Hussain, 2019; Freckleton et al., 2012; Gründler & Potrafke, 2019; Song et al., 2021; Wang et al., 2018b). Nevertheless, the recent empirical study about the impact of corruption on human development is limited. Moreover, those existing studies only focus on direct relationships. Akçay (2006) examines the relationship between corruption and human development in 63 countries. He found out that corruption and human development have a negative and significant relationship. Higher levels of corruption tend to lower human development. Similar results published by Akisik et al. (2020), their research used control of corruption as one of the predictors. Together with IFRS, FDI, and openness to foreign trade are positively related to human development in Anglophone and Francophone African Countries. It means if control of corruption by a country is getting better, it will increase human development. Those findings are fully supported by Urbina and Rodríguez (2022) who examined the effect of corruption on economic growth, human development, and the natural resources sector in Latin American and Nordic Countries. By using VAR, they discover that corruption weakens human development. Murshed (2018) got similar

results in developing countries that corruption will hamper human development, it will disrupt public allocations in health and education; whereas, public spending is the government's primary tool for carrying out its mission (Gupta et al., 2002).

Akhter (2004) tried a different approach. He used corruption as a mediating variable to examine the link between economic globalization and human development directly and indirectly with economic freedom and corruption as mediating variables. The result showed: (1) economic globalization has a positive and significant influence on human development directly; (2) economic freedom and corruption has successfully mediated economic globalization to human development; and (3) economic freedom has significantly positive effects while corruption has significantly negative effects on human development. Increase in corruption has decreased environmental uncertainty and transparency in the business environment. Hence, it will cause inefficiency in the allocation of resources.

Furthermore, there is lack of empirical research that captures the direct effect of corruption on human development; even the indirect effect is even more insufficient. Whereas, the corruption known affecting the stabilization function of governments, raises operating expenses and decreases government revenues, which may impede spending on public services (Tanzi, 1998). The corruption not only affects the total amount of public expenditures, but also the composition of the expenditures. The empirical evidence reveals a correlation between corruption and the misallocation and misappropriation of public monies through concurrently affecting expenditure decisions and budget execution. Corruption adversely affects the distribution of funds towards social welfare policies as these programs offer fewer opportunities for rent-seeking compared to other projects that require significant investments, where the scope for engaging in corrupt practices is much higher. Banik et al. (2023) in their recent article examined the relationship between healthcare spending and human development with quality of governance as moderating variable.

Therefore, based on the literature, we develop some hypotheses for the direct relationship between corruption and human development, and the moderating role of corruption in the relationship between public spending and human development.

H₃ = Corruption is significantly related to human development

H₄ = Corruption has moderation effect on the relationship between public spending and human development

3. Data, Methodology, and Empirical Specifications

3.1. Data Sources and justification for the variable selection

This study examines the effect of corruption and public spending on human development in Middle-Income Countries from 2012 to 2019. The reason we use 2012 as a starting period is because Transparency International (TI) changed the methodology of Corruption Perception Index (CPI) as a corruption indicator. It makes CPI more comparable over time (Gründler & Potrafke, 2019). Based on data availability and justification, 47 countries are selected (Table 1). As a unit of analysis, we use Middle-Income Countries (MIC) which are classified by the World Bank. We divide into two groups: Upper Middle-Income Countries (UMIC) and Lower Middle-Income Countries (LMIC). The selected

countries are those that during the period 2012 to 2019 were consistently in the classification of either UMIC or LMIC. In other words, countries that change classifications will be excluded from the sample.

Measurement of human development (HD): Human development is a dependent variable for this research. It is a complex process that includes many aspects of everyday life, such as improved health and longevity, education, a high quality of living, knowledge, and skills, as well as social, cultural, and political freedom, civil rights, and self-esteem. Human Development Index (HDI) used to measure human development. According to Dervis and Klugman (2011), the HDI is the most popular composite index of human development. The HDI is a composite index measuring average achievement in three basic dimensions of human development- a long and healthy life, knowledge, and a decent standard of living (UNDP, 2019). The HDI data collected from the United Nations Development Program (UNDP) Data Center.

Measurement of corruption (CORR): Towards this end, corruption becomes a major issue in achieving inclusive development. Corruption is directly connected with increased operational expenses, decreased income, and misallocation and misuse of funds, all of which have a negative impact on public service expenditures (Gupta et al., 2000; Silal & Saha, 2021; Tanzi, 1998). Corruption invariably results in reduced allocations for social policies, accompanied by misdirected expenditure and bad budget executions, all of which have a detrimental impact on the total income levels (Gupta et al., 2002; Haque & Kneller, 2015; Ortega et al., 2016). Corruption will be measured by using an index named the CPI, developed by the Transparency International (TI). Normally, CPI has 0-100 scale where 0 is the highly corrupt of perceived corruption and 100 is very clean of perceived corruption. However, in this research we will use reversed CPI as measurement of corruption in order to facilitate the interpretation (Emara, 2020; Gründler & Potrafke, 2019). Thus, the measurement will be the opposite of the regular CPI, 0 will be no corruption, and 100 will be extreme corruption.

Measurement of public spending on health (PSH): PSH estimates of current health spending by the government on health affair like healthcare goods and services consumed such as spending on medical services, capacity building, administering public health and training, and presentation programs by public or private sources or public-private partnerships (Banik et al., 2023). This indicator does not include capital health spending like buildings, machinery, and stocks of vaccines for emergency or outbreaks. We use total government health expenditure as a percentage of GDP to measure the PSH. The PSH data is collected from World Development Indicators (WDI), World Bank database.

Measurement of public spending on education (PSE): Public spending on education includes various types of expenditures such as salaries and benefits of teachers and staff, construction and maintenance of school buildings, purchase of textbooks, educational technology, classroom supplies, and other instructional materials. In addition, public spending on education may include investments in research and development of educational policies and practices, as well as funding for higher education institutions such as universities and colleges. We use total government expenditure on education as a percentage of GDP to measure the PSE. This data is collected from World Development Indicators (WDI), World Bank database.

GDP: Level of income proxied by annual growth of GDP. It has been seen as a crucial element for understanding differences in the rise and amount of public spending between nations. According to Ranis

(2004) a higher level of income would result in a broader range of options and capacities for households and governments, which in turn would promote human development. GDP data obtained from the WDI database.

Access to Electricity (ELECT): ELECT is exceptionally important for human development since it is practically required for many basic activities. It is essential for addressing the social demands that drive and propel human development (Gaye, 2007). ELECT has a significant impact on health, agricultural and industrial productivity, education and information, and improved access to information services. ELECT data are collected from WDI. ELECT is proxied by access to electricity (% of the population).

Emission (EMISS): The movement toward a tranquil environment through the reduction of carbon emissions could have substantial effects on human development; however there is no consensus on this point. It is expected that reducing carbon emissions will enhance human development, yet certain economic conditions have opposed this potential (Adekoya et al., 2021). To proxied emission variables, we use CO₂ emissions (kg per 2015 US\$ of GDP). It may have a negative impact on the environment and human life (Banik et al., 2023; Dimitriou & Kassomenos, 2017). Emission data are collected from the WDI database.

3.2. Empirical Model Specification

This study aims to examine the effect of corruption on the relationship between public spending and human development with additional control variables. Therefore, Equation (1) will show the dynamic and multivariate regression of the moderation effect of corruption on public spending into human development.

$$\begin{aligned}
 HD_{it} = & \alpha + \beta_1 HD_{it-1} + \beta_2 CORR_{it} + \beta_3 PSH_{it} + \beta_4 PSE_{it} \\
 & + \beta_5 (PSH_{it} \times CORR_{it}) + \beta_6 (PSE_{it} \times Corr_{it}) + \beta_7 GDP_{it} \\
 & + \beta_8 ELECT_{it} + \beta_9 EMISS_{it} + \epsilon_{it}
 \end{aligned} \tag{1}$$

Where, HD is the human development; CORR is the corruption; PSH is the public spending on health; PSE is the public spending on education; some control variables like ELECT, GDP, and EMISS explain access to energy, level of income, and level of emission. The expected coefficient outcome for ELECT and GDP would be positive according to theoretical and empirical literatures, while EMISS will be negative. In addition, human development is an enduring process; hence, prior levels of human development (HD_{it-1}) may shed light on current and upcoming levels of human development.

$$\frac{HD_{i,t}}{PSH_{i,t}} = \beta_3 + \beta_5 CORR_{i,t} \tag{2}$$

$$\frac{HD_{i,t}}{PSE_{i,t}} = \beta_4 + \beta_6 CORR_{i,t} \tag{3}$$

One of significance in this research is to investigate the interaction between CORR-PSH and PSE, whether CORR will weaken or strengthen the relationship between PSH and PSE into HD. Thus, we are differentiating the equation where β_4 and β_5 represent the degree to which CORR country's affect the efficacy of PSH and PSE into HD. Some control variables such as ELECT, GDP, and EMISS are used to

prevent omitted variable bias in the analysis (Banik et al., 2023). Furthermore, in the past study, many studies neglected in the past study, many neglected the existence of endogeneity between public social spending and human development, whereas, according to (Banik et al., 2023; Ibukun, 2021; Onofrei et al., 2021) the relationship between public social spending and human development addresses issue related endogeneity, whether caused by reverse causality, omitted variable bias, or un-estimated heterogeneity (Baltagi, 2021). Particularly for this study, the relationship between human development-public spending; human development-GDP; and human development-CO₂ emissions are potentially endogenous. The relationship between those relationships can run in both ways (Akbar et al., 2021; Makuta & O'Hare, 2015; Rahman et al., 2018).

As the use of a static model will not capture this endogeneity bias and the outcome may be erroneous, it is necessary to employ an instrumental variable estimate strategy. This is done to avoid inconsistent estimated coefficients when there is a correlation between the independent variables and the error term, when there are measurement errors and omitted variable bias, and when there is a correlation between the error term and the dependent variables (Porter & Gujarati, 2009). Therefore, this study will apply the GMM estimation technique. However, according to (Blundell & Bond, 1998; Nickell, 1981) the difference GMM has limitations. It struggles from small-sample bias due to weak instruments. Hence, the sys-GMM will be applied in this study which will solve the issue caused by reverse causation, endogeneity, serial correlation, heterogeneity (Roodman, 2009).

Table 1. List of Sample Countries by Income Level

| Upper Middle-Income Countries | Region | Lower Middle-Income Countries | Region |
|-------------------------------|--------|-------------------------------|--------|
| Albania | ECA | Bolivia | LAC |
| Azerbaijan | ECA | Cameroon | SSA |
| Belarus | ECA | Congo Rep | SSA |
| Botswana | SSA | Cote d'Ivoire | SSA |
| Brazil | LAC | Djibouti | SSA |
| Bulgaria | ECA | Egypt | MENA |
| China | EAP | El Salvador | LAC |
| Colombia | LAC | Ghana | SSA |
| Costa Rica | LAC | Honduras | LAC |
| Dominican Republic | LAC | India | SA |
| Ecuador | LAC | Lesotho | SSA |
| Gabon | SSA | Mauritania | SSA |
| Iran, Islamic Rep | MENA | Moldova | ECA |
| Jamaica | LAC | Morocco | MENA |
| Kazakhstan | ECA | Nicaragua | LAC |
| Lebanon | MENA | Pakistan | SA |
| Malaysia | EAP | Philippines | EAP |
| Mexico | LAC | Sao Tome | SSA |
| Namibia | SSA | Sri Lanka | SA |
| Peru | LAC | Ukraine | ECA |
| Serbia | ECA | Uzbekistan | ECA |
| South Africa | SSA | Vietnam | EAP |
| Thailand | EAP | Zambia | SSA |
| Turkey | ECA | | |

Note(s): ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MENA = Middle East and North Africa, SSA = Sub-Saharan Africa, SA = South Asia, EAP = East Asia and Pacific

Source: World Bank

4. Findings and Discussion of Empirical Results

Table 2 shows the summary statistics of all variables. The information presented is average, standard deviation, skewness, and kurtosis. Skewness scores that are between -2 and 2; and kurtosis score greater than 2 indicates that the data for all variables is normally distributed (Byrne, 2016; Hair et al., 2011). Therefore, we use normalized variables in this paper. Further, we conducted the stationarity test to avoid inaccurate regression between independent and dependent variables, also to see the reliability of the data variables used (Wahyudi et al., 2023). The null hypothesis and alternative hypotheses to be tested are as follows:

H_0 : the variable has a unit root.

H_a : the variable does not have a unit root.

Table 2. Summary Statistics

| Variables | Variable Definition | Obs | Mean | S. D | Min | Max | Skewness | Kurtosis |
|-----------|--|-----|--------|--------|---------|---------|----------|----------|
| HD | Human Development (scale 0-1) | 392 | 0.687 | 0.097 | 0.423 | 0.817 | -0.780 | 2.694 |
| CORR | Corruption Perception Index (reversed) (scale 0-100) | 392 | 63.936 | 8.348 | 35.000 | 81.000 | -0.844 | 4.377 |
| PSH | Public Spending on Health, total (% of GDP) | 392 | 2.869 | 1.380 | 1.910 | 9.981 | 0.141 | 2.003 |
| PSE | Public Spending on Education, total (% of GDP) | 392 | 4.560 | 1.607 | 1.496 | 10.639 | 0.902 | 3.892 |
| GDP | GDP Annual rate (%) | 392 | 3.516 | 3.100 | -10.783 | 19.047 | -0.683 | 6.959 |
| ELECT | Access of Electricity (% of population) | 392 | 86.172 | 19.650 | 20.560 | 100.000 | -1.434 | 3.906 |
| EMISS | CO ₂ Emissions (kg per 2015 US\$ of GDP) | 392 | 0.603 | 0.390 | 0.128 | 2.471 | 1.710 | 6.869 |

Table 3 presents the stationary test. We conduct 4 tests of stationary, LLC (Levin-Lin-Chu), D-F (Fisher-type Dickey-Fuller), H-T (Harris Tzavalis), and Breitung. It can be seen clearly that according to L-L-C all variables are stationary at levels. Further, the other test was conducted to see the robustness, and it showed that all variables stationary at level at least 2 from 4 tests.

Based on Table 4, CPI and GDP are negatively correlated with HD. Correlation coefficients for CPI and ICRG are as anticipated, but not for GDP. This could be attributed to negative average GDP growth. Meanwhile, there is a positive link between PSH, PSE, ELECT, and EMISS. However, with the existence of control variables and a set of nations, the connection might change. In addition, information can be drawn from the matrix that both independent and control variables do not have strong correlation coefficients with each other, except corruption with its two measurements. This indicates that there is no multicollinearity problem between independent variables in the analysis model. This condition is reaffirmed by the VIF score which has a range between 1.18 and 2.01.

Table 3. Stationary Test Result

| Variables | Test Stationary at Level | | | | Test Stationary at 1 st Difference | | | |
|-----------|--------------------------|----------|----------|----------|---|----------|---------|----------|
| | L-L-C | D-F | H-T | Breitung | L-L-C | D-F | H-T | Breitung |
| HD | -5.93*** | 4.29*** | | | | | 0.42*** | -1.79*** |
| CORR | -25.10*** | 3.09*** | 0.05*** | -2.91*** | | | | |
| PSH | -16.12*** | | 0.13*** | | | 33.20*** | | -5.57*** |
| PSE | -24.87*** | 4.28*** | 0.11*** | | | | | -5.57*** |
| GDP | -31.89*** | 1.94*** | -0.03*** | | | | | -3.14*** |
| ELECT | -19.94*** | 17.80*** | -0.02*** | | | | | -4.27*** |
| EMISS | -29.60*** | 10.67*** | 0.12*** | | | | | -4.88*** |

Note(s): statistics marked*** indicate significance at 5% levels, respectively.

Move on into the nexus between public spending, corruption, and human development. We will explain this section into 3 sections. First, we applied the research model with static panel data with Fixed Effect Model (FEM) estimation and performed robust standard error to overcome serial correlation and heteroscedasticity whose results are shown in Table 5. According to the FEM result, the sign of all variables is as expected, except PSH and PSE. PSH and PSE have negative effects on HD. Nevertheless, only GDP and ELECT have significant impact. Comprehensive GDP and broad access to electricity will significantly enhance human development. However, these results are presumed biased and inadequate, with potential issues on causality and endogeneity. Moreover, the highly significance of legged HD affirms that human development is persistent. Hence, it is true that the dynamic panel model is the ideal specification for this study. Further, this study will implement two-step robust sys-GMM because the estimators derived from it are more effective than those produced from one-step robust sys-GMM (Banik et al., 2023).

Since the past studies had revealed a direct negative relationship between corruption and human development (Emara, 2020; Murshed, 2018; Urbina & Rodríguez, 2022), we want to confirm it in this study. Table 6 shows the main findings with two-step robust sys-GMM. Column (1) shows finding of direct relationship without interaction, while Column (2) presents finding with interaction of CORR into relationship between public spending and HD. According to Table 6 (Column 1), CORR is significantly negatively affecting HD with $\alpha = 5\%$ significance. This finding supports the results of prior research (Akçay, 2006; Emara, 2020; Murshed, 2018; Urbina & Rodríguez, 2022) that corruption directly will hamper human development. According to result estimation, 1 index point increase of CORR will drive on average 0.00004 index point on HD. Corruption-driven misallocation of resources causes significant distortions in essential components of human development promotion. In addition, direct relationship in Column (2) also shows similar results, even with higher coefficient and significance. It is significant at $\alpha = 5\%$, with -0.0004 coefficient.

Table 4. Correlation Matrix

| | HD | CPI | PSH | PSE | GDP | ELECT | EMISS |
|-----|---------|---------|--------|-----|-----|-------|-------|
| HD | 1.0000 | | | | | | |
| CPI | -0.2813 | 1.0000 | | | | | |
| PSH | 0.3171 | -0.1931 | 1.0000 | | | | |

| | | | | | | |
|-------|---------|---------|---------|---------|---------|---------|
| PSE | 0.0142 | -0.4930 | 0.4830 | 1.0000 | | |
| GDP | -0.1663 | -0.1264 | -0.3092 | -0.0880 | 1.0000 | |
| ELECT | 0.7925 | 0.0335 | 0.2387 | -0.1420 | -0.0872 | 1.0000 |
| EMISS | 0.2615 | 0.1670 | 0.1583 | 0.0362 | -0.2148 | -0.3371 |
| | | | | | | 1.0000 |

Furthermore, PSH and PSE also have expected signs. They have positive and highly significant direct impact on HD. PSH can improve health outcomes, leading to longer life expectancy and a better quality of life (Ibukun, 2021). PSH also may increase access to healthcare services for all members of society, regardless of their income level. This may include preventive care, general care, and specialist treatments for life-threatening conditions. Meanwhile, PSE can assist in increasing education access for people, regardless of financial level. This might involve investing in schools, granting scholarships, and ensuring that students have free or low-cost access to education. Also, may involve investments in teacher training, school infrastructure improvements, and access to technology and learning materials.

Beside direct relationship, the objective of this study also investigates the effect of CORR on the relationship between public spending and HD, whether it will weaken or strengthen the effect of public spending on HD. Still according to Table 6, we found that the interaction between CORR-PSH and CORR-PSE is negative and highly significant. It means corruption will hamper the efficacy of PSH and PSE in terms of escalating HD. The coefficient of both interactions is similar, which is -0.00006. Corruption will harm human development mostly via its adverse effects in health outcomes (Ortega et al., 2016) and it disrupt public allocations in health and education, by raising the cost of the services and lowering their level of quality (Gupta et al., 2002; Murshed, 2018). When corruption is widespread in the public sector, public spending on social services may not reach those who use them the most. Instead, corrupt authorities may use these funds for their own benefit, denying underprivileged people access to crucial services. Consequently, there may be a lack of investment in education, healthcare, and other social services, leading to poor human development outcomes.

Table 5. Regression Result FEM: Dependent Variable HD, measured by HDI.

| | Without Interaction Term (1) | With Interaction Term (2) |
|------------|---------------------------------|------------------------------|
| CORR | -0.00002 (0.00007) | -0.0004** (0.0002) |
| PSH | -0.0002 (0.0004) | -0.0031 (0.0019) |
| CORR x PSH | | 0.00004 (0.00003) |
| PSE | -0.0003 (0.0003) | -0.0025 (0.0019) |
| CORR x PSE | | -0.00003 (0.0003) |
| GDP | 0.0003*** (0.00009) | 0.0003*** (0.00009) |
| ELECT | 0.0020** (0.00009) | 0.0002** (0.00009) |
| EMISS | -0.0009 (0.0062) | -0.0011 (0.0023) |
| Constant | 0.1501*** | 0.1803*** |

| | | |
|---------------------|-----------|-----------|
| | (0.0111) | (0.0176) |
| HD _(t-1) | 0.7656*** | 0.7639*** |
| | (0.0230) | (0.0227) |
| Observation | 343 | 343 |
| R-squared | 0.9975 | 0.9969 |

Notes: Robust Standard errors reported in parentheses, each model uses fixed period effects. *p < 0.1, **p < 0.05, ***p < 0.01.

Meanwhile, GDP and ELECT have the expected direction. They have significant and positive influence on HD. From mid-twentieth century, income has been seen as the clearest indicator of economic development (Domar, 1946; Harrod, 1939) and later validated by Ranis et al. (2000) and Suri et al. (2011) that raising in GDP will improve HD. A greater income may result in more wealth, allowing citizens access to more and better resources, such as education, healthcare, and housing. Individuals may have more opportunity to realize their potential and enhance their well-being, which are crucial parts of human development, if they have greater access to these resources. Meanwhile, ELECT enables access to clean water, clean air, better healthcare facilities, and improved sanitation for peoples. This can lead to reduction in illnesses for households caused by poor living conditions and better health outcomes, like life expectancy (Wang et al., 2019). ELECT is also capable of boosting HD by improving education outcomes. It allows for better access to educational resources such as books, lighting, computers, and the internet. It also allows for longer study hours, which can improve student performance and upgrade teacher capabilities (Rao & Pachauri, 2017). In addition, ELECT will provide job creation by enabling the use of machinery and technology in agriculture, manufacturing, and other industries (Dinkelman, 2011). The EMISS positively significantly improved HD. This finding is in line with Adekoya et al. (2021), Wang et al. (2018a), and Sinha and Sen (2016) who argue that the rise in carbon emissions compels policymakers to prioritize clean energy. In this way, it will assure increasing production of renewable energy, and this ultimately promotes human development.

Table 6. Estimation Result from Two-step system GMM: Dependent Variable HD, measured by HDI.

| | Without Interaction Term | With Interaction Term |
|------------|--------------------------|--------------------------|
| | CPI | CPI |
| | (1) | (3) |
| CORR | -0.00004** (0.00006) | -0.0006*** (0.0004) |
| PSH | -0.0001 (0.0003) | 0.0038*** (0.0046) |
| CORR x PSH | | -0.00006*** (0.00007) |
| PSE | 0.00039*** (0.0004) | 0.0043*** (0.0037) |
| CORR x PSE | | -0.00006*** (0.00005) |
| GDP | 0.0004*** (0.0001) | 0.0005*** (0.0001) |
| ELECT | -0.00002 (0.00006) | 0.0001*** (0.00009) |
| EMISS | 0.0010*** (0.0006) | 0.0015*** (0.0008) |

| | | |
|---------------------------|-----------------------|------------------------|
| Constant | 0.0094*** (0.0071) | -0.0312*** (0.0248) |
| HD _(t-1) | 0.9935*** (0.0124) | 0.9788*** (0.0155) |
| Observation | 343 | 343 |
| Group/ Instruments | 49/46 | 49/46 |
| AB Test for AR1 | 0.001 | 0.001 |
| AB test for AR2 | 0.311 | 0.544 |
| Sargan (Prob > χ^2) | 0.000 | 0.000 |
| Hansen (Prob > χ^2) | 0.144 | 0.121 |

Notes: Robust Standard errors reported in parentheses, each model uses fixed period effects. *p < 0.1, **p < 0.05, ***p < 0.01.

Appendix 1 presents the findings with two-step sys-GMM of the interaction of CORR with public spending on HD in both income countries, UMIC and LMIC. According to Appendix 1, there are some differences between both countries. First, CORR is highly significant, reducing HD in LMIC, while in UMIC it is insignificant. Second, PSH in UMIC is positive and significant affecting HD, while in LMIC it is insignificant, and so is the interaction condition. One of the possible causes is the average growth of PSH in LMIC showing a negative trend from 2017 until 2019 with average -0.15%. The next difference is PSE is negatively significant affecting HD in LMIC. The possible reason is that the average growth of PSE in LMIC is negative (-0.02%) compared to UMIC 0.005%. Another possible cause is the ineffectiveness of government spending. The nations who could not efficiently manage their spending per capita in health and education are not capable of maximizing or improving their HDI (Prasetyo & Zuhdi, 2013). In minimal infrastructure or conflict-affected regions, for instance, healthcare facilities and schools may be unavailable or damaged, reducing the effectiveness of government spending. In addition, Hassan and Kalim (2012) who did research on Pakistan, found that more government expenditure on health and education may not result in maximum gains in the outcomes if a country's system lacks the requisite infrastructure and human resources.

Furthermore, the interaction between CORR and PSE is positive and significant, meaning that CORR will strengthen the relationship between PSE and HD. In this case, these results is validating the statement of Ibukun (2021), Kelsall et al. (2016), and Onofrei et al. (2021) that the efficacy of government spending depends on a variety of factors, such as the quality of institutions, the political risk, and the effectiveness with which recipient countries employ assistance. Unfortunately, according to this case, it needs stimulation from CORR. There is a concept in economics: “the Grease the Wheel”, which means corruption becomes a lubricant to accelerate the economy (Dreher & Gassebner, 2013; Huntington, 1968; Leff, 1964). Méon and Weill (2010) found that corruption is less damaging in nations with a weaker institutional framework. Also confirmed by Dreher and Gassebner (2013) that when government regulations are overbearing, corruption might be profitable. The countries with a particularly ineffective institutional structure may gain from corruption's existence. The countries with cumbersome institutions have the advantage in terms of opportunity to commit corruption. Supervision of corruption will be indigent, people's behavior is nonchalant, allowing corrupt behavior to occur, therefore, corrupt actions are considered normal. The policymaker tends to speed up the bureaucratic procedure, by giving “grease money”, gifts, or other incentives to an individual or organization. Leff (1964) and Huntington (1968)

declare that corruption implementation like “speed money” will shorten the bureaucratic process; and bribery will stimulate public servants to work harder, especially in a country that has a frustrating bureaucracy. Unfortunately, according to a survey conducted by Transparency International on Pring (2017), the institutions closely related to the improvement of human development, such as elected representatives, government officials, local government, and even prime minister and president are considered in the top 5 most corrupt institutions by peoples. Those institutions are supposed to be the regulator maker, the policy maker, and even the law enforcer to fight corruption. Yet what happened was that bribery became normal. Around 40-75% of people in LMIC pay bribes when interacting with governmental services, while UMIC is 10-40%, and average worldwide around 25% (Pring, 2017).

Meanwhile, the control variables like GDP and EMISS have similar results with the MIC. They have a positive and significant impact on HD. However, the ELECT variable has a different sign. ELECT’s sign in UMIC is in line with the MIC, while in LMIC it has a negative effect but insignificant. Acheampong et al. (2021) validated that ELECT significantly deteriorates human capital. In many LMIC, ELECT is limited and unreliable by a lack of infrastructure and investment in the power sector. Without sufficient infrastructure, it is impossible to transmit energy to people efficiently, and there may be substantial power outages and electricity shortages which will impede teaching and learning. In addition, LMIC has limited industrialization, which means that the demand for electricity is lower than UMIC. Consequently, there may be less incentive to grow the power industry and boost ELECT. Additionally, overuse of electronic devices and screens can lead to negative health effects such as eye strain and disrupted sleep patterns. ELECT in LMIC on average is just around 77%, compared to UMIC around 95%, even some countries like Zambia, Mauritania, Lesotho, and Congo Republic have ELECT below 50%.

5. Conclusion and Policy Recommendations

There have been many studies investigating the effect of public spending on health and public spending on education on human development in previous studies. However, not many studies have investigated the direct effects of corruption on human development, and further the impact of corruption on the effectiveness of public spending to accelerate human development. This study applied dynamic panel data using two-step robust sys-GMM to address reverse causality, endogeneity, heteroskedasticity, and serial correlations, on 47 countries who categorized as MIC: (1) who did not move between income level classification; and (2) who did not move between sub-level of MIC from 2012 until 2019 period. First, this study will examine the direct effect of corruption on human development. Next, this study will investigate the impact of CORR on the effectiveness of public spending on health and public spending on education. In addition, this study will provide the result based on the income sub-level of MIC to examine whether the result will be different across sub-level.

The study finds that: first, for the aggregated MIC, corruption significantly worsens human development, while public spending on health and public spending on education significantly boosts human development. Our result further finds that the impact of corruption into both public spending on health and public spending and education debilitated human development. In addition, some control variables like GDP, access to electricity, and CO₂ emissions significantly improve human development.

Second, for the UMIC, corruption and public spending on education is insignificant and improves human development while public spending on health significantly boosts human development. For interaction terms, we found that corruption decreases the effectiveness of public spending on health and public spending on education to boost human development. Nevertheless, it is significant for public spending on health, but insignificant for public spending on education. Meanwhile, the effect of GDP, access to electricity, and CO₂ emissions in UMIC is similar to the aggregated MIC which significantly raises human development. Third, in the LMIC, we found corruption significantly diminishes human development. Public spending on health was found to insignificantly improve human development. On the contrary, public spending on education significantly raises human development. Last, GDP and CO₂ emissions significantly increase human development, while access to electricity insignificantly reduces human development.

Based on those findings, the “outlier” findings in LMIC that interaction between corruption and public spending on education positively affects human development is not something to be proud of or grateful for. The government must see this as a degradation to good governance implementation. Nevertheless, corruption in aggregate MIC overall clearly became a plague for the government in MIC, it was found to have diminished human development both directly and through interaction between public spending on education and public spending on health. Therefore, the government in MIC and specifically in LMIC needs to strengthen the quality of government by: (1) prioritize transparency and accountability in all aspects of governance, including budgeting, procurement, and decision-making processes. This can be achieved through the implementation of open data initiatives, the establishment of independent oversight bodies, and the promotion of citizen participation in decision-making processes; (2) invest in recruiting and training a skilled and competent workforce for public service. This includes providing ongoing professional development opportunities for government employees to ensure they have the necessary knowledge and skills to perform their duties effectively. (3) Governments should actively involve people in governance processes via frequent consultations, public hearings, and other participation mechanisms. This may assist guarantee that government policies and initiatives reflect residents' needs and interests; and (4) enact and enforcing anti-corruption laws and regulations to ensure that officials are held accountable for their actions. This includes setting up independent anti-corruption commissions or ombudsman offices that have the power to investigate and prosecute cases of corruption.

This study has found that corruption has a significant influence on human development, either direct effect or indirect effect through interaction with public spending. The dynamic panel model adopted in this study already addresses endogeneity and reverse causality. However, this study only uses the quantity of government indicators, which is public spending, but did not include the quality of government. This study also only focuses on 47 countries in MIC and uses short data. Therefore, in the future, it is necessary to conduct a study that will include elements of quality of government with a longer period.

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