RESEARCH ARTICLE

▪ Vol. 5, No. 1 (Winter 2024)
▪ p-ISSN: 2791-0237
▪ e-ISSN: 2791-0202
▪ Pages: 141 – 157
▪ DOI: 10.55737/qjss.910387224

Open Access

QLANTIC JOURNAL OF SOCIAL SCIENCES

Analysing the Impacts of Fiscal Decentralisation on Public Services Delivery: Evidence from Health Sector in Pakistan

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Abstract: *Delegation of power can of political, social and fiscal authority and all the three has been considered an important policy reform to achieve high growth, better delivery of services and stabilize the macro uncertainties in economy. Among the three types of decentralization, this study was conducted to assess the fiscal aspect of decentralization and its impacts were analyzed on public services deliveries, which is one of the core objectives of power delegation. Pakistan was taken as a sample case. Annual time series data spanning from 1974 to 2021 were sourced from both the World Bank and the economic survey of Pakistan. Fiscal decentralization was measured through fiscal transfers and vertical balances while public services were proxy through health sector. In health sector this study took infant mortality rates because of the ways availability of data. Per capita GDP, Rural-Urban ratio and health expenditures were taken as a control variable. The results were extracted through ARDL and it was found that between the two proxies of fiscal decentralization, fiscal transfers is more effective than vertical balances and therefore it was suggested that government may increase the share of provinces to further improve the delivery of public services in Pakistan.*

Key Words: ARDL, Health, Fiscal Transfers, Infant Mortality, Public Services, Vertical Balances

Introduction

Since the last few decades fiscal decentralization became the world-wide reform agenda, as it is assumed that fiscal decentralization will boost up the economy plus public services may both improve, be delivered compare to the central government. Fiscal decentralization (FD) is a main component of devolution/decentralization where responsibilities are transfer, Regarding the policies of governments at lower tiers, specifically those of subordinate or lesser authority are formulated in such a way that reflects the interest and preferences of the residents. As it brings the government closer to the masses therefore it is believed that if local governments and private organizations are fully authorized, they will be allowed to collect sufficient income, which may be generated locally or transferred via the government of center. It also gives the authority to local governments to make decisions relevant to their expenditures by themselves. Because population with in a country is different on many bases like culture, language etc. therefore it seems necessary to give some sort of control toward the masses the nation's economic and political decisions making so that they can directly involve in the decision making and development of a country. Although in most countries the main force behind decentralization is politics but with good economics the same purpose can best be served as viewed by Bird et al. (1995), who argue that through fiscal decentralization the lower governments are empowered by their head government to perform certain economic activity in their locality. This given authority is of fiscal responsibilities with fiscal instruments and procedures to deliver public goods to the masses. Similarly, Bird and Wallich (1993) said that Fiscal Decentralization enhance efficiency of the governments through Generating competition amongst them

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▪ **To Cite:** Riaz, S., Khan, S. U., Khan, A. U., & Khan, H. U. (2024). Analysing the Impacts of Fiscal Decentralisation on Public Services Delivery: Evidence from Health Sector in Pakistan. *Qlantic Journal of Social Sciences*, 5(1), 141-157. https://doi.org/10.55737/qjss.910387224

and thus the overall the economy is growing, and public service performance is improving. Davey (2003) is of the view that fiscal decentralization concern with, a- sharing of expenditure responsibilities and revenue sources amongst different level of government. b- Choice of the local governments to decide and allocate their revenues and expenditures by themselves. He further said that to finance their expenditures the local governments must have their own revenues and it does not matter from where it comes.

When the decision-making power is transferred to the local governments, they are supposed to provide; Primary Healthcare, Sanitation, Local Roads etc. and is rightly portrayed by Oates (1999) that fiscal decentralization can be in form of user charges, e.g., a) Charging fees for educational tuition, road tolls, and park recreational use. b) Creating regional income through taxation, such as income tax. c) Intergovernmental transfers that redirect overall tax-derived revenues from the central government to local governments for both general and specific purposes, commonly denoted to as (similar) grants.

The literature so far written on fiscal decentralization goes for both in favor and against it. Those who favor fiscal decentralization are of the view that as it helps in bringing competition therefore it is a source of innovation in the market. Second, fiscal decentralization brings a chance for the persons to be involved in the decision thus they are willing to pay for the services. Third, it enhances economic growth because once the public expenditure decision is made by lower governments it will consider the interest of the masses to whom these governments are closer thus there will be more demand for local services compared to the central governments. Fourth, as the general masses are involved in the decision making so the monitoring system will improve and thus the governments will become transparent in its affairs. The opponents of fiscal decentralization are of the view that by decentralizing the fiscal responsibilities there is a fear of destabilization of public expenditure and debt policies as the implementation of these policies will become difficult if the decentralized system is not designed in a best manner.

Today Fiscal Decentralization became the integral part of reform agenda throughout the world and is supported by the main donor agencies like World Bank, USAID, the Asian Development Bank, besides many others. The Western European countries in the second phase of the 20th century bring some institutional changes to the government set up and thus redistribute the territorial power. As a result of this, new set up is established so elected and sometime legislative powers emerged (UK, Spain, Italy, France, Belgium, and Portugal), local governments are strengthened, especially in the Scandinavian countries (Engel,C et. al. 1993). Many countries in the world go for decentralization. In developing countries: e.g. Moldova; Uganda; Indonesia; Philippines; also gone for fiscal reforms where these governments transfer some of their fiscal responsibilities to their lower governments. In transition economies e.g. Czech Republic and Slovakia; South Africa, new lower tiers of governments were formed and their central governments devolve their fiscal and political responsibilities to these new level of governments (Bryson et al. 2000).

In Latin America fiscal decentralization was consider as a process of democratization and thus the elected governments replace the autocratic governments and under the new constitution these elected governments start their functions. In Africa, as the multiparty system emerges, the demand for decision making at local level increases. In Ethiopia, ethnic groups demand for their role as a decision maker give way to decentralization. Sometimes decentralization became possible because of the civil wars, like in Mozambique and Uganda, where at local level, there are enough opportunities for the former warring parties to take part in politics and govern the country. In East Asia it is viewed that fiscal decentralization helps to improve the public service deliveries therefore the country has to be devolved its fiscal responsibilities. In India in 1992 some amendments (73rd/74th) were bring in the constitution and thus a third tier of governments were formed (M.A. Oommen, 2020) China, starting from the late 1970s, Pakistan has undergone multiple rounds of fiscal reforms aimed at achieving decentralization within its fiscal system and enhancing fiscal management. (World Bank 1990). In Pakistan various attempts has been made to decentralize the financial powers to bore the outcomes associated with it. National Finance Commission (NFC) awards were formulated to ensure fair distribution of resources amongst the lower tiers of government. As per 1973 constitution Article 160, NFC meeting should be held after every five years. (Ahmed et al. 2007) Here, the financial resources of the country (Pakistan) are distributed by the federal/central government amongst the provinces on the basis of this (NFC) formula. Each province's taxes are combined and, on the basis of this NFC formula, are redistributed.

Based on the above discussion, the conduction of current deemed necessary as it is clear that i. Fiscal decentralization had a theoretical background and therefore need to be tested empirically. Second, most of the research has been done with respect to developed countries and ignore the developing countries. Third, no common consensus exists about the impacts of fiscal decentralization amongst the researchers. Fourth, the level of government selected for the study varies greatly. Fifth, In Pakistan NFC awards are always a hot and debatable issue, so its impacts on economy of Pakistan especially with respect to public services have to be checked empirically. Sixth, In case of Pakistan the fiscal decentralization has been scarcely investigated, very few studies have been conducted on this topic.

Literature Review

Impacts of Fiscal Decentralisation on Socio-economic Variables

Marius R. Busemeyer (2007) analyzed fiscal decentralization and education nexus in OECD economies from 1980 to 2001 where it was found that fiscal decentralization improve the efficiency of sampling economies at lower tiers while opposite were the case at upper tiers.

David A. Robalino et al. (2001) assessed the health sector response in decentralization of powers. The panel of low and high income economies in OECD were focused to complete the analysis. The data were taken from 1970 to 1995. It was found that increase in the delegated powers leads to better delivery of health services in shape of decrease in infant mortality.

Abay Asfaw et al. (2004) focused on Indian economy to empirically investigate the impacts of decentralized powers on health sector over the period of 1990 to 1997. Being the one of the largest democratic nation the findings of this study were supposed to be of much importance and it evident that here too decentralization of power helps in decrease of infant mortality rates in India.

Sun Xiaoli (2007) analyzed the underlying hypothesis in education sector of China from 2002 to 2004. Amongst the different regions of China, wealthier, the effects of decentralization of financial power were found satisfactory while it create disparities in relatively poorer regions.

Similarly, Hiroko Uchimura and Johannes Jutting also focused on China to analyze the FD and health sector relationship over the period of 1995 to 2001. Like Xiaoli (2007), they also found that the response in wealthier regions were positive as compared to poorer countries.

Nobuo Akai et al. (2007) analyzed US economy to assess the impacts of FD on education sector. A panel of 49 states of USA were selected for the analysis to focus education sector at secondary and primary levels. Surprisingly, at secondary level FD helps in improving the efficiency of education sector while at primary level the results were not found satisfactory.

Cristian F. Sepulveda and Martinez- Vazquez, (2010) analyzed the poverty and FD and income inequality troika in a selected panel countries. The sample period was extended from 1971-2000. Poverty was found to be reduced by delegation of powers and similarly income inequality was found to be narrow down by FD.

Meghan Skira (2006) selected 200 economies over 1965-2004 to assess poverty and decentralization nexus. The results evident that fiscal decentralization reduce poverty in these economies selected for this study.

Hoang Phuong Nguyen focused on Vietnam economy to explore the impacts of fiscal decentralization. This study covers the period from 2002 to 2004. A total of 64 cities and provinces were selected for the study and results revealed that poverty can be reduce by decentralization of powers to local governments.

Christian Lenman and Gunther Markwardt, (2010) found that a nation having press freedom experience less corruption practices while opposite were the case in counties with less press freedom.

Impacts of Fiscal Decentralization in Pakistan

Malik et al. (2006) conducted a study for Pakistan to analyze the growth and decentralization relationship in the period of 1972 to 2005. In this time series study, t was found that the results are not conclusive as extended from positive to negative but statistically insignificant.

Naeem et al. (2010) analyzed fiscal decentralization in Pakistan. Time series data spanning from 1980 to 2007 were employed to capture the impacts of fiscal decentralization in Pakistan. In the light of their empirical study on FD with respect to Pakistan they concluded that the revenue distribution of resources mechanism has historically failed to impact economic growth positively in the long run therefore the criteria for resource redistribution must be expanded by include parameters for tax collecting efficiency, infrastructural lag, and geographic region.

Ijaz Hussain and Sumbal Rana (2010) examined the comparison of fiscal efforts by the provincial governments in Pakistan using the data from 2000 to 2010 and their study showed that Punjab has highest fiscal efforts while Sindh in the last decade varied and overall index of Sindh dropped to 0.76 in 2010. Khyber Pakhtunkhwa fiscal efforts also declined while Baluchistan showed no improvements.

Tahir Sadiq (2010) tested the causality between revenue and expenditure of federal and provincial governments of Pakistan and select the period from 1980-81 to 2009-2010 for conducting this study and found that there is no strong causality in either direction between tax revenue and expenditure; therefore, they conclude that the fiscal management in Pakistan is weak.

Naeem Iqbal and Wasim Shahid Malik (2010) analyzed budget balance through revenue and spending adjustment in Pakistan. They used the data from 1961 to 2008 and concluded that in the instance of Pakistan, the budget is balanced by either borrowing or monetizing the deficit. Neither Revenue nor Expenditure are adjusted to response to increase fiscal deficit while the behavior of government expenditure and revenue are independent of each other.

Rashid and Sadiq (2010) analyzed human development with respect to Pakistan. They used the data from 1976 to 2009 and concluded that the effects of fiscal decentralization boost human development in Pakistan by creating unity among all the provinces to strengthen the federation of a country.

Fazal H. and Qasim, M. A. (2010) using the data from 1978 to 2009, analyzed the fiscal decentralization and revealed that a unidirectional causality that run from expenditure to revenue existed in Pakistan. Which mean that it is the expenditure that create revenue and therefore government should increase expenditure to create revenue for further financing..

M. Z. Faridi (2011) assessed the role of FD in growth of Pakistan over the period of 1972-2009.by using ARDL approach, it was found that fiscal decentralization helps in boosting the growth pace of Pakistan. Both the proxies of decentralization were found significant and therefore a complete decentralization was suggested.

Shiraz et al., (2012) analyzed delegation of power to a third tiers of governments in Pakistan. In this tudy the authors selected three districts of Sindh province and found that fiscal decentralization better serve the health sector and therefore they stressed on more fiscal autonomy of the provinces.

Ahmed and Lodhi (2013) undertook a study that centered on investigating the influence of fiscal decentralization on healthcare outcomes. Their research unveiled a favorable association between fiscal decentralization and health results across various provinces of Pakistan. The investigation also highlighted variations in the extent of fiscal decentralization in the health sector, with Baluchistan and KPK displaying relatively weaker levels compared to other provinces. In contrast, Punjab and Sindh exhibited more successful fiscal decentralization in healthcare, attributed to enhanced fiscal capacity and infrastructure development. Additionally, the study emphasized the beneficial role of effective governance in promoting fundamental healthcare.

In 2015, Hanif and Chaudhry conducted an investigation into the impact of foreign direct investment (FD) on state investment in Pakistan, utilizing data spanning the period from 1972 to 2013. Their study unveiled a significant connection between FD and public investment, asserting that the level of investment in public sectors is positively influenced by the degree of autonomy possessed by provincial administrations. The authors of the study highlight the potential of FD to contribute significantly to the advancement of the public sector.

Similarly, Rauf (2017) explored the repercussions of FD on Public Service Delivery (PSD) in Pakistan, specifically focusing on gross primary school attendance, using data from 1972 to 2009. The study's findings underscored the positive role of decentralization in enhancing school attendance rates.

Usman's (2021) utilized the ARDL model to explore the implications of fiscal decentralization on the educational quality within Pakistan, spanning the years 1970 to 2019. The study assessed education quality using the teacher-student ratio, and decentralization was gauged through indicators like expenditure decentralization and revenue decentralization. The study's results indicate that, while the decentralization of expenditure doesn't enhance education quality, revenue decentralization positively contributes to raising the educational standards in Pakistan.

Naeem, Farid, Ferrer, and Shahzad (2021) expanded upon the analysis of the relationship between fiscal decentralization (FD) and effectiveness in the realm of Public Service Delivery (PSD). They conducted a more comprehensive exploration of Examining how fiscal decentralization impacts the balance between genders in the realm of education within Pakistan. Utilizing the ARDL bounds test method to assess cointegration, the study's results indicate a substantial role played by fiscal decentralization in advancing gender equality within Pakistan's educational sector. These findings corroborate the conclusions drawn by Naeem and Khan (2021) for a group of 29 developing economies.

All the cited literature is although highlighted the importance of fiscal decentralization for public services deliveries but still there is a lack of consensus over the outcomes of power delegation to lower tiers. Therefore, the current study will attempt to explore the impact of fiscal decentralization on Pakistan's healthcare sector. The current study while using the most relevant methodology by borrowing a model from Abay Asfaw et al. (2004), will be a useful contribution to the literature. This study also contributes by taking the latest data on Pakistan to capture The extent of fiscal decentralization's influence within Pakistan's health sector.

Methodology

Theoretical Model

Suppose a state planner want the better delivery of the public services in a region. We hypothesize that the delivery of the public services is a function of fiscal decentralization and economic performance of the region. Now suppose that the closer the authorities to the inhabitants, the efficient will be the allocation of resources and the supervision will be easier. Thus, the public services deliveries can be improved. Furthermore, we assume that the structure of the economy and the total budget allocation are exogenous to a planner. Now the efficient allocation of this decentralized budget can ensure the better delivery of the public services. Mathematical specification of the model can be made as;

$$PS = \phi\ (\theta_t + \phi_t) \ldots\ldots\ldots\ (1)$$

Where:

PS are the public services outcomes, θ_t is a vector of economic indicators in a province of state at time t. Φt is the expected public services effect of fiscal decentralisation at a given time t.

We suppose that the direct impacts of fiscal decentralisation on public service deliveries cannot be observed and expect that it depends on the total amount of budget to be decentralised and efficient utilisation of the budget. From that, it can be said that improved deliveries of public services depend on i)- economic structure, ii)- the amount of budget, and iii)- the use of the budget. This assumption makes sense as there is the possibility that fiscal decentralisation may not improve the deliveries of public services, and also, the capacity of the provinces for optimal utilisation of the budget may vary considerably.

From the above assumption that has been made, it can be said that Φ_t depends on the total amount of the allocated budget and on the utilisation of the budget.

$$\Phi_t = [\ D_t, f\ (D_t, \omega_t)] \ldots\ldots\ldots\ 2$$

D_t is the amount of allocated budget, and ω_t represents the variables that may show the capacity of the province to efficiently use the budget.

By substituting equation 2 in equation 1, we have,

$$PS = \Phi\ [\theta t, \Sigma{=}1\ \{Dt, f(Dt, \omega t)\}] \ldots\ldots\ldots\ 3$$

We further assume that ϕ and f are continuous and twice differential functions and

$$\frac{\partial PS}{\partial D} = \frac{\partial \Phi}{\partial D} + \frac{\partial \Phi}{\partial f} * \frac{\partial f}{\partial D} \text{ ..... } 4$$

Here "∂PS/∂D" is the Public Services deliveries affected by fiscal decentralization. Because fiscal decentralization is expected to optimally use the available resources therefore, we expect that ∂Φ/(∂D)will be positive. ∂Φ/(∂f)*∂f/∂Ddepends on social characteristics of the locality therefore its impacts are uncertain which mean it may be negative and may positive. The intuition behind is that decentralization may not improve health unless the capacity of the local decision makers in allocating and managing the decentralization resources is better than that of the state authorities. These show that the impacts of fiscal decentralization on public service deliveries are uncertain. Which mean it may be positive or negative or even zero. The case will show negative impacts if the inefficiency in public services is higher than those benefits when the power is transferred to the local entities. So, it can be said that fiscal decentralization impacts on public services deliveries is a function of decentralized budget and local entities efficiency to use the budget. There the planner would maximize,

$$\text{Max.}_{Dt} = PS_t = \Phi\,[\theta_t, \textstyle\sum^{N}_{j=1}\{D_t, f(D_t, \omega_t)\}] + \lambda\,[Y - \textstyle\sum^{N}_{j=1} D_t] \text{ ..... } 5$$

Here in the above equation "Y" stands for decentralized budget, and λ stand for the impacts of the decentralized budget on Public Services. If the the above equation satisfies the relative maxima condition, then there would be enough budget to be decentralized so that to ensure the better delivery of the public services.

By using the first-order Taylor expansion, say at point $D_{0,}$ our equation 3 become,

$$PS = \frac{\phi(D0)}{0!} + \frac{\phi * (D0)}{1!}(D - D0)$$

$$= \Phi\,[\theta t, \textstyle\sum^{N}_{j=1}\{D_t, f(D_t, \omega_t)\}] + \frac{\partial \Phi}{\partial D} + \frac{\partial \Phi}{\partial f} * \frac{\partial f}{\partial D}(D - D0)$$

$$= \Phi\,[\theta t, \textstyle\sum^{N}_{j=1}\{D_t, f(D_t, \omega_t)\}] - \frac{\partial \Phi}{\partial D}(D0) + \frac{\partial \Phi}{\partial f} * \frac{\partial f}{\partial D}(D0) + \frac{\partial \Phi}{\partial D}(D) + \frac{\partial \Phi}{\partial f} * \frac{\partial f}{\partial D}(D0)$$

$$= \alpha + \beta_0 D + \gamma D\,\omega t \text{ ..... } 6$$

Econometric Model:

$IMR_t = \text{constant}_t + \beta_1 FT_t + \beta_1 PGDP_t + \beta_2 RUR_t + \beta_3 HE_t + \beta_3 VB_t + \varepsilon_t$ 7

IMR: Immortality rate
FT: Fiscal transfer
PGDP: Per capita GDP
RUR: Rural-urban ratio
HE: Health expenditure
VB: Variable balance

Estimation Strategy

Autoregressive Distributive lag model is used in this study to estimate the long run cointegration amongst the variables taken for the conduction of this study. The application of ECM will estimate the short run dynamics in the model. The cointegration analysis is conducted as it will explain that a variable might have the trend in itself but when join with other variable it will move together and show some relationship.

Concept of Stationarity

In case a random process has constant mean and variance while the covariance does not rely on the actual time period on which it is calculated, then this random process is called stationary (Gujarati 2003). The time series is checked for unit root because if the time series have a unit root then in such case the estimated results will be biased/ spurious and misleading (Khan et al., 2023). Therefore before the estimation of any time series it has to be checked for unit root. In case there is unit root in the time series then it can be eliminated by taking first difference and if still persist then go for another difference until the unit root is eliminated from the time series. There are various techniques that are used for the investigation of the unit root analysis but we will employ the ADF test.

Augmented Dicky Fuller test estimates the following;

$$dYi = constt. + \varphi Yi - 1 + \sum_{j=1}^{p-1} \omega j dYi - j + \varepsilon i \dots \dots \dots i$$

Here, the ε is the error term and $dY_{i-j} = Y_{i-1} - Yi\text{-}2$
In the case of having a time trend, the general form is,

$$dYt = constt. + \alpha 1t + \varphi Yt - 1 + \sum_{j=1}^{p-1} \omega j dYt - j + \varepsilon t \dots \dots \dots i\, i$$

In equation "ii" "t" stands for time trend and our null hypothesis in such case is φ=0. The rejection of the null hypothesis indicates that their series is stationary.

Cointegration Concept

It is viewed that the time series has a changing pattern over a time and this change some time is stable one while it may be unstable during the course of time. The unstable pattern is called the non-stationary while the stable one is stationary. As stated earlier that the estimation of non-stationary series will provide spurious results thus it has to be made stationary. To attain stationarity for a non-stationary variable, it involves the process of differencing the specific variable or time series. The number of differencing steps determines its order of integration, e.g. we have a variable which became stationary after taking the difference two time then this particular variable is integrated of order 2 or I(2). The cointegration increases the series from univariate to multiple. In case where the linear transformation of the two or more variable is become stationary then it is called cointegrated. The equation of the cointegration shows long run relationship amongst the variables and the error correction mechanism shows the behavior of the variables in a short span of time.

Several methodologies are employed to analyze cointegration in the model. These include the Engle and Granger two-stage cointegration approach (1987), the Johansen and Juselius cointegration approach (1990). The study utilized the Autoregressive Distributive Lag (ARDL) model, commonly known as the Bound test for cointegration, as a fundamental analytical framework. This approach offers a comprehensive method to assess the relationships among variables and ascertain their long-term associations. The approach which is particularly effective is Engle and Granger, when dealing with two variables. On the other hand, the Johansen and Juselius approach requires a larger dataset and assumes that the variables under consideration share the same level of integration. In cases where the sample size is limited and the integration orders of variables differ, the Autoregressive Distributive Lag model becomes applicable. This specific scenario aligns with the circumstances of the present study.

Co-integration Analysis

In this study, cointegration analysis is conducted using the Autoregressive Distributive Lag model, which was developed by Pesaran et al. (2001) and is also commonly known as the boundary testing procedure for cointegration. This particular technique is selected for the cointegration analysis because of the following reasons;

1. It is simple and easy to use. Once the order of integration is known, then the cointegration analysis can be made by applying OLS.
2. This technique does not need to go for the test of unit root analysis. It can be applied whether the variable has the same order of integration or has a different order of integration.
3. It provides better results even if the sample period is small.

A notable limitation of this approach arises when the variable's order of integration surpasses 1, denoted as I(1), rendering its applicability invalid

Application or steps of ARDL/Bound Test

The process of bound testing can be carried out through a sequence of three distinct steps;

a). Assessment of Long-Term Relationship: In this phase, an examination of the long-term relationship is conducted to determine the presence of cointegration within the model. This determination is based on the F-test, which evaluates the collective significance of coefficients related to lagged levels of the variables, as exemplified here

$$dzt = constant + \sum_{i=1}^{p} \beta i dzt - i + \sum_{i=0}^{p} \gamma i dMt - i + \vartheta 1 zt - 1 + \vartheta 2 Mt - 1 + \mu t$$

In the above model, "z_t" and "M_t" are the two variables amongst whom the cointegration has to be checked.

The hypothesis under consideration in the aforementioned scenario is the null hypothesis;

$$HN : \vartheta 1 = \vartheta 2 = 0$$

$$HA : \vartheta 1 \neq \vartheta 2 \neq 0$$

Now to know the cointegration in a longer period of time we go for the application of bound test. In this context, the F-test is applied to evaluate the collective null hypothesis that there is no long-term cointegration present within the model. We will check that at what series the variables are integrated, are they integrated at level, or they integrated at first order. Second we will see that how many regressors we have in our model. Next, we assess whether the model is constructed solely with an intercept or if it incorporates a trend. Critical values are computed for two scenarios:

A. when the order of integration is zero, and

B. when the order of integration is 1 or when both orders of integration, 0 and 1, are present. After confirming the above stated steps and once we get the value of the F-statistic, now we will compare this F-statistic with the tabulated value of the F-statistic for making the decision for the absence or presence of long run cointegration. If the calculated value of the Wald statistic (F-statistic) exceeds the upper bound value of the tabulated F-statistic at 5% level of significance then that means that the long run cointegration exist while in case the calculated value is found less than the lower value then it is the acceptance of the null hypothesis for the absence of long run cointegration, and in such a case where the value lies in between the upper and lower tabulated values of the F-statistic then this is the case of inconclusiveness which means that one should not be sure whether the long run relationship exist or not (Pesaran et al. 1999, 2001).In the second step of the application of the ARDL, the long-run coefficients of the suggested model are estimated by the use of the Ordinary Least Square technique.

$$zt = Cpnstant + \sum_{i=0}^{p} + \vartheta 1 zt - 1 + \sum_{\mathbf{i=0}}^{\mathbf{p}} \vartheta 2 Mt - 1 + \mu t$$

Here $\vartheta 1, \vartheta 1$ are the long-run coefficients in the above model.

C. In the final stage, estimation of the error correction model is undertaken to show the short-term dynamics. This involves formulating an Error Correction specification derived from the implied ARDL specification, achieved through a linear transformation.

$$dzt = constant + \sum_{i=1}^{p} \beta i dzt - i + \sum_{i=1}^{p} \gamma i dMt - i + \mu t$$

In the above model $\beta i, \gamma i$ are the short-run coefficients.

Error Correction Mechanism

In 1964, Sargan introduced the Error Correction Mechanism, which primarily addresses the proportion of imbalance within the model, necessitating correction from one period to the subsequent one (Engle and Granger, 1987). Time series data typically exhibit non-stationarity at the base level (Gul et al., 2023). To go through the process of stationarity it may loss degrees of freedom. Thus, to avoid this fear the ECM is applied which by using the traditional estimation methods do not lost the degrees of freedom. In this context, the assumption is that once a series is found to be cointegrated, this long-term cointegration should endure, as elucidated by the Error Correction Mechanism (ECM). The ECM is represented by a generalized formulation, which can be expressed as follows;

$$\Delta Zt = \beta \Delta Mt - \varphi(Zt - 1 - \delta Mt - 1) + \varepsilon t$$

Here ε is the error term which has the property of zero mean and covariance and the constant variance. "φ" Shows the speed of adjustment in Z and it is usually having negative sign which indicate the direction of adjustment that will be restored the long run equilibrium (Hallam and Zanoli, 1993). "β" show the short run effects of the changes in M that can affect Z.

$$Zt = \delta Mt + \varepsilon t$$

The application of the ECM is preferable because; it avoid autocorrelation because of the presence of the error term, as it estimate the short run and long run effects therefore the parameters estimation is consistent, as error correction mechanism run when all the variables are stationary therefore no information can be lost and finally as the trend affects are eliminated therefore the results are bias, Granger and Newbold (1978).

Stability Test

This study employs the Recursive and Cumulative Sum (CUSUM) test to assess the stability of the long-term coefficients. This test, originally introduced by Brown, Durbin, and Evans in 1975, relies on recursive residuals and serves as a valuable tool when confronting potential structural changes in time series data. It operates under the assumption that the coefficient vector "α" remains constant over a defined time frame. One significant advantage of this test is its ability to detect instability without requiring prior specification of when a structural break might occur (Gul et al., 2023).

The test involves establishing two error boundaries for the residuals. If a residual falls within these boundaries, the model is considered stable. Conversely, if a residual exceeds these boundaries, the model is indicative of instability. These two limits span from -2 to +2.

Diagnostic Tests

This study entails the execution of four diagnostic assessments,

1. To check the serial correlation, this study employs the Lagrange Multiplier test. When there is correct identification of the variables, then the LM test is the better choice. This test was developed by Breusch-Pagan, who devised the LM test. In the scenario of homoscedasticity, the chi-squared distribution of the LM test is constrained, with degrees of freedom corresponding to the total number of variables. One of the advantages of this test is that it is sensitive to the normality assumption. Koenker and Bassett (1982) believe that LM estimates the robust variance of ε^2, Gujratee (2003).
2. To assess the functional structure of the model, this study will employ Ramsey's RESET test, employing the squared values of the fitted data points
3. The assessment of normality in the model is conducted using the Jarque Bera test. This involves calculating the skewness and kurtosis of the Ordinary Least Squares (OLS) residuals. The Jarque Bera test is a joint hypothesis test in which the null hypothesis assumes that the residuals follow a normal distribution, while the alternative hypothesis suggests the opposite. The calculated test statistic adheres to a Chi-Square distribution characterised by 2 degrees of freedom. Should the resulting "p" value be small, it leads to the rejection of the null hypothesis, whereas a higher "p" value results in the acceptance of the null hypothesis (Jarque and Bera, 1987).
4. Heteroscedasticity is examined using the White test, which enables the estimation of consistent variance and standard errors. This facilitates statistical inference regarding the actual parameters of the model, Gujratee (2003).

All the diagnostic tests mentioned above are readily available within the Microfit software, eliminating the need for additional effort when conducting these assessments.

Data

Public services can be measured by various ways and health sector is one of these dimensions through which literature measure public services. Different variables have been used by previous studies where infant mortality is one of them selected for the conduction of this particular study. We take Infant mortality because of; easy availability of data and its sensitivity in a response of policy change. The current study cover the period from 1974 to 2021 and to test the underlying hypothesis we used annual data collected from various sources. Public Services are measured through infant mortality rates and its data are taken

from various issues of economic survey of Pakistan. Similarly, the data on the proxies of fiscal decentralization e.g. vertical balances and fiscal transfers are also taken from the various publications of Economic survey of Pakistan. Data on health expenditure, rural-urban ratio and per capita GDP are taken from World Bank (WDI).

Table 1

Definition and source

Variable	Source	Definition
Fiscal Transfer as a percentage of Total State Expenditure (FT)	Economic Survey of Pakistan	This the amount transferred by the central government to the provincial government on the basis of various criteria which is set by the N.F.C. commission, and we take it in the form of %age of total state expenditure.
Vertical Balances (VB)	Economic Survey of Pakistan State Bank of Pakistan	This is the provincial expenditure divided by the provincial revenue
Infant Mortality Rate (IMR)	State Bank of Pakistan	Per 1000 Live Births
Rural-Urban Ratio (RUR)	World Bank (WDI)	Rural / Urban
Per capita GDP (PCGDP)	State Bank of Pakistan	Nominal Form
Health Expenditure (HE)	World Bank (WDI)	Percentage of GDP

Results and Discussion

Correlation Analysis

The correlation matrix serves as a condensed representation of data, providing correlation coefficients between various random variables for more sophisticated analyses. The outcomes of the correlation matrix, presented in Table 1, demonstrate the absence of perfect collinearity among the chosen variables investigated in this hypothesis. The summarised results can be found in Table 1.

Table 2

Correlation matrix

	VB	FT	IMR	HE	PCGDP	RUR
VB	1.000	0.4832	0.3198	0.7361	0.6925	0.2741
FT	0.4832	1.000	0.5231	0.6549	0.7569	0.3964
IMR	0.3198	0.5231	1.000	0.8120	0.3274	0.1748
HE	0.7361	0.6549	0.8120	1.000	0.2847	0.1173
PCGDP	0.6925	0.7569	0.3274	0.2847	1.000	0.2371
RUR	0.2741	0.3964	0.1748	0.1173	0.2371	1.000

Lag Length and Criteria Selection

The table provided below illustrates the criteria used for selecting the appropriate lag length for the analysis. The outcomes displayed in Table 2 indicate that, for our analysis, the Akaike Information Criteria at lag one emerges as the most suitable criterion.

Table 3

Lag length criteria table

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-283.92	NA	7159.62	32.46	32.72	32.93
1	-301.71	17.37	2116.528	28.84	29.81	28.76
2	-284.84	145.56	972.31	28.67*	29.76	28.73

Stationarity Analysis

ARDL application does not need prior test of unit root but having time series data may create a problem of spurious regression because of the presence of unit root characteristics in it and therefore we will test the data for unit root before application of ARDL. Further, it has to be mentioned that ARDL is best suited even in case of mixed order of integration but none exceeding I(2), (Ouattara B., 2004), so to verify that none of our variable has second integration order, it deem necessary to test for unit root. Based on these arguments. We checked unit root of our selected variables like IMR, FD, PGDP, RU and HE. We used our variables in log form.

The unit root analysis is completed in two steps, i.e. once we include the intercept only and then with time and intercept. The results in Table 4.3 suggested that only the proxies of fiscal decentralization like expenditure and revenue were found stationary at level while the rest of the variables were found non-stationary and therefore we opted for difference to make it stationary and found that all the variables that were nonstationary at level were become stationary at first difference. Thus it is concluded that we have mixed order of integration of our selected variables.

Table 4

Unit root analysis at Level using ADF methodology

VARIABLE	INTERCEPT	TREND AND INTERCEPT
*lnRPESE**	-4.6238	-4.6049
*lnRPRSR**	-2.9510	-3.5666
lnIMR	-.9480	-2.9521
lnHE	-1.8494	-2.3270
lnPCGDP	-0.7322	-1.8890
lnRUR	-2.0080	-2.8441

Note: The variables with "" are stationary at level or integrated with order zero, I(o).*

Table 5

Unit root analysis at first difference

Variable	Intercept	Trend and intercept
dlnIMR	-9.4713	-9.2695
dlnRUR	-3.2813	-3.6439
dlnHE	-4.9519	-5.283
dlnPCGDP	-9.0228	-8.9243

Cointegration Exploration

In the sample period taken for this study, it is found that there exist a long run cointegration in all the three selected models. As per Pesaran (2001), if the computed value exceeds the tabular value by 5% level of significance that indicate long run cointegration. Here in case of this study in model 1 where vertical balance and FD are checked for cointegration, it is found that the calculated value (7.52) is greater than the 5% level given by Pesaran (2001). Our second model also evident long run cointegration where we take FT as a proxy for FD and similarly for the third model where both the measures are taken in a single model to jointly analyze the impacts of both the proxies on health services in Pakistan.

Table 6

Long-run cointegration

Model	F-Statistics	Criteria	Decision
F_{IMR}[IMR/VB,RUR,PCGDP,HE,const,]	7.52	AIC	Cointegration
F_{IMR}[IMR/FT,RUR,PCGDP,HE,const,]	1.44	AIC	No-Cointegration
F_{IMR}[IMR/VB,FT,RUR,PCGDP,HE,const,]	1.31	AIC	No-Cointegration

Long-run Estimates

In model 1 as discussed earlier, we estimate the individual impacts of vertical balances on IMR and found it as insignificant in the sample period of the study. In second model, we regress fiscal transfer as a measure of FD and investigate its individual impacts on infant mortality rates. We found that FT reduce infant mortality in Pakistan by 4 percent. In third model where we regress both the measures of FD, it is found that vertical Balances are still insignificant while fiscal transfers come-up with positive response reducing IMR.

The insignificance of vertical balances can be justified on several grounds; sometime the programs are feasible to be launched by the central government so launching it at the provincial level will increase the cost e.g. vaccination, and thus the decentralization became ineffective, lack of management skill at the provincial level also contribute to the ineffectiveness of the devolution attempts to bore fruits (Litvack and Seddon 1999) and corruption because of the lack of proper accountability also contribute to the ineffectiveness of decentralization (Vabraun and Grote 2000).

Amongst control variables, socio-economic characteristics overall impacts are that it will increase the infant mortality rate in Pakistan which is the true picture of the society and it was expected that this particular variable will show positive impacts on the infant mortality rate. There are various reasons behind that e.g. extent of poverty, lack of education, lack of infrastructure, lack of professional and Malnutrition etc all affect the health sector. The overall impact of health expenditure shows that it will decrease the infant mortality rate. Similarly education and Per capita growth are also helpful in the reduction of the infant mortality rate. Health expenditure also helps in minimizing the IMR in Pakistan by 12%.

Table 7

Long Run Estimates

↓EXP/ DEP→	lnIMR (1)	lnIMR (2)	lnIMR (3)
*ln*VB	-.2451 [.642]		-.1320 [.764]
*ln*FT		-.0461 [.003]	-.0013 [.005]
*ln*PCGDP	-.5650 [.000]	-.1232 [.004]	-.0741 [.009]
*ln*RUR	.7610 [.003]	.2239 [.007]	.5431 [.000]
lnHE	-.1286 [.000]	-.0721 [.047]	-.2751 [.009]
Constant	-.2604 [.001]	-.6817 [.000]	-.4089 [.000]
R-Sq	.85	.88	.92
Adj. R-sq.	.71	.80	.83
DW	1.97	2.09	2.21

Short Run Analysis

Our short-run dynamics are different than the long-run estimates. Here, we found that fiscal transfers are insignificant, while vertical balances are significant against infant mortality rates when we regress individually, and both reduce infant mortality when regressed jointly. Therefore, complete decentralisation helps in the short run.

The shock adjustment from the previous year to the current year is suggested by ECM, and in our cases, 13 per cent, 18 per cent, and 21 per cent disequilibrium are adjusted in models 1, 2, and 3, respectively.

Table 8

Short-run analysis

EXP/DEP	ΔlnIMR [Model 1]	ΔlnIMR [Model 2]	ΔlnIMR [Model 3]
ΔlnVB	.0067[.000]		.0057 [.002]
ΔlnFT		-.0143[.121]	-.5620 [.000]
ΔlnRUR	.6984 [.002]	1.3248[.015]	.4327 [.009]
ΔlnPCGDP	-.0021 [.071]	-.0149[.208]	-.0213[.099]
ΔlnHE	-.0532[.003]	-.0533[.005]	-.8123 [.000]
Constant	-.0091 [.053]	-5.2946[.028]	-.2476 [.000]
$ECM_{(-1)}$	-.1340 [.002]	-.1854 [.000]	-.2145 [.000]

Adj.R^2	.67	.52	.82
F-statistic	22.02 [0.000]	9.75[0.000]	16.82[.000]
D.W.	1.98	1.91	2.01

Further, we also check for diagnostic tests to validate whether our models have any econometric issues. The extracted results suggested that our models do not have heteroscedasticity, serial correlation, normality issues and the misspecification problem.

Table 9

Model 1: diagnostic tests

Test Statistic	Chi –Sq.	Value
LM Test	Chi –Sq.	2.82 (.8961)
Ramsey Reset Test	Chi –Sq.	.108 (.627)
JB Test	Chi –Sq.	2.2 (.875)
White Test	Chi –Sq.	.927 (.375)

Figure 1

CUSM and CUSUQ

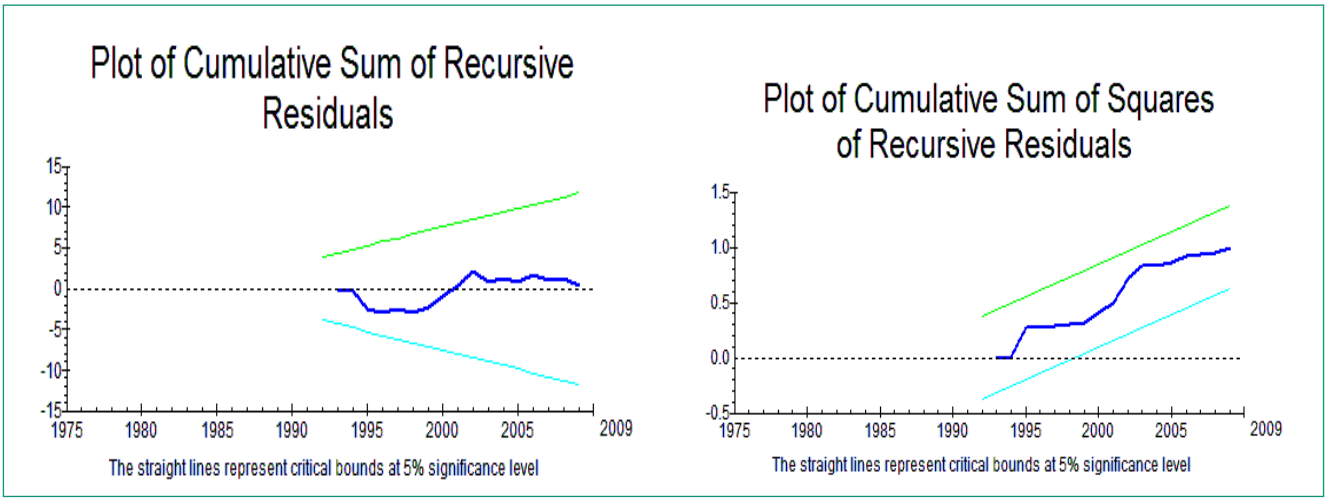


Table 10

Model 2: diagnostic tests

Test Statistic	Chi –Sq.	Value
LM Test	Chi –Sq.	3.91 (.831)
Ramsey Reset Test	Chi –Sq.	1.42 (.856)
JB Test	Chi –Sq.	1.47 (.865)
White Test	Chi –Sq.	2.37 (.932)

Figure 2

CUSM and CUSUQ

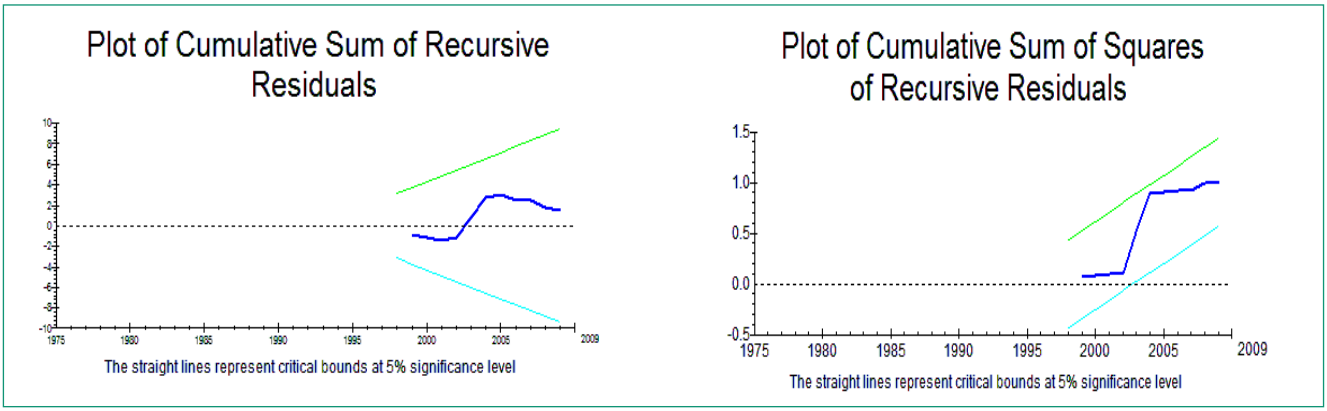


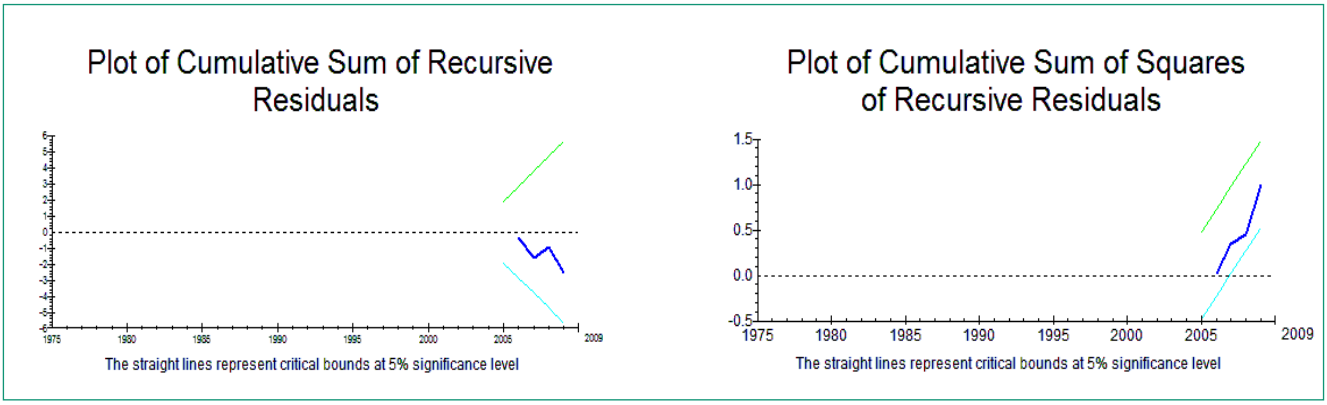
Table 11

Model 3: diagnostic tests

Test Stat.	Chi –Sq.	Value
LM Test	Chi Sq.	4.23 (.569)
Ramsey Reset Test	Chi Sq.	2.363(.813)
JB Test	Chi Sq.	3.754(.749)
White Test	Chi Sq.	4.712 (.571)

Figure 3

CUSM and CUSUQ



Conclusion and Policy Recommendation

Impacts of fiscal decentralization has been studied throughout the world where the main emphasis was given on fiscal decentralization and economic growth relationship while very less attention has been paid to the other dimensions of fiscal decentralization outcomes. This study is designed to cover the important postulates of fiscal decentralization i.e. Provision of public services.

Previous studies used different measures for capturing the impacts of fiscal decentralization and that is one of the reasons that the outcomes varies across country and recommendation given by these researchers are different. This study used Federal transfer as a percentage of total state expenditure and Vertical balances to capture fiscal decentralization. The study selected the provincial level of government and selection of federal transfer as a measure of fiscal decentralization is due to the hot and, most debatable/controversial issue amongst the provinces in Pakistan, National Finance Commission.

In the second chapter, the previous studies that are conducted on fiscal decentralization impacts are discussed and the aim is to get the importance of fiscal decentralization for services provision. The major finding of the second chapter is that the researchers do not agree on the single measure of fiscal decentralization and effects of fiscal decentralization are inconclusive.

The third chapter discussed the theoretical model used in the study for achieving the objectives set for this study. The economic and econometric model is also given. These models are later on used for the empirical analysis of the study. For the unit root analysis, we use Augmented Dicky and Fuller tests while for the empirical analysis we employ Autoregressive Distributive Lag model in the study. In this process, our initial focus is on identifying the presence of long-term cointegration. Subsequently, we proceed to estimate the coefficients pertaining to the long-term aspects. Moving forward, the third step involves estimating the dynamics in the short run. Additionally, we delve into stability tests, including LM tests for detecting serial correlation, JB tests to assess normality, and White tests to examine heteroscedasticity.

In chapter four of the study we interpret the results which we get from the empirical study of the data. First we check the individual impacts of the fiscal decentralization measures and then use it collectively in a single equation. This bifurcation is simply made to analyze every measures individually and also with the collaboration of the other variables. Analyzing the impacts of fiscal decentralization on the public services deliveries it is found vertical balances used alone has positive but statistically insignificant impacts on the reduction of infant mortality rate while federal transfers alone reduce the infant mortality rate in the long

run. In shorter period of time vertical balances increase the infant mortality rate while fiscal transfer reduce the infant mortality rate. Joint application of both vertical balances and federal transfers suggest that vertical balances shows insignificant impacts on infant mortality rate while federal transfers reduce the infant mortality rate in long run. As far as the short span of time is consider it is found that vertical balances are harmful for health services provision while fiscal transfer efficiently delivered the health services.

Policy Recommendation

The primary focus of the study centered on examining the effects of fiscal decentralization on the provision of public services in Pakistan. There are various issues in the economy of Pakistan that can be addressed properly.

Summarizing the finding of the whole it can be said that a real autonomy will ensure the transparent and adequate performance of the economy of Pakistan. There must be a proper identification of the resources and its transformation to the provincial government. A focused approach is needed that have a clear definition of the formula through which the transfer to the provinces is made. Aims and purpose of the assignment must be clearly defined. The Government of Pakistan has placed considerable emphasis on decentralizing power, and when complemented by a suitable financial devolution, this approach could lead to optimal economic benefits.

Increase in the autonomy of the provincial governments will helps in giving confidence to the provinces and they will perform much better. Fiscal decentralization offers the central government a means to tackle nationwide concerns and gather resources that hold economic viability at the federal level. As a result, the deficiency in capacity-building mechanisms within provinces and the central government's involvement in provincial affairs, leading to economic losses, can be effectively addressed

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