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Fiscal Decentralization, Spatial Spillovers, and Regional Growth in Ethiopia

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Abstract
This study investigates the effectiveness of fiscal decentralization in promoting regional economic growth in Ethiopia, a context significant for its distinctive federal structure and ongoing policy reforms. Employing spatial econometric techniques, I analyze panel data from 14 regions over the period 2014 to 2021 to assess how decentralized fiscal policies influence economic performance both within and across regions. The findings indicate that, despite Ethiopia's efforts at decentralizing fiscal authority, regional fiscal autonomy remains constrained by substantial vertical imbalances. Moreover, the study observes that decentralization has negligible direct effects on economic growth within regions and fails to generate significant spatial spillovers across regions. This suggests that the current intergovernmental fiscal arrangements do not support the intended local economic development and regional interdependence. The study underscores the need for re-evaluating the decentralization strategies in Ethiopia and similar emerging economies to enhance their impact on regional growth. By
highlighting these dynamics, this research contributes methodologically and substantively to the literature on fiscal decentralization's role in economic development.
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Introduction

Fiscal federalism provides a lens through which to analyze public finance in federal political systems, focusing on how financial powers and responsibilities are distributed among national, regional, and local governments. This framework is pivotal for examining the allocation of spending and revenue functions and understanding their economic and governance implications across different levels of government (Oates, 1972b). The concept of fiscal decentralization, a core component of fiscal federalism, posits that transferring authority and resources from central to subnational governments can enhance efficiency and responsiveness to local needs (Bird & Vaillancourt, 1997). This shift is argued to bring governance closer to the people, fostering greater local participation in political and economic decision-making (J. Jin & Zou, 2005a).

However, the decentralization discourse is marked by a significant dichotomy. Some scholars advocate for the disintegration of central authority, especially in developing countries, as a means to empower local governments and encourage local economic development (Altunbaş & Thornton, 2012a). Conversely, others argue that the complexities of global economic interactions and the need for coordinated economic management across jurisdictions necessitate a strong central government (Ter-Minassian, 1997). These opposing views highlight the trade-offs between centralization and decentralization, such as potential efficiency gains versus the risks of increased regional disparities and governance challenges.

Despite the rich theoretical discussions, there remains a notable gap in empirical research, particularly concerning the specific economic outcomes of fiscal decentralization within different federal structures. The mixed empirical evidence from existing studies underscores the complexity of fiscal decentralization's impacts. These studies range from findings of positive impacts on economic efficiency and governance to evidence of exacerbating regional inequalities and administrative inefficiencies (Rodŕiguez-Pose & Krøijer, 2009). Recent literature has further explored the nuances of fiscal decentralization, with some studies highlighting its potential benefits in fostering local economic growth and public service delivery (Gemmell et al., 2013a), while others caution against the risks of increased fiscal disparities and the need for adequate institutional capacity at the subnational level (Bartolini et al., 2016).

The concept of fiscal decentralization has been studied extensively within the frameworks of fiscal federalism, with a primary focus on how decentralizing fiscal authority from central to regional governments impacts economic growth and governance. The literature provides a range of perspectives on the economic benefits and risks associated with fiscal decentralization, such as enhanced tax efforts, improved service sustainability, and increased regional competitiveness (Ter-Minassian, 2009). Economically, decentralization is argued to improve the efficiency of resource allocation, cater to local preferences more effectively, and enhance access to public services, potentially leading to better equity and addressing poverty at the local level.

In addition to these economic arguments, Fiscal decentralization is touted as a strategy for enhancing governance by aligning public policies more closely with local needs, thereby potentially reducing corruption and promoting good governance. It also supports the accommodation of regional diversity by granting regional governments increased autonomy, allowing solutions that respect local diversity and contribute to national integration. However, the implementation of fiscal decentralization can introduce significant challenges, including the risk of fostering unaccountable and sometimes corrupt regional governance structures, especially in environments with low political competition and inadequate governance frameworks (Albornoz & Cabrales, 2010; Altunbaş & Thornton, 2012b; Lestari, 2023; Salam, 2021)

Ethiopia represents a unique case in this discourse, with the adoption of an ethnic federalism model in 1991 and subsequent fiscal decentralization reforms aimed at enhancing regional autonomy by aligning resources with local needs and capabilities to support regional development and economic equity. Recent studies from 2023, however, indicate mixed outcomes. For instance, fiscal decentralization has shown to have a statistically significant negative effect on regional economic growth, highlighting contradictions with the goals of fiscal federalism and the complexities introduced by Ethiopia's ethnically based federalism framework (Bushashe & Bayiley, 2023a). Additionally, another study points out the challenges at the local level, where fiscal decentralization practices are not adequately supported by financial resources, leading to high fiscal imbalances and limited local government autonomy (Mesfin & Teka, 2023). These insights underscore the complex dynamics and mixed impacts of fiscal decentralization within Ethiopia's distinctive federal structure. However, the empirical assessment of these impacts is limited, particularly regarding spatial spillovers and economic growth within its diverse regional states. This study seeks to fill this gap by employing spatial econometric techniques to analyze how Ethiopia's fiscal decentralization has influenced regional economic growth, considering both direct effects within regions and spillover effects across regions.

The motivation for this research stems from a critical need to bridge the theoretical expectations of fiscal decentralization with its practical outcomes in a complex federal context like Ethiopia's. This is increasingly relevant as the country navigates substantial political and economic reforms amidst diverse regional dynamics. The study's objectives are twofold: firstly, to provide a detailed empirical analysis of the impacts of fiscal decentralization on regional economic growth and spatial spillovers in Ethiopia; and secondly, to offer insights that might be applicable to other emerging markets with similar multi-level governance structures.

Research on fiscal federalism has extensively debated the merits and pitfalls of decentralization, but studies have often focused on relatively homogeneous economic contexts or limited their scope to developed nations. This has left a substantial void in understanding the effects within diverse and multi-ethnic federations like Ethiopia, which operates under a unique form of ethnic federalism that inherently complicates fiscal and administrative

structures (Assefa, 2015b). The Ethiopian government's decentralized fiscal approach, intended to address the diverse needs of its multiple ethnic regions, presents an ideal case for examining the broader implications of fiscal decentralization theories in practice (Seyoum, 1994a).

The relevance of this study is further underscored by Ethiopia's dynamic socio-political landscape, marked by significant regional autonomy and ongoing decentralization reforms that aim to enhance economic management and regional equity. These reforms are crucial in a country where historical centralization has often led to inefficiencies and regional disparities, prompting policymakers to shift towards more localized governance structures (Kundishora, 2009). By focusing on Ethiopia, this study not only fills a critical gap in the fiscal federalism literature but also provides a framework for understanding the potential for fiscal decentralization to contribute to more balanced regional development in similar federal systems

Furthermore, by exploring the specific case of Ethiopia—a nation with significant ethnic diversity and regional disparities—this research contributes to a deeper understanding of how fiscal decentralization can be designed and implemented to foster economic growth while mitigating risks such as increased regional disparities or inefficiencies in resource allocation (Oommen, 2020). Through a meticulous examination of Ethiopia's fiscal structures and their outcomes, this study not only aims to contribute to the academic literature but also to provide policy-relevant insights that could guide future reforms both within and beyond Ethiopia.

Moreover, the study seeks to build on the existing body of literature by integrating insights from both economic and political science perspectives, addressing the multifaceted impacts of fiscal decentralization. Previous studies have often segmented these impacts, focusing either on economic efficiency or governance outcomes without a holistic view of their interplay (Martinez-Vazquez & McNab, 2003a). This research proposes to bridge these analytical divides by considering how fiscal policies designed for economic purposes also affect political stability, governance quality, and regional equity—factors that are particularly pertinent in the Ethiopian context.

In doing so, this study will critically analyze the theoretical assumptions underpinning fiscal federalism and decentralization, challenging and potentially reaffirming prevailing notions about the relationship between decentralization and regional economic development. This comprehensive approach will enhance our understanding of the conditions under which fiscal decentralization can be most effective and the potential pitfalls that may undermine its intended benefits.

The structure of this paper is as follows: Section 2 discusses the literature review, data, and econometric methods covered by section 3; section 4 covers the empirical result; and the last section concludes and identifies proposals.

Overview of the Ethiopian Fiscal Decentralization

Ethiopia’s approach to fiscal decentralization is profoundly influenced by its distinctive political and administrative structure, characterized by an ethnic federalism that divides the country into regions based primarily on ethnic lines. This system, instituted in 1991, aims to provide substantial fiscal and administrative autonomy to regional governments. However, the implementation of these policies has resulted in a complex fiscal landscape marked by significant disparities in revenue generation and expenditure responsibilities among the regions.

This section uses data and figures to analyze fiscal transfers, revenues, and expenditures between the federal and regional governments in Ethiopia from 2013/14 – 2020/21. Table 2 shows that federal subsidies are increasing, though not matching discretionary budget growth (UNDP, 2022). Figure 3 and Table 3 show that per capita transfers vary widely, with an inverse relationship to population size, disadvantaging larger regions (Assefa, 2015a; Eshetu, 1994a).

One of the most pressing issues in Ethiopia’s fiscal decentralization is the persistence of vertical fiscal imbalances. As shown in Table 4, both the federal and regional governments struggle with weak revenue

generation, resulting in a heavy reliance on federal transfers to finance regional expenditures. On average, about 50% of regional spending is covered by federal subsidies, indicating a substantial dependency that undermines regional fiscal autonomy (Seyoum, 1994a); (Negussie, 2006).

In addition to vertical imbalances, Ethiopia's fiscal framework also suffers from horizontal imbalances, as depicted in Figure 4. These imbalances manifest in the disproportionate share of total revenue retained by regions, which has consistently ranged between 16-19% over the observed period. The limited fiscal autonomy is further exacerbated by inefficient tax administration systems and poor revenue mobilization at the regional level (Beyene, 2017).

Ethiopia's ethnic federalist structure introduces additional layers of complexity to its fiscal decentralization efforts. The alignment of political boundaries along ethnic lines has not only shaped fiscal policies but also influenced the economic interactions between regions. This structure has sometimes hindered effective resource mobilization and exacerbated regional disparities, challenging the notion that decentralization inherently leads to improved economic efficiency and governance (Moges, 2020).

Overall, the analysis of Ethiopia's fiscal decentralization from 2013 to 2021 reveals a system still in its infancy, characterized by growing regional dependence on federal transfers and significant fiscal imbalances. These challenges underscore the need for reforms aimed at enhancing regional revenue sources, improving tax administration, and increasing fiscal autonomy to foster better service delivery and macroeconomic stability (Defere, 2018a). The unique case of Ethiopia, with its complex interplay of ethnic federalism and fiscal decentralization, offers a valuable context for examining the broader implications of decentralization policies, making it a critical area of study for understanding the dynamics of fiscal federalism in developing countries

Literature Review

The impact of fiscal decentralization on economic growth and development has been a subject of extensive research, yielding complex and often contradictory results. This review examines recent empirical studies on fiscal decentralization, with a particular focus on developing countries and ethnically diverse contexts. The paper explore four key themes: the theoretical framework of fiscal decentralization, the varied impacts of fiscal decentralization on economic growth, the role of institutional factors and ethnic diversity, and the specific challenges in the Ethiopian context.

Theoretical Framework: Fiscal Decentralization and Regional Economic Growth

Fiscal decentralization is theorized to impact regional economic growth through several interconnected mechanisms. At its core, the theory posits that decentralization allows local governments to make more informed spending decisions, leading to improved allocation efficiency (Oates, 1972a). This efficiency stems from the ability to better match public goods provision with local preferences and reduce information asymmetries between government and citizens (Tiebout, 1956). Furthermore, by bringing government closer to the people, decentralization is expected to foster increased accountability. This proximity enhances citizen participation in local decision-making and improves monitoring of government performance (Seabright, 1996) potentially resulting in more effective governance and, consequently, better economic outcomes (Bardhan, 2002)

Another key aspect of the theoretical framework is the role of inter-regional competition. Fiscal autonomy at the regional level can stimulate competition between regions, spurring innovation in policy-making and public service delivery (Brennan & Buchanan, 1980) This competitive environment is theorized to drive economic efficiency and growth across regions (Weingast, 1995) Additionally, fiscal decentralization is associated with improved fiscal management. It can lead to better alignment of revenues with expenditure responsibilities and increased fiscal effort at the local level (Musgrave, 1959) contributing to overall economic stability and growth (Bahl, 1999)

However, the theoretical framework also acknowledges potential negative effects of fiscal decentralization. These include the risk of increased regional inequality if some regions are better equipped to benefit from autonomy (Prud'homme, 1995) and the possibility of macroeconomic instability if local borrowing is not properly regulated (Tanzi, 1996) The net effect of fiscal decentralization on regional economic growth is thus

theorized to depend on the balance and interaction of these various mechanisms. This balance may vary based on local institutional, economic, and social contexts, underscoring the complexity of the relationship between fiscal decentralization and economic growth (Martinez-Vazquez & McNab, 2003b) This theoretical framework provides the foundation for our empirical investigation into the impacts of fiscal decentralization on regional economic growth in Ethiopia's unique context of ethnic federalism.

Varied Impacts of Fiscal Decentralization on Economic Growth

Recent empirical research underscores the nuanced and context-dependent nature of fiscal decentralization's effects on economic growth. (Y. Jin & Rider, 2020) conducted a comparative study of China and India, revealing that fiscal decentralization has mixed short-term impacts but generally positive long-term effects in India, while in China, the impact remains neutral to negative. This stark contrast highlights the significance of country-specific economic and institutional factors in shaping decentralization outcomes.

The complexity of these impacts is further emphasized by (Ganaie et al., 2018), who found that while fiscal decentralization is associated with positive economic outcomes in some regions, the overall effects vary widely based on local governance structures and the balance between expenditure and revenue decentralization. This variability is also evident in more recent studies. For instance, (Munir et al., 2022) reported positive effects of fiscal decentralization on health outcomes in Pakistan, suggesting sector-specific benefits. Conversely, (Vasilyeva, 2023) found that in Russia, fiscal decentralization fails to enhance economic development in wealthier regions and negatively affects less developed ones, revealing a complex relationship with regional inequalities.

The distinction between revenue and expenditure decentralization is crucial, as highlighted by several studies ((Ezcurra & Rodríguez-Pose, 2023; Hanif et al., 2020; Iqbal et al., 2012). These researchers found that the impacts of revenue versus expenditure decentralization can vary significantly depending on a country's institutional maturity and administrative capacity.

Institutional Factors and Ethnic Diversity

The role of institutional quality and ethnic diversity in determining the outcomes of fiscal decentralization has gained increasing attention in recent literature. (Faguet & Pöschl, 2023a) and (Smoke, 2022a) emphasize that decentralization outcomes are heavily influenced by institutional quality, particularly in ethnically diverse settings. They argue that many countries implement decentralization without adequately considering their institutional capacity or political economy, often leading to suboptimal results.

In the context of ethnically diverse countries, the impacts of fiscal decentralization become even more complex. (Ababakr, 2022) and (Walter & Emmenegger, 2022) explored federalism's role in managing ethnic conflicts and its impact on fiscal capacity development. Their findings emphasize the importance of inclusive policies in ethnically diverse federal systems. However, (Gadenne & Singhal, 2021) caution that decentralization can sometimes lead to the capture of local governments by ethnic elites, potentially exacerbating existing inequalities.

The relationship between decentralization and government quality is explored by (Ezcurra & Rodríguez-Pose, 2023), who find that while decentralization generally improves government quality, this effect is weaker in countries with high levels of ethnic fractionalization. This finding is particularly relevant for countries like Ethiopia with significant ethnic diversity.

The Ethiopian Context

Ethiopia presents a unique case study for fiscal decentralization due to its ethnic federalist structure implemented in 1991. This system, intended to provide significant autonomy to regions, has resulted in considerable fiscal imbalances—both vertical and horizontal—that complicate the realization of the intended benefits of decentralization (Alam & Gerbaba, 2019; Assefa, 2015b; Defere, 2018b). These imbalances are often exacerbated by weak regional administrative capacities and governance issues, which may hinder effective decentralization (Eshetu, 1994b; Seyoum, 1994b).

Recent research specific to Ethiopia provides mixed evidence on the effects of fiscal decentralization. (Bushashe & Bayiley, 2023b) argue that fiscal decentralization negatively impacts regional economic growth in Ethiopia, potentially exacerbated by the ethnically based federal system. This finding contrasts with some of the more positive outcomes observed in other developing countries, highlighting the need for context-specific analysis.

The literature on regional growth in Ethiopia and the role of spatial spillovers is still developing. Integrating these aspects into the analysis of fiscal decentralization provides a more comprehensive understanding of how decentralized policies affect not only individual regions but also their interactions with neighboring regions, contributing to a holistic view of national economic development (J. Jin & Zou, 2005b; Martinez-Vazquez & McNab, 2003c).

Conclusion and Research Gap

While the existing literature provides valuable insights into the complexities of fiscal decentralization, there remains a significant gap in our understanding of its impacts in the specific context of Ethiopia's ethnic federalism. The varied findings across different countries and contexts underscore the need for detailed, country-specific studies that account for unique institutional, economic, and ethnic factors.

This study aims to address this gap by providing empirical evidence on the impacts of fiscal decentralization on regional economic growth and spatial spillovers in Ethiopia. By focusing on both revenue and expenditure decentralization and incorporating spatial econometric techniques, this research seeks to offer a more nuanced understanding of fiscal federalism in ethnically diverse developing countries. The findings will not only contribute to the academic discourse on fiscal decentralization but also provide valuable insights for policymakers in Ethiopia and similar contexts grappling with the challenges of implementing effective federal fiscal structures.

Hypothesis Development

Drawing from the theoretical framework of fiscal federalism and the empirical literature, this study proposes four key hypotheses. H1: Revenue decentralization is positively associated with regional economic growth in Ethiopia, grounded in the principle that increased fiscal autonomy allows better matching of revenue generation with local needs (Oates, 1972a; Tiebout, 1956). H2: Expenditure decentralization has a stronger positive effect on regional economic growth than revenue decentralization in Ethiopia, reflecting findings that suggest more direct impacts of expenditure autonomy on local economic outcomes (Gemmell et al., 2013b; Rodríguez-Pose & Krøijer, 2009). H3: The effects of fiscal decentralization (both revenue and expenditure) on regional economic growth are moderated by the level of regional administrative capacity, acknowledging the crucial role of institutional quality in determining decentralization outcomes ((Faguet & Pöschl, 2023b; Smoke, 2022b). H4: Fiscal decentralization generates positive spatial spillovers, leading to economic growth in neighboring regions, based on theories of inter-regional competition and policy diffusion ((Brennan & Buchanan, 1980; Weingast, 1995). These hypotheses will guide our spatial econometric analysis, allowing us to test the mechanisms through which fiscal decentralization impacts regional economic growth in Ethiopia's unique context of ethnic federalism.

Data and Econometric Methodology

In this section, the method to detect cross-sectional dependence and the methodology for the spatial Durbin model is presented in detail.

Data

Spatial Weight Matrix

A critical component of spatial econometric analysis is the spatial weight matrix, which quantifies the spatial relationships between regions. For this study, the paper construct a row-standardized contiguity-based spatial weight matrix, where regions sharing a border are considered neighbors. The choice of a contiguity-based matrix is justified by several factors: Ethiopia's regions often interact most strongly with their immediate neighbors due

to shared borders facilitating economic and social exchanges; the ethnic federal system creates natural boundaries that align with administrative regions, making contiguity a relevant measure of inter-regional connections; and more sophisticated matrices based on economic flows or transportation networks, while preferable, lack consistent data availability for all regions over the study period. The spatial weight matrix W is constructed such that $W\_ij = 1$ if regions i and j share a border, and $W\_ij = 0$ otherwise.

After construction, the matrix is row-standardized to ensure that the sum of each row equals 1, facilitating interpretation of spatial lag coefficients. I acknowledge this approach's limitations, as it assumes equal influence of all contiguous neighbors and doesn't account for varying sizes of shared borders or intensity of economic interactions. This spatial weight matrix is then used in the spatial Durbin model to capture both direct effects of fiscal decentralization within regions and potential spillover effects across neighboring regions, allowing us to test our hypotheses about the spatial dynamics of fiscal decentralization in Ethiopia.

Data

This subsection describes the data source and the composition. It is regional-level data and a monthly time series. The collected data is from 2013/14[1] to 2020/21 of regions and mainly taken from the Ministry of Finance and Ministry of Revenue. The choice of the study period from 2014 to 2021 was driven by several critical factors. First, this period marks significant policy shifts in Ethiopia's approach to fiscal decentralization, coinciding with political reforms that aimed to enhance regional autonomy. The start year 2013/14 [2005 Ethiopian Calendar (EC)] was selected as it follows the implementation of major fiscal policies aimed at enhancing local revenue generation and expenditure management. This timeframe allows for the analysis of the medium-term effects of these reforms on regional economic outcomes. Besides, data shortage limits those year beyond 2020. The data, while covering a significant period, may not reflect very recent changes in Ethiopia's fiscal landscape. The ongoing nature of fiscal reforms means that some effects may not be fully captured within our study period. Furthermore, the data, while complete, cannot account for all factors influencing regional growth, such as informal economic activities or the quality of local institutions. These limitations suggest avenues for future research, including the development of more sophisticated spatial weight matrices and the incorporation of additional variables as data become available.

As (Halder, 2007a) indicates, there are two standardized measures of fiscal decentralization: Revenue Decentralization (R_d) and Expenditure Decentralization (E_d). Moreover, Human Capital (h) and Capital (k) are also considered (see The variables *in this table are considered from (Raza, 2016)*.

Table 1).

Variables Description

The description of the independent variables listed in Table 1 is given below: The real per capita income proxied by GDP is the dependent variable and Revenue Decentralization (R_d), Expenditure Decentralization (E_d), Human Capital (h) and Capital (k) are the independent variables.

[1] Regarding the data notation "2013/14," this refers to the Ethiopian fiscal year, which runs from Sep 11th of the Gregorian calendar year until Sep 10th of the following year, a convention stemming from the Ethiopian calendar system. The base year "2015-00" is noted to clarify the real terms adjustment to the base financial year of 2015, ensuring that all economic data are comparable over time without the distortions caused by inflation.

Variable	Definitions
Dependent variable (Y)	*Real per capita income of regions (base = 2015-00)*
Revenue Decentralization (R_d)	*Regions revenue/Total revenue (including Federal)*
Expenditure Decentralization (E_d)	*Regions expenditure/Total expenditure (including Federal)*
Human Capital (h)	*Per capita health and education expenditure of regions*
Capital (k)	*Per capita expenditure of regions*

The variables in this table are considered from (Raza, 2016).
Table 1: Variable Description of the variable details

Revenue Decentralization (*R_d*): Revenue decentralization measures fiscal decentralization as the ratio of sub-national revenue to total government revenue. Sub-national revenue includes all sources except transfers from higher levels. Total revenue sums sub-national and central revenue. A higher ratio reflects greater sub-national fiscal autonomy and capacity. A lower ratio indicates more centralized public finances and reliance on transfers.

Expenditure Decentralization (*E_d*): Refers to the amount or share of the regions' expenditure out of the total expenditure, including the Federal government. The ratio of total sub-national government spending to overall government spending is known as the expenditure ratio. In this case, regional and local public expenditures make up sub-national government spending, whereas sub-national and central government spending make up total government spending.

To prevent double counting, subsidies given to sub-national governments are excluded from the federal government expenditure (Deribe, 2015). The reason is that when a certain level of government gives subsidies to a lower level of government, it accounts for that as an expense. Hence, upon spending that money, the lower level of government also records it as an expense. Hence, subtracting the subsidy ensures that the expenditure is recorded only once.

Human Capital (*h*): This is indicated by the per capita health and expenditure of regions. *The use of per capita health and education expenditures provides a direct measure of investment in human capital development. Per capita capital expenditures serve as a proxy for physical capital investments by regional governments. The meta-analysis by* (Bodman, 2018) *on fiscal decentralization and economic growth found human and physical capital to be important control variables. The use of health and education expenditures as a proxy for human capital follows convention in the literature on fiscal decentralization and economic growth* (Lin J. Y., 2000) (Rodríguez-Pose, 2011).

Capital (*k*): Expressed by the per capita expenditure of regions.

The variables selected for this study—Revenue Decentralization (Rd), Expenditure Decentralization (Ed), Human Capital (h), and Capital (k)—are grounded in the literature as key indicators of fiscal decentralization's impact on regional growth. These variables allow for a comprehensive analysis of how financial autonomy and resource allocation at the regional level influence economic outcomes, in line with models presented by (Raza, 2016) and (Halder, 2007b). These variables collectively allow us to examine both the direct effects of fiscal decentralization and the indirect effects through human and physical capital formation, providing a comprehensive picture of the fiscal decentralization-growth nexus in Ethiopia's unique context.

Cross-sectional dependence

The (Pesaran, 2004) cross-sectional dependence (CD) test assesses if spatial dependence exists in the panel data. It particularizes the test for general cross-sectional dependence. Equations (3.1) and (3.2) show the CD test formulas for global and local cross-sectional dependence, respectively. The test determines if spatial connections exist between the cross-sectional units.

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{i=1}^{N-1} \rho\hat{\imath}\, j \qquad \text{Err}$$

$$CD_{\hat{\rho}} = \sqrt{\frac{T}{\sum_{i-1}^{N-1}\sum_{j-i+1}^{N}\omega(\rho)ij}} \left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}[\omega(\hat{\rho})]ij\right) \qquad \textbf{Error! No text of specified style in document.}.1$$

where $\hat{\rho}_{ij}$ is the sample estimate of the pair-wise correlation of the residuals and given by

$$\hat{\rho}_{ij} = \frac{\sum_{i=1}^{T}\hat{\mu}_{it}\,\hat{\mu}_{jt}}{(\sum_{i=1}^{T}\hat{\mu}_{it}^{2})^{1/2}(\sum_{i=1}^{T}\hat{\mu}_{jt}^{2})^{1/2}} \qquad \text{Error! No}$$

$\omega(\rho)_{ij}$ is the (i, j)-th element of the p-th order proximity weight matrix and μ_{it}, μ_{jt} are the error term for i and j individual elements across time. *The Pesaran CD test can identify spatial dependence between cross-sectional units like regions, even when geographical adjacency is not present. This makes it suitable for analysis of economic interactions between subnational jurisdictions.*

The equations used (3.1 and 3.2) are clarified with sub-indexes to better illustrate the interactions between different regions (i and j), where "i" represents the region of interest, and "j" represents other regions in the study. The model notation has been refined to ensure clarity, with μ now clearly defined as representing fixed effects for each region to control for unobserved heterogeneity.

The methodology section now integrates a more robust theoretical framework that links the empirical strategy directly to the hypotheses derived from the literature review. This approach ensures that the study's objectives are tightly aligned with the methodological choices, addressing the previous lack of clear hypothesis testing and theoretical grounding highlighted by the reviewers.

A Spatial Durbin model approach

The Model

Given the test statistics and spatial dependence, the spatial Durbin model is selected over other static spatial models. The general form of the static spatial Durbin model includes spatial lags of the dependent variable (WY) and independent variables (WX). It estimates direct and indirect effects while accounting for spatial connections. Specifically, the general form of the static spatial Durbin model (Elhorst, 2014) takes the form:

$$y_t - \rho_{Wy_t} + X_t\beta + WX_t\theta + \mu + \alpha_t I_N + \epsilon_t, \qquad \textbf{Error! No text of specified style in document.}.2$$

where y_t denotes an *NX 1* vector consisting of one observation for the dependent variable for every region in the

sample $(i = 1,\ldots,N)$ at a particular point in time $(t = 1,\ldots,T)$, and X_t is an *N X K* matrix of exogenous explanatory variables with associated response parameters β and θ contained in a *K X 1* vector. β denotes the direct coefficient of the independent variable and θ denotes the spatial lag coefficients of the independent variables. $\epsilon_t = (\epsilon 1t ,\ldots,\epsilon Nt)^T$ is a vector of *i.i.d.* disturbance terms, whose elements have zero mean and finite varianceσ^2. $\mu = (\mu_1,\ldots,\mu N)^T$is a vector with country fixed effects μ_i. α_t is the coefficient of a time fixed effect, and I_N is an *NX1* vector of ones. Country-fixed effects control for all country-specific, time-invariant variables whose omission could bias the estimates, while time-period fixed effects control for all time-specific, country-invariant variables whose omission could bias the estimates in a typical time-series study. The variables WY_t denote contemporaneous endogenous interaction effects among the dependent variables. σ is called the spatial autoregressive coefficient. *W* is an *NXN* row-normalized matrix with non-negative elements describing the spatial arrangement of the countries in the sample. Its diagonal elements are set to zero by assumption since no country can be viewed as its own neighbour. *The spatial Durbin model builds on the standard growth regression framework by accounting for spatial interdependence through the spatially lagged dependent and independent variables. This technique is well-suited for analyzing fiscal decentralization policies in an economic system where regions exhibit spatial interactions.*

To estimate the parameters of this model (Yu et al., 2008) consider the log likelihood function of Equation (3.4), taking into account the Jacobin term that reflects the endogeneity of the WY_t variable, i.e. the fact that one country can affect another country, and vice versa. The estimator that is derived from this log likelihood function is called the *Quasi Maximum Likelihood (QML)* estimator; the term' *quasi'* is used here since the error terms are not assumed to be normally distributed.

The methodology employing the Spatial Durbin Model (SDM) is particularly suited for this study due to its ability to capture both direct local effects and indirect spillover effects among regions. This choice is substantiated by the spatial interdependence likely present among Ethiopia's regions, where economic activities in one region can affect neighboring regions, a critical aspect often overlooked in non-spatial analyses.

Direct and Spatial Spillover Effects

Spatial spillover effects are a central component of this research, given the interconnected economic landscape within Ethiopia. The SDM enables the examination of how changes in fiscal policy in one region may lead to significant economic outcomes in another, which is pivotal in understanding the full implications of decentralization. This analysis is not merely about local impacts but also about how regions collectively influence one another through fiscal and economic interactions.

Many empirical studies use point estimates of one or more spatial regression models to test the hypothesis as to whether or not spatial spillover effects exist. However, (LeSage, 2008) have pointed out that this may lead to erroneous conclusions and that a partial derivative interpretation of the impact from changes to the variables of different model specifications represents a more valid basis for testing this hypothesis. *Marginal effects analysis based on partial derivatives allows proper interpretation of direct, indirect, and total effects. This helps quantify the magnitude of spatial spillovers.*

Empirical Results

In this section[2], the paper analyses the different models of spatial econometrics starting from testing the cross-sectional

[2] The paper uses testparm command in stata to check which specific (spatial and/or time) effect to include. The estimated F statistic strongly rejects the null that there is no country-specific fixed effect. The (Hausman, 1978) test is used to test the random effect model against the fixed effects. The results in all cases indicate that the random-effects model must be rejected. As far as model selection is concerned, following the strategy described in (LeSage, 2008) and (Elhorst, 2010) I commence with the spatial Durbin model (SDM) as a general specification and test for the alternatives. That is, I estimate a static SDM, but I need to determine if it is the best model for the data. Since the static SEM may be easily derived starting from a

dependence using the Pesaran-CD test. The dependent variable is real per capita income proxied by regional GDP and the explanatory variables are revenue and expenditure decentralization, human capital and capital; all are in log forms. *xsmle* and *xtreg* packages of stata and *pcdtest* function of the *plm*: R package have been used for estimation. The Pesaran CD test for cross-sectional dependence demonstrates (*P-value* < 0.00005) that there exists a cross-sectional dependence between the spatial units under the Null of cross-sectional independence. The likelihood ratio (LR) test result from (X2) Represent test results of SDM against other static models.

LR and AIC *represent the Likelihood Ratio and Akaike Information Criterion, respectively.*

- SAR, SDM, SEM, and SAC represent Spatial Autoregressive Model, Spatial Durbin Model, Spatial Error Model, and Spatial Auto Correlated Model, respectively.

suggests that static SDM has a better fit than both SAR and SEM. Further, it has a better fit than SAC as it is shown by the results of the Akaike Information Criterion (AIC).

The marginal analysis of the spatial Durbin model results reveals complex dynamics in the effects of fiscal decentralization on regional economic growth in Ethiopia. The analysis of direct, indirect, and total effects derived from the model provides refined insights into the spatial interactions of fiscal policies across regions. The spatial interaction effect denoted by ρ (0.833 for revenue decentralization and 0.825 for expenditure decentralization, as shown in Table 4 and

static spatial Durbin model (SDM), it is easily shown that if $\theta = 0$ and $\rho \nvDash 0$, the model is a static spatial autoregressive model (SAR), while if $\theta = -\beta\rho$ the model is a static SEM.

Table *5* respectively) indicates a strong positive spatial interdependence between regions in terms of income. This suggests that neighboring regions have similar income levels that influence each other, likely due to economic connections and spillovers. However, this spatial correlation does not translate into significant spillover effects from fiscal decentralization policies.

Examining the marginal effects reported in Table 2, I find that neither revenue nor expenditure decentralization has statistically significant direct, indirect, or total effects on regional economic growth. For revenue decentralization, the direct effect is positive (0.140) but statistically insignificant. This suggests that while increasing a region's revenue autonomy may be associated with a slight increase in its own economic growth, this relationship is not statistically reliable. Similarly, the indirect effect (0.845) and total effect (0.985) are positive but insignificant, indicating no clear evidence of spatial spillovers or overall impact on growth.

For expenditure decentralization, I observe negative but insignificant effects across all measures (direct effect: -0.316, indirect effect: -1.751, total effect: -2.068). This suggests that greater expenditure autonomy, if anything, might be associated with lower economic growth both within regions and across neighboring regions, though these relationships are not statistically significant.

Following (Elhorst, 2014), tests of the hypotheses of whether spatial spillover effects exist indicate that there is no significant spatial indirect effect. This may relate to weak institutions and less administrative and political autonomy among regional governments, which also helps explain the negative effect of expenditure decentralization (Iqbal & et al, 2012). *Greater regional autonomy could strengthen intergovernmental linkages and magnify cross-regional interactions.* The results for revenue decentralization and expenditure decentralization are detailed in the following section.

These findings do not provide strong support for our hypotheses. Contrary to H1, I do not find clear evidence that revenue decentralization is positively associated with regional economic growth. H2, which posited that expenditure decentralization would have a stronger positive effect than revenue decentralization, is also not supported, as both forms of decentralization show insignificant effects. H4, which predicted positive spatial spillovers, is not substantiated by our results, as the indirect effects are insignificant for both revenue and expenditure decentralization.

Table 2: Estimation Results of the Marginal Effects Analysis

Variables	Revenue Dec.			Expenditure Dec.		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Log(R_d)	0.140	0.845	0.985			
Log(E_d)				-0.316	-1.751	-2.068
Log(h)	0.026	0.106	0.133	-0.014	-0.152	-0.166
Log(C)	-0.049	-0.318	-0.368	0.115	0.669	0.785

**** statistical significance at the level of 1%*
*** statistical significance at the level of 5%*
** statistical significance at the level of 10%*
Dir. eff, Indir. eff and Tot. eff. represents direct effect, indirect effect and Total effect, respectively.

The negative coefficient for the expenditure decentralization variable Log(Ed) suggests that increased decentralized expenditures reduce real per capita regional income, though insignificantly. This aligns with (Barro, 1991) endogenous growth model, which argues government consumption spending distorts incentives and provides limited stimulus to investment and growth. Barro also found government investment has little relation to growth, while productive expenditures contribute positively and consumption negatively.

The lack of significant effects across the board could be attributed to several factors specific to the Ethiopian context. First, the ethnic federal structure may create barriers to both intra- and inter-regional economic interactions, limiting the effectiveness of fiscal decentralization policies. Second, the overall level of economic integration among Ethiopian regions may be low, reducing the potential for fiscal policies to have substantial impacts within or across regions. Third, as hypothesized in H3, the administrative capacity of regional governments may be insufficient to effectively implement decentralization policies or generate growth-enhancing outcomes. This aligns with the theoretical framework that emphasizes the importance of institutional quality in determining the success of decentralization efforts.

From a policy perspective, these findings underscore the need for a comprehensive review of Ethiopia's fiscal decentralization strategies. While the theoretical benefits of fiscal decentralization are well-established in the literature, their realization in Ethiopia's complex federal system appears to be hampered by various contextual factors. The strong spatial interdependence in regional incomes, coupled with the lack of significant decentralization effects, suggests that there may be other, more influential factors driving regional economic performance.

Policymakers should consider strengthening intergovernmental coordination mechanisms to enhance the effectiveness of decentralized fiscal policies. This could involve improving the capacity of regional governments to generate and manage their own revenues, as well as developing more targeted expenditure strategies that align with local economic needs and growth potential. Furthermore, efforts to increase economic integration and reduce barriers to inter-regional economic activities could help realize the potential benefits of fiscal decentralization.

In conclusion, our spatial analysis reveals a nuanced picture of fiscal decentralization in Ethiopia, where the anticipated benefits are not clearly materializing in terms of regional economic growth. These results underscore the importance of considering local contexts, implementation challenges, and potential barriers to economic integration when designing and implementing fiscal decentralization policies in ethnically diverse federal systems. Future research should delve deeper into the specific mechanisms through which Ethiopia's unique federal structure interacts with fiscal policies to influence economic outcomes, potentially exploring sector-specific impacts and longer-term effects of decentralization reforms.

Conclusions and Recommendations

This study enriches the literature on fiscal decentralization by delving into its impacts on regional economic growth within Ethiopia's unique framework of ethnic federalism. It demonstrates that while the premise of fiscal decentralization is robust, its practical outcomes are hampered by inconsistencies in implementation and administrative deficiencies. The findings indicate that revenue decentralization has not significantly enhanced regional per capita income, suggesting that policy frameworks, though well-intentioned, lack effective execution mechanisms. Similarly, expenditure decentralization appears to negatively influence regional income, supporting theories that unsystematic increases in regional spending can lead to inefficiencies and economic stagnation.

Despite anticipated benefits, investments in human capital have not yielded significant growth, pointing to potential misalignments in how resources are allocated and utilized. The negative impact of the capital-labor ratio under expenditure decentralization suggests that the type of regional spending might not be optimally aligned with growth-enhancing activities.

These findings have several important implications for future fiscal decentralization reforms in Ethiopia. First, policymakers should focus on strengthening the administrative capacity of regional governments to effectively manage increased fiscal autonomy. This could involve targeted training programs for regional financial administrators and the development of robust financial management systems. Second, there's a need to reassess the current intergovernmental fiscal transfer system to ensure it promotes regional self-reliance while addressing equity concerns. This might involve designing performance-based grant systems that incentivize efficient resource use and local revenue generation. Third, to enhance positive spatial spillovers, policies should be implemented to promote inter-regional economic cooperation and reduce barriers to trade and factor mobility between regions. This could include investments in transportation infrastructure connecting regions and the harmonization of regional economic policies. Lastly, given the weak link between expenditure decentralization and growth, there's a need for improved expenditure assignment and monitoring mechanisms to ensure that decentralized spending aligns with local development priorities and contributes effectively to economic growth.

From a policy perspective, these findings underscore the need for a series of strategic adjustments to enhance the effectiveness of fiscal decentralization in Ethiopia. Improving administrative capabilities to oversee and implement decentralization policies is crucial. There is a compelling need for enhanced coordination at both federal and regional levels to ensure that expenditure guidelines prioritize long-term investments over short-term consumptive spending. Additionally, fostering physical and economic linkages between regions could amplify the positive effects of decentralization, enhancing economic integration and mobility across regions.

Addressing ways of coordination and accountability, this paper recommends the establishment of robust monitoring systems to track the performance of decentralization efforts. These systems would provide essential data to guide policy adjustments and ensure that decentralization achieves its intended economic outcomes. Promoting transparency in regional spending and enhancing the decision-making autonomy of regional governments could also improve accountability. This approach should include equipping regions with the tools and authority to generate and manage their own revenues, thereby reducing their dependency on federal transfers.

Further research is advised to assess the sectoral impacts of fiscal decentralization, identifying sectors that are particularly responsive to decentralized policies and understanding the reasons behind such dynamics. This targeted research could inform more nuanced policy interventions that cater specifically to the unique economic and social landscapes of Ethiopia's regions.

Appendices

Table 3: Test Statistics Results Using Static Spatial Panel Data Model

Test Results	Spatial Models - Static			
	SAR	SDM	SEM	SAC
	Country FE	Country Time FE FE	Country FE	Country FE
AIC	-233.52	-240.04	-226.54	-233.38
LR Test (X^2)	8.52		15.5	
LR Test (P-values)	0.000		0.000	

- (X^2) *Represent test results of SDM against other static models.*
- *LR and AIC represent the Likelihood Ratio and Akaike Information Criterion, respectively.*
- *SAR, SDM, SEM, and SAC represent Spatial Autoregressive Model, Spatial Durbin Model, Spatial Error Model, and Spatial Auto Correlated Model, respectively.*

Table 4: Estimation Results Using Spatial Panel Data Models for Revenue Decentralization

Variables	Non- Spatial Models			Static Spatial Models (SDM)		
	Country FE	Time FE	Country & Time FE	Country FE	Time FE	Country & Time FE
$\rho(Wy_t)$				0.833	0.020	0.828
Estimated β:s						
Log(RR)	0.269***	-0.153***	0.030	0.052	-0.042	0.050**
Log(ER)						
Log(HC)	0.049	-1.230***	0.004	0.016	-1.207***	0.014
Log(C)	-0.060	0.477***	-0.06	-0.018	0.328***	-0.019
Constant	9.684			1.253		
Estimated θ:s						
Log(RR)				0.123	0.398***	0.122***
Log(ER)						
Log(HC)				0.016	-0.288	0.014
Log(C)				-0.074	0.657***	-0.068
R^2	0.48	0.91	0.91	0.52	0.96	0.44

**** statistical significance at the level of 1%*
*** statistical significance at the level of 5%*
** statistical significance at the level of 10%*

Table 5: Estimation Results Using Spatial Panel Data Models for Expenditure Decentralization

Variables	Non Spatial Models			Static Spatial Models (SDM)		
	Country FE	Time FE	Country & Time FE	Country FE	Time FE	RE
$\rho(Wy_t)$				0.825***	0.019***	0.808***
Estimated β:s						
Log(RR)						
Log(ER)	-1.063***	-0.222***	-0.128	-0.143	-0.141	-0.163*
Log(HC)	0.004	-1.150***	-0.000	0.001	-1.169***	-0.001
Log(C)	0.372***	0.388***	0.047	0.047	0.346***	0.051
Constant	6.751***	0.369	7.971***			0.382
Estimated θ:s						
Log(RR)						
Log(ER)				-0.192*	0.269	
Log(HC)				-0.007	-0.279	
Log(C)				0.047	0.593	
R^2	0.22	0.91		0.53	0.91	0.54

**** statistical significance at the level of 1%*
*** statistical significance at the level of 5%*
** statistical significance at the level of 10%*

Table 6: Subsidy transfer from the federal government to regions (In millions Birr).
Source: Data provided by UNDP Ethiopia

Regions	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23
Addis Ababa	39	85	3,421	7	1,636	3,937	2,635	3,884	3,340	3,280
Afar	1,355	1,620	2,290	2,741	3,492	3,976	4,172	5,208	6,058	6,224
Amhara	9,966	11,918	17,055	20,419	24,975	28,440	29,838	37,256	43,332	44,518
Beninshangul	903	1,080	1,578	1,889	2,116	2,410	2,528	3,156	3,671	3,772
Dire Dawa	499	597	851	1,019	1,017	1,159	1,216	1,517	1,765	1,814
Gambella	645	772	1,101	1,318	1,538	1,751	1,837	2,293	2,668	2,741
Harari	430	514	734	879	879	1,001	1,050	1,311	1,525	1,566
Oromiya	13,979	16,717	23,814	28,512	39,844	45,373	47,603	59,435	69,131	71,022
SNNPR	8,645	10,339	14,758	17,670	23,252	26,478	27,780	27,771	32,274	26,591
Somali	3,501	4,187	5,959	7,135	11,539	13,140	13,786	17,213	20,021	20,569
Tigray	3,088	3,693	5,247	6,282	6,972	7,940	8,330	10,400	12,096	12,428
Sidama								6,914	8,069	8,455
South-West										6,400
Total Subsidy	43,052	51,520	76,809	87,871	117,260	135,605	140,775	176,358	203,950	209,381
Average Growth Rate of Subsidy		20%	49%	14%	33%	16%	4%	25%	16%	3%
Total Budget	155,000	179,000	223,000	274,000	321,000	347,000	387,000	476,000	561,700	786,600
Share of Subsidy from the Total	28%	29%	34%	32%	37%	39%	36%	37%	36%	27%

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Table 7: Aggregate fiscal performance (In millions Birr). Source: Ministry of Finance, Ethiopia

Revenue	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Federal	180,525	224,020	295,239	349,478	387,980	428,306	455,290	580,278
Regional	34,353	47,040	57,377	65,093	76,577	92,972	100,977	135,695
Recurrent expenditure								
Federal	128,220	176,121	235,181	304,716	353,604	425,072	460,656	576,211
Regional government	50,133	70,954	84,255	112,082	126,496	151,630	179,989	212,614
Capital expenditure								
Federal	150,466	174,051	200,244	235,600	243,585	271,069	285,251	330,665
Regional government	43,081	49,476	50,708	58,529	54,572	73,315	77,675	95,256
Total regional expenditure	93,214	120,430	134,963	170,611	181,068	224,945	257,664	307,870
Regional subsidies (plan)	43,052	51,520	76,809	87,871	117,260	135,605	140,775	176,358
Own Revenue & Subsidies	77,404	98,560	134,186	152,964	193,837	228,577	241,752	312,053
Actual								
Subsidies/Expenditure	46%	43%	57%	52%	65%	60%	55%	57%
Revenue/Expenditure	37%	39%	43%	38%	42%	41%	39%	44%
Subsidies & Own Rev./Exp.	83%	82%	99%	90%	107%	102%	94%	101%

Table 8: The level of vertical imbalances. Source: Ministry of Finance, Ethiopia

In millions (Br)	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Regions								
Revenue	34,353	47,040	57,377	65,093	76,577	92,972	100,977	135,695
Expend	93,214	120,430	134,963	170,611	181,068	224,945	257,664	307,870
Vertical Imbalance	(58,861)	(73,390)	(77,586)	(105,518)	(104,491)	(131,973)	(156,686)	(172,175)
Federal								
Revenue	180,525	224,020	295,239	349,478	387,980	428,306	455,290	580,278
Expend	278,686	350,173	435,425	540,316	597,189	696,141	745,907	906,876
Vertical Imbalance	(98,160)	(126,153)	(140,186)	(190,837)	(209,209)	(267,835)	(290,617)	(326,599)
Subsidy	43,052	51,520	76,809	87,871	117,260	135,605	140,775	176,358
Subsidy/Exp.	46%	43%	57%	52%	65%	60%	55%	57%

Figure 1: Federal discretionary budget and Federal subsidy to regions
Source: Data provided by UDNP Ethiopia

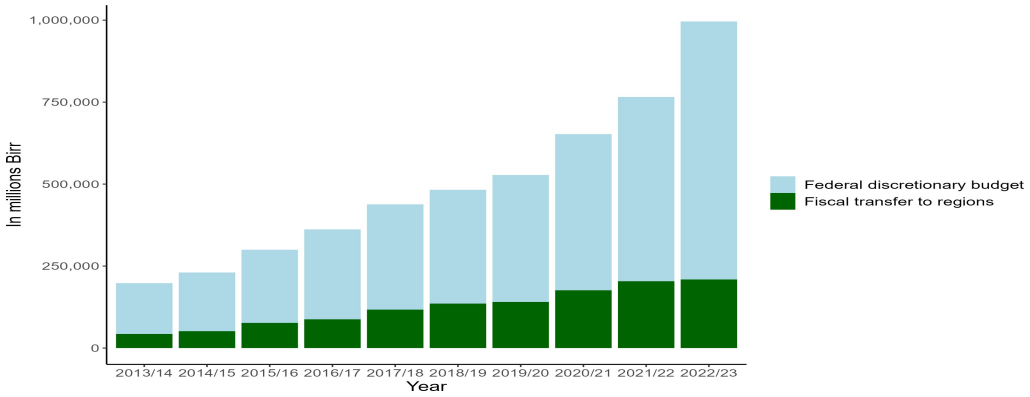


Figure 2: Sources of finance for the federal budget, 2017/18–2021/22 (Birr in Billion).
Source: UNICEF (2021)

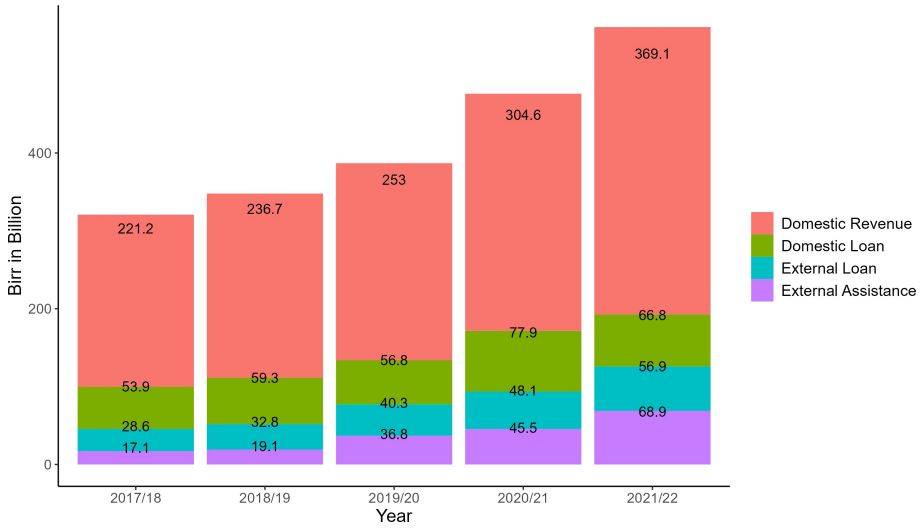


Figure 3: Revenue ratio by government level (In ratio). Source: Ministry of Finance, Ethiopia

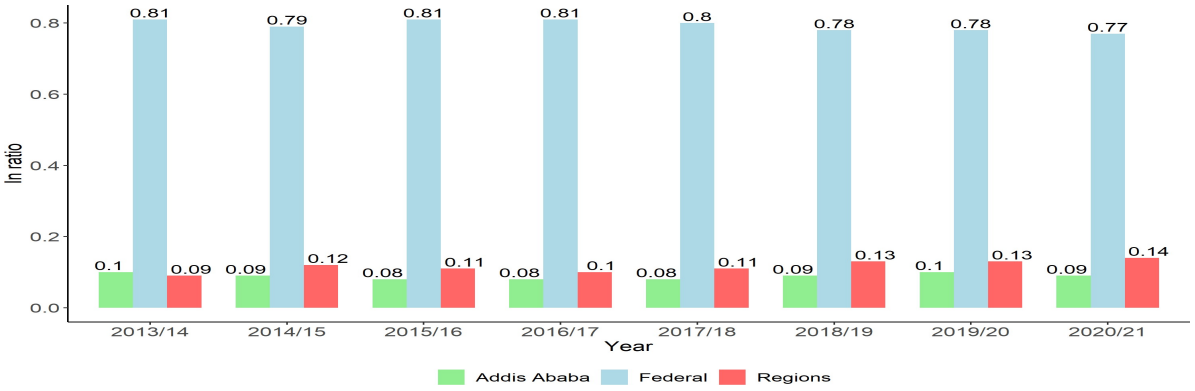


Figure 4: Expenditure ratio by government level (In ratio). Source: Ministry of Finance, Ethiopia

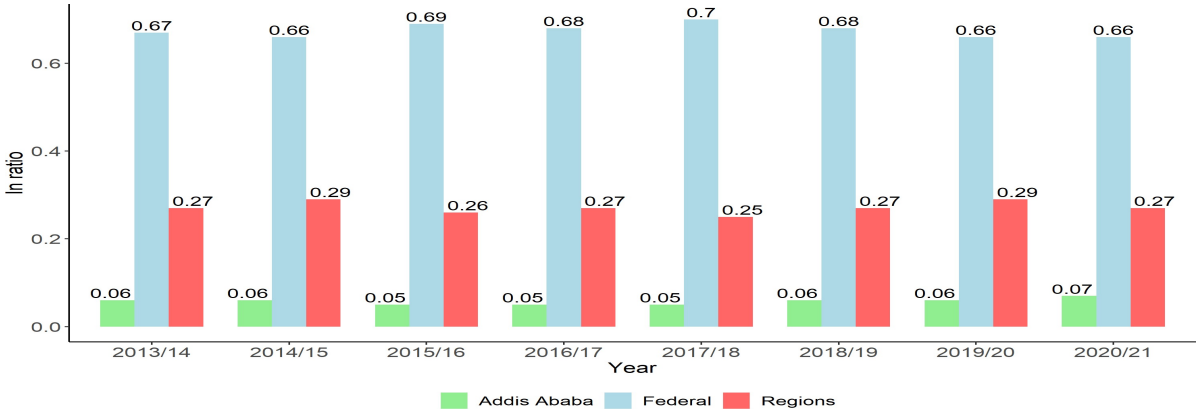


Figure 6: Relationship between the average population of Regions and per capita fiscal transfer, 2013/14-2016/17.

Source: UNDP, Ethiopian Statistical Services (ESS) and Ministry of Finance

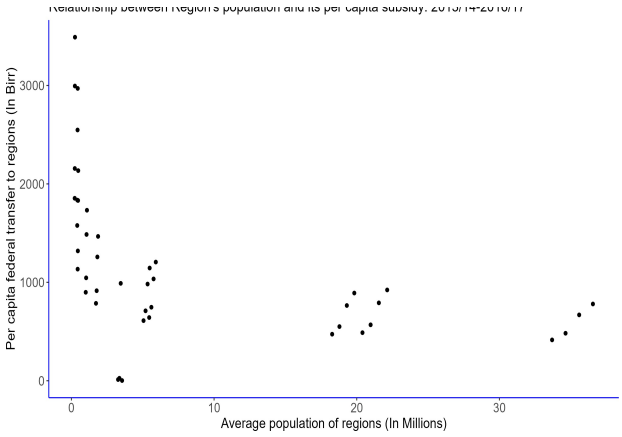
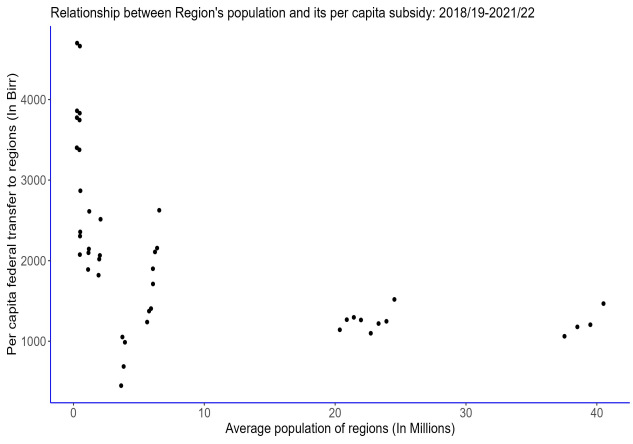


Figure 5:Relationship between the average population of Regions and per capita fiscal transfer, 2018/19-2021/22.

Source: UNDP, Ethiopian Statistical Services (ESS) and Ministry of Finance



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Data Availability Statement

The data that support the findings of this study are available from the corresponding author, Henok Fasil Telila, upon reasonable request.

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