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**Working Paper**

## Modeling the impact of fiscal decentralization on health outcomes : empirical evidence from India

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Abay Asfaw, Klaus Frohberg, K.S. James  
and Johannes Jütting

Number  
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**Modeling the Impact of  
Fiscal Decentralization on  
Health Outcomes:  
Empirical Evidence from  
India**

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The CENTER FOR DEVELOPMENT RESEARCH (ZEF) was established in 1995 as an international, interdisciplinary research institute at the University of Bonn. Research and teaching at ZEF aims to contribute to resolving political, economic and ecological development problems. ZEF closely cooperates with national and international partners in research and development organizations. For information, see: <http://www.zef.de>.

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## Abstract

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Over the last two decades, many countries around the world have been enthusiastically embarking on the path of decentralization. Decentralization has been advocated as a powerful means to improve the provision of health care services and health outcomes in developing countries. However, due to a preconceived idea that decentralization will result in efficient allocation of public resources and lack of an analytical framework to systematically analyze its impact on health outcomes, very little empirical works have been done in this area. Scant attention has also been given to analyze factors enabling or constraining its outcomes. In this paper, we develop a theoretical model and use it to test empirically the impact of fiscal decentralization on rural infant mortality rates in India between 1990 and 1997. The random effect regression results show that fiscal decentralization plays a statistically significant role in reducing rural infant mortality rate in India and the results are robust to the way the decentralization variable is measured and to different model specifications. The results also show that the effectiveness of fiscal decentralization can be affected by other complementary factors such as the level of political decentralization. States who have good fiscal and political decentralization index are twice more effective in reducing infant mortality rates than states with high fiscal but low political decentralization index.

## Kurzfassung

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Während der letzten beiden Jahrzehnte sind viele Länder mit Enthusiasmus den Weg der Dezentralisierung gegangen. Dezentralisierung wurde als ein wichtiges Instrument zur Verbesserung der Bereitstellung von Leistungen der Gesundheitsfürsorge angesehen. Da man jedoch von der Vorstellung ausging, dass Dezentralisierung automatisch zu effizienter Verteilung von öffentlichen Ressourcen führt, und da ein analytischer Rahmen zur Untersuchung der Auswirkungen von Dezentralisierung auf die Gesundheit fehlte, gab es bisher nur wenige empirische Untersuchungen auf diesem Gebiet. Ebenfalls nur wenig Aufmerksamkeit wurde der Analyse von Faktoren geschenkt, die sich positiv oder negativ auf das Ergebnis von Dezentralisierung auswirken können. In diesem Artikel entwickeln wir ein theoretisches Modell, um den Einfluss von fiskalischer Dezentralisierung auf die ländliche Kindersterblichkeit in Indien zwischen 1990 und 1997 empirisch zu bestimmen. Die Ergebnisse der Regression mit Zufallseffekten zeigen, dass fiskalische Dezentralisierung einen statistisch signifikanten Einfluss auf die Reduzierung der Kindersterblichkeitsrate in Indien hat. Die geschätzten Parameter sind sowohl gegenüber der Art der Messung von Dezentralisierung als auch gegenüber anderen Modellspezifikationen robust. Sie zeigen auch, dass die Effektivität fiskalischer Dezentralisierung beeinflusst werden kann durch andere, ergänzende Faktoren wie z.B. dem Grad der politischen Dezentralisierung. Staaten, die einen starken fiskalischen und politischen Dezentralisierungsgrad aufweisen, sind doppelt so effektiv bei der Reduzierung der Kindersterblichkeitsrate wie diejenigen, die zwar auch eine hohe fiskalische Dezentralisierung erreicht haben, aber politisch noch sehr zentralisiert sind.

# 1 Introduction

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The last decade has witnessed a significant shift of power and resources from central and regional authorities to lower level grass-root institutions in almost all over the world. Dillinger (1994) has shown that out of 75 developing and transitional countries covered in a recent survey, 84 percent have embarked on a certain type of decentralization process. Given such gathering of momentum and enthusiasm for decentralization in many countries, the causes and consequences of decentralization have caught the interest of researchers and policy makers.

Decentralization is a complex and multifaceted concept that involves the shifting of fiscal, political, and administrative tasks to lower level governments. It is a policy tool of devolving power and resources from central or regional authorities to local governments to achieve equity, efficiency, and accountability. Decentralization has been advocated by health care reformists as a powerful means of improving the provision of public goods such as health care services. It is hypothesized that devolving power to local governments would improve efficiency as well as equity and thereby health outcomes by bringing decision makers closer to the people and by enhancing the participation of the community in the decision making and implementation processes (Mills, 1994; Arun and Ribot, 1999; Peabody et al., 1999; Robalino et al., 2001; Besley and Burgess, 2001).

However, despite these convincing arguments in favor of decentralization, there is little evidence that countries, which have a decentralized system, have also improved health outcomes. Decentralization being a recent event and often politically motivated, there is a preconceived idea that it will result in an efficient allocation of public resources. As a result, most researchers focus on elaborating its theoretical benefits and possible limitations. Moreover, while very few studies have tried to assess the impact of decentralization on the provision of health care services and health outcomes (West and Wong, 1995; Rao, 2000; Faguet, 2001; Khaleghian, 2003; Robalino et al, 2001; Akin et al, 2001), there is still a lack of analytical framework to empirically analyzing its impact on health outcomes. Scant attention has also been given to analyze factors enabling or constraining its outcomes and to examine how its benefits can be realized. As a result, there is limited empirical evidence on the impact of decentralization on improving delivery of health care services and health outcomes worldwide (Rao, 2000; Litvack and Seddon, 1999; Akin et al., 2001). Therefore, this study contributes to bridge the existing research gap in the literature by examining how the possible impact of decentralization on health outcomes can be modeled both theoretically and empirically using longitudinal data from fourteen major states of Indian between 1990 and 1997<sup>1</sup>. Given the lack of empirical evidence in this area and the

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<sup>1</sup> The time frame is totally governed by the availability of data about fiscal decentralization.

recent enthusiasm for decentralization throughout the developing world, the results of this study would be of interest to researchers and policy makers worldwide.

Among other countries, India is of interest because it has more than a decade of experience in decentralization as authorities, responsibilities, and resources have been devolved with varying degree from regional to local authorities since the 1980s. While the decentralization decision has come from the top and has been politically motivated, the implementation process has been very slow in the country. There are also large inter-state disparities in the level of decentralization in the country. At the same time, the degree of decentralization has been changing over time within a state, depending on the willingness of states to devolve political power, functions, resources, etc. to local bodies. As a result, one can expect different impacts of decentralization on health outcomes among different states and within a state through time. The country has also relatively well organized time series data sets.

## 2 Conceptual Framework and Theory

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Decentralization is broadly defined as the shifting of responsibilities between tiers of government by several fiscal, political, and administrative instruments. Decentralization may take many different forms such as political, administrative, fiscal, economic, etc. Political decentralization is often associated with pluralistic politics, democratization, and creation of local political units. Transferring of certain public functions such as planning, financing etc. from the central government to local authorities involves administrative decentralization. Fiscal decentralization on the other hand is concerned with collection of revenues and expenditure among different levels of government and economic /market decentralization is associated with privatization and deregulation (Pokharel, 2000; von Braun and Grote, 2000).

Better provision of public services in general and improving the performance and outcomes of health care systems in particular is one of the impetuses for decentralization. Even the underpinning principle of the Alma Ata declaration of ‘health for all’, the Primary Health Care approach, the Global Strategy for Health for All by the Year 2000 of the 32nd World Health assembly in 1979, etc. was decentralization. As indicated by Collins and Green (1994), centralization has been considered as incompatible with the objective of providing primary health care services. Various studies conducted by the World Bank have also suggested that public goods and services such as health care should be provided by the lowest level of government who can fully bear the costs and benefits (World Bank, 1997, 2004). Therefore, it is imperative to see how decentralization may affect health outcomes.

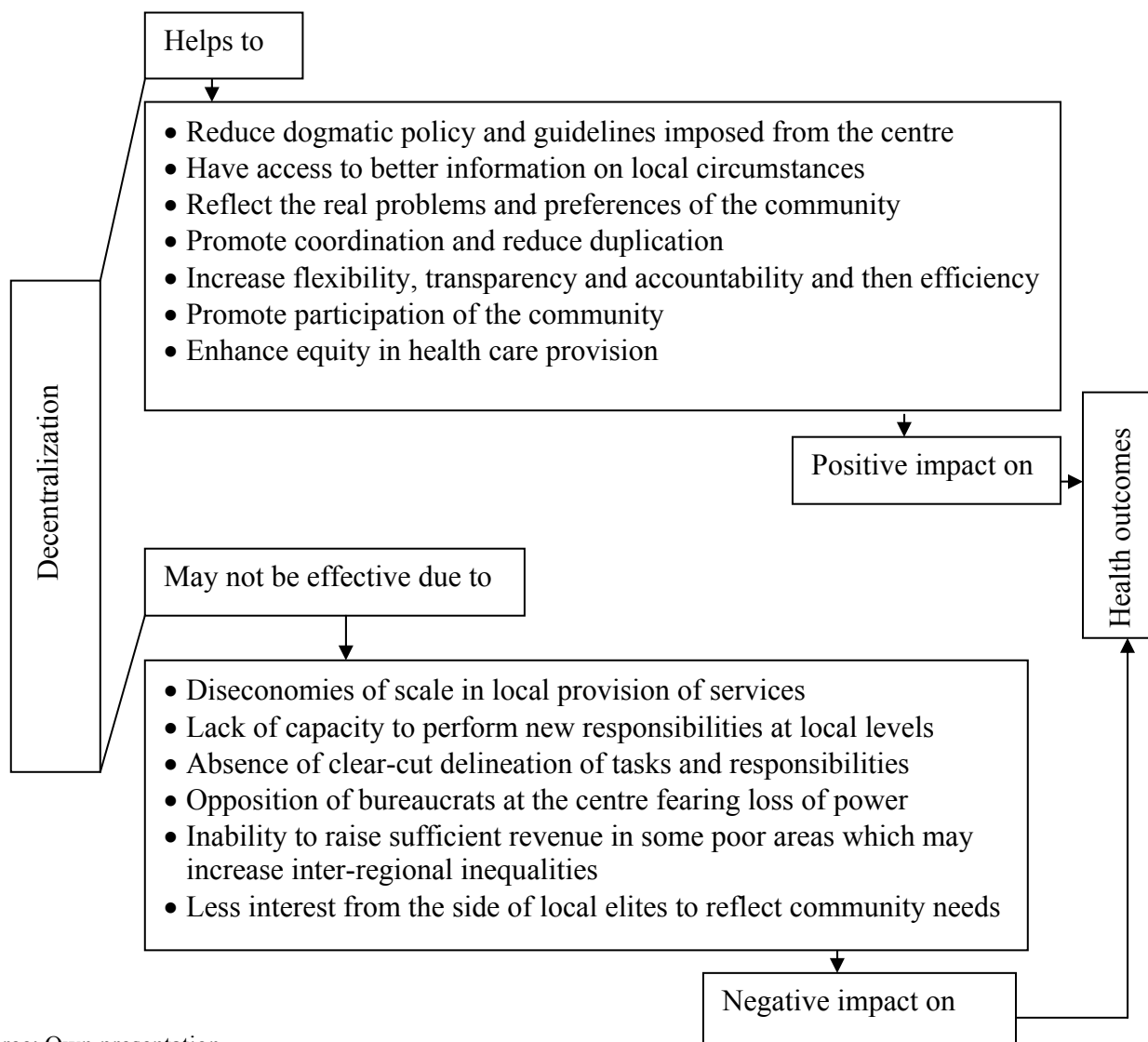
The upper panel of Figure 1 provides the summary of arguments cited in the literature in favor of decentralization. First, it is argued that a decentralized system, by reducing ‘dogmatic policy and guidelines imposed from a centre’ and increasing the access to better information on local circumstances, helps to make rational and flexible decisions that reflect the real problems and preferences of the population. This closer flow of information and interaction between health service providers and clients can provide non-bureaucratic institutional support to effectively target the local needs. It also promotes intersectoral coordination, increases accountability, reduces duplication, and improves the implementation of health programs (Litvack and Seddon, 1999; Lieberman, 2002). This in turn affects the delivery of health care services and ultimately health outcomes.

Second, decentralization passes responsibility and accountability to local bodies. This makes local governments work efficiently, flexibly, and creatively by mobilizing all the available resources in their localities to fulfill the targets. Their close relation with the local people enables them to know the local problems and needs, and they are ‘therefore in a better position to establish the right priorities than a central (or regional) government far away’ (Netherlands Ministry of Foreign Affairs, 2002:5; Peabody et al., 1999; World Bank, 2004).

Third, decentralization is expected to enhance the participation of local communities in decisions regarding health policy objectives, goals, strategies, planning, financing, implementation, and monitoring, which are important to improve the health outcomes at the local level (Lieberman, 2002).

In general, decentralization is expected to create an environment for decision makers to get appropriate and up-to-date information about the preferences and problems of the local people, an effective channel for the people to express their wants and priorities, and a motivating environment for the local decision makers to respond to the local needs quickly and effectively (Khaleghian, 2003). Therefore, a well-designed and implemented decentralization policy is expected to improve equity, efficiency, quality, and coverage of health care services and thereby health outcomes.

Figure 1: Possible Channels through which Decentralization may Affect Health Outcomes



Source: Own presentation

However, if not properly implemented decentralization may pose ‘significant risks and challenges’ that may lead to a deterioration in the provision of health services and consequently to poor health outcomes (Lieberman, 2002). The lower panel of Figure 1 presents various arguments cited in the literature against decentralization and about factors that may hinder its effectiveness. The first major argument against decentralization is diseconomies of scale. It is argued that some health care programs may not be better performed at local levels because either they require a national perspective or may not be cost effective. For instance, the provision of immunization services, the control of ‘vector-borne’ diseases, etc. may be more effectively provided at a central than at a local level (Akin et al., 2001).

Second, a key factor that influences the effectiveness of decentralization is the existence of a strong planning and executive capacity at local levels as ‘decentralization brings a heavy new management burden’ to local bodies (Litvack and Seddon, 1999: 61). However, the experience of most developing countries reveals that local governments suffer from a shortage of qualified personnel and managers to shoulder the new responsibilities. This may undermine the competence of local bodies to plan and execute the new tasks (Collins and Green, 1994; Asante, 2003). The problem can further be complicated if there is lack of clearly defined accountability and responsibility between and within different actors at the central, regional, and local levels (Arun and Ribot, 1999).

Third, opposition and unwillingness or half-hearted tendency from the central body to delegate power and authority to local bodies may also undermine the effect of decentralization on the delivery of efficient, responsive, and qualitative health services at lower levels (Gilson and Mills, 1995; Pokharel, 2000). Fourth, decentralization may also aggravate inequalities in service access between rich and poor areas. Local authorities in rich areas can mobilize substantial resources to attract qualified labor and to deliver high quality and efficient services compared to poor areas. This may exacerbate the inequalities between poor and rich areas and communities. The fifth potential disadvantage of decentralization is that local bodies may not necessarily reflect the interests and developmental priorities of the community they represent. It is imputed that local elites and dominant individuals may hijack the decentralized power and authority to pursue their own interests and may not promote efficiency and equity (Collins, 1989; Mills et al., 1990). Some studies have also shown that the level of corruption at local governments can be much higher than at the central level (Brueckner, 1999; Dethier, 2000; von Braun and Grote, 2000). The problem can be more severe if the expected participation of the community cannot be materialized.

The literature shows mixed results regarding the impact of decentralization on health outcomes. Mahal et al. (2000), using data from a survey of human development indicators conducted by the National Council of Applied Economic Research (NCAER) in 1994 in a sample of villages in India, found a significant and positive impact of decentralization on health outcomes. Robalino et al. (2001) have also tried to measure the impact of decentralization on health in a cross-country analysis using infant mortality as the outcome variable.

Decentralization is measured as the ratio between expenditures managed by the local government and expenditures managed by the central government. The result of the panel data analysis revealed a significant positive impact of decentralization on the improvement of health outcomes.

However, other research results show that decentralization can create various distortions and hindrances in the delivery of health care services. For instance, studies conducted in the Philippines, Bolivia, Zambia, New Guinea, and Tanzania show that due to poor linkages and lack of clearly defined responsibilities between the centre and the local bodies and due to low capacity at the local level, decentralization reduces the access of rural households to health care services (Litvack and Seddon, 1999; Omar, 2002). The health assessment report of the Philippines government also shows that significant changes could not be observed in health outcomes from a decade-long decentralization in the health sector (Lieberman, 2002). Decentralization has also increased inter-district inequalities in access to health care in Zambia (Standing, 1997). Other negative consequences of decentralization such as poorly trained and motivated health workers, poor administration, and inadequate finance have also been observed in many Latin American and African countries (Collins and Green, 1994; Araujo and Luiz, 1997).

### 3 Decentralization in India

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The need for decentralization in India has long been acknowledged and the history of decentralization in the country is well documented elsewhere (for instance see Alagh, 1999; Baumann, 1998; Poornima and Vyasulu, 1999; Rajaraman, 2000). Table 1 summarizes the historical development of decentralization in India. The Community Development Program (CDP) recommended by the Balwant Rai Mehta Committee and initiated as early as in the first Five Year Plan was the first step in tune with the decentralization of independent India (Alagh, 1999; Jha, 1999). Subsequently, the National Development Council endorsed a three-tier scheme of decentralization in 1958. Different states followed different models for the constitution of the local bodies. Overall, the progress towards a decentralized form of governance had been slow. Political and bureaucratic resistance at the state level to sharing powers and resources came in the way of an effective decentralized system of government (Hanumantha Rao, 1989). Paucity of funds curtailed the functioning of many local bodies. There was lack of clarity about the responsibilities of these bodies. As a result, most of these elected bodies remained as administrative machinery without adequate powers.

After a quiet period in the second half of 1960s and early 1970s, the Ashok Mehta Committee recommended that the institutional structure of Panchayati Raj institutions should be designed in the light of implementing rural development programs (Alagh, 1999). Subsequently a few state governments, viz., Gujarat, Jammu and Kashmir, Karnataka, Maharashtra and West Bengal took many important steps. Unfortunately, those large states like Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh, where decentralized planning was of utmost importance due to their sheer size, did not undertake any major step for decentralization. Even in states like Gujarat and Maharashtra who pioneered implementing decentralized planning, the effective powers to the decentralized bodies had been extremely inadequate. Perhaps a better system of decentralized governance emerged only in Karnataka, West Bengal, and Jammu and Kashmir (Hanumantha Rao, 1989). Both Karnataka and West Bengal embarked upon legislation, delegating powers and resources to the elected local bodies. The mid 1980s witnessed a major boost for decentralization, which resulted in the 1989 Panchayati Raj Bill. This Bill gave discretionary political power for states to devolve power to Panchayati Raj institutions and protect the political rights of unfavorable groups such as Scheduled Castes, Tribes and women.

Table 1: Historical Development of Decentralization in India

Time	Event	Main outcome
1957	The Balwant Rai Mehta Committee was appointed	Recommended <ul style="list-style-type: none"> <li>- statutory elected local bodies with the necessary resources and authority</li> <li>- the basic unit of decentralization be the block/samiti level</li> <li>- directly elected Panchayats for a village(s), Panchayat Samiti for a block and Zila Parishad at the district level</li> </ul>
1972	The advice of the Planning Commission	State governments were advised to <ul style="list-style-type: none"> <li>- set up state planning boards</li> <li>- decentralize the planning process to districts and eventually to the block level</li> </ul>
1978	The recommendation of the Ashok Mehta Committee	The Committee recommended <ul style="list-style-type: none"> <li>- the institutional structure of the Panchayati Raj to be designed in light of implementing rural development programs</li> </ul>
1977-1982	Planning Commission appointed working groups	The working groups recommended <ul style="list-style-type: none"> <li>- the district level to be the basic planning unit</li> <li>- transfer of more autonomy and planning functions to the district level</li> <li>- Panchayati Raj institutions at both levels to play an active role in the planning, implementation, and monitoring of development programs</li> <li>- to allocate some untied funds to the district which might be used according to local priorities</li> </ul>
1980s	<ul style="list-style-type: none"> <li>- Rajiv Gandhi's, the then premier, thought that 'India was too large to be ruled from a centre'</li> <li>- The Planning Commission report that rural development would be realistic if people participate in local planning</li> </ul>	The 1989 Panchayati Raj Bill was passed. It gave discretionary powers to states such as: <ul style="list-style-type: none"> <li>- compulsory election</li> <li>- reservation for Scheduled Castes, Tribes and women</li> <li>- devolution of power and resources</li> <li>- allocation of money directly to villages (JRY)* depending on the unemployment level</li> </ul>
1992	The 72 <sup>nd</sup> and 73 <sup>rd</sup> Amendment Bills	Local governments got constitutional rights: <ul style="list-style-type: none"> <li>- A 3-tier system of Panchayati Raj for all states</li> <li>- Mandatory Panchayat elections every 5 years</li> <li>- Reservation of seats for women and marginalized groups</li> <li>- Every state to set up finance commission to determine financial issues about Panchayats</li> <li>- 29 functional areas listed for Panchayats</li> <li>- Power and authority to function as self-government</li> </ul>

\* A development scheme, which tried to put economic power to nationwide employment

Sources: Compiled from Alagh (1999)

Considering all the above developments, direct democracy was mandated in India in the early 1990s through 73<sup>rd</sup> and 74<sup>th</sup> amendment of the Constitution. By this amendment, it became a constitutional necessity for the state governments to form elected local bodies. Through these acts, Panchayats and Urban Local Bodies became units of local self-government (see Figure 2 for the decentralization structure in the country). In line with the federal spirit, the scope, details and pace of administrative and fiscal decentralization was left to discretion of the state governments and its legislatures (World Bank 2000). Nevertheless, the Eleventh and Twelfth Schedules list 29 and 18 subjects in which necessary powers and resources have to be transferred to Panchayats and Municipalities, respectively. There is also a provision for constituting a State Finance Commission every fifth year in every state that would recommend principles governing the distribution and devolution of financial resources between the state and the local bodies at every level. Among the powers that are to be transferred to the local bodies, health and education figure at the top of the list as the need for decentralization in these subjects had already been felt for a long time. For instance, one study conducted in Karnataka state shows that due to the active involvement of Panchayats in the performance of institutions under their control, ‘attendance of school teachers, medical officers, paramedical staff in rural institutions improved remarkably’ (UNDP no date:22).

Figure 2: Decentralization Structure in India (1997)

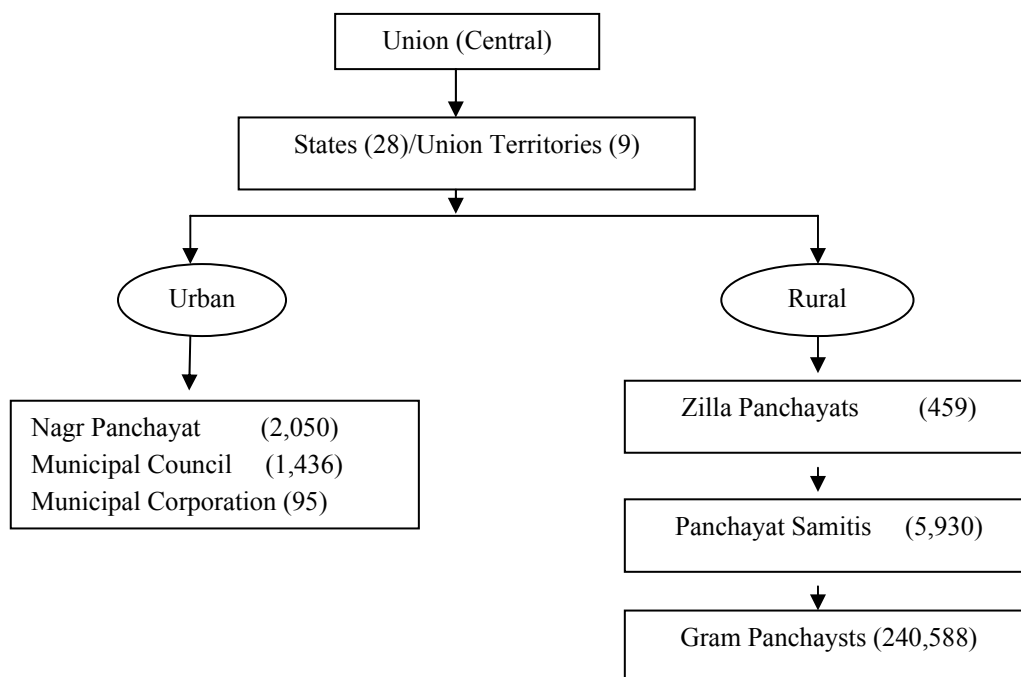


Figure in brackets are number in 1997.

Source: Own Compilation

Given this background concerning the historical development of decentralization in India, let us examine how far the decentralization process succeeded in improving the health outcomes of the population. Some states having made significant strides in decentralization compared to other states and through time, and given variations in the effectiveness of local institutions in health delivery, one can expect variations in health outcomes across states and through time.

## 4 Specification of the Model

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Modeling a theoretical frame is important to conceptualize the relationship between decentralization and health outcomes, identify important explanatory variables, scrutinize the channel through which the independent variables affect the health outcomes, and even to make hypotheses and interpret results (Akin et al., 2001; Robalino et al., 2001). As we have seen before, very few attempts have been made to model the impact of decentralization on health outcomes. In this section, a theoretical model is developed based on the premise that the impact of decentralization on health outcomes varies depending on the efficiency of local institutions in the provision of health care services compared to regional governments.

To present the model formally, consider a regional state planner who tries to maximize the health outcomes of a region with  $N$  number of districts. Assume also that the health outcome of the region depends on its level of economic performance such as per capita income and on the outcome of fiscal decentralization in the region. It is hypothesized that decentralization would improve health outcomes since local authorities know the problem of the district and supervise the implementation of projects more closely and consequently may allocate resources more efficiently than officials at the regional level. The structural characteristics of the economy and the amount of budget allocated to the state are assumed to be exogenous to the state planner. Then, the problem of the planner is to improve the health indicators of the state such as infant mortality rate, immunization coverage, total death rate, life expectancy, etc. by determining the amount of budget to be decentralized among different districts. The problem can be specified algebraically as follows:

$$H_{it}^s = \phi(\Omega_{jt}^s; \Phi_{1t}^s, \Phi_{2t}^s, \dots, \Phi_{Nt}^s) \quad (1)$$

Where

$H_{it}^s$  is health outcome  $i$  ( $i = 1, 2, \dots, M$ ) in state  $s$  at time  $t$

$\Omega_{jt}^s$  is a vector of economic indicators in district  $j$  ( $j = 1, 2, \dots, N$ ) of state  $s$  at time  $t$

$\Phi_{jt}^s$  is the expected health effect of fiscal decentralization in district  $j$

However, the expected health outcomes of fiscal decentralization are not directly observable to the planner, but the planner can expect that the outcomes depend on the amount of budget allocated to the district and on the capacity of the local authorities to use the budget efficiently. This implies that the health outcomes of decentralization depend not only on the structural characteristics of the district economy and the amount of budget allocated to it, but also on how efficiently the budget is used by the local bodies. This is a plausible assumption since decentralization per se may not bring health improvements and the capacity of districts in allocating and using the decentralized budget varies significantly.

Therefore,  $\Phi_{jt}$  can be written as a function of the magnitude of the budget allocated to districts and the capacity of local bodies in utilizing the decentralized budget efficiently.

$$\Phi_{jt}^s = (D_{jt}^s, f(D_{jt}^s, \Psi_{jt}^s)) \quad (2)$$

Where

$D_{jt}^s$  measures the amount of budget allocated to district  $j$  at time  $t$  and

$\Psi_{jt}^s$  represents a vector of variables that may reflect the capacity of district  $j$  in utilizing the decentralized budget efficiently.

Then, equation (1) can be rewritten as:

$$H_{it}^s = \phi(\Omega_t^s; \sum_{j=1}^N (D_{jt}^s, f(D_{jt}^s, \Psi_{jt}^s))) \quad (3)$$

We assume that  $\phi$  and  $f$  are continuous and twice differentiable functions and

$$\frac{\partial H}{\partial D} = \frac{\partial \phi}{\partial D} + \frac{\partial \phi}{\partial f} \frac{\partial f}{\partial D} \quad (4)^2$$

Now let us break down each component of equation (4).

$\frac{\partial H}{\partial D}$  measures the total effect of fiscal decentralization on health outcomes and its sign

depends on the value of the two terms on the right hand side of equation (4). It is expected to be a useful instrument to examine the impact of decentralization on health outcomes. The sign of  $\frac{\partial \phi}{\partial D}$  is expected to be positive since decentralization does not have inherent limitations and is

likely to improve the allocation of scarce resources so as to maximize health outcomes of the local population. However, the sign of the last term in equation (4),  $\frac{\partial \phi}{\partial f} \frac{\partial f}{\partial D}$ , can be negative or

positive, depending on the social domain and institutional setting in which decentralization is implemented and consequently on the capacity of local bodies in carrying out responsibilities effectively. The intuition behind this assumption is that decentralization per se may not improve the delivery of health services and consequently may not bring improved health outputs unless the capacity of the local decision makers in allocating and managing the decentralized resources is better than that of the state authorities.

These imply that the overall impact of decentralization on health outcomes can be positive, negative, or zero. If inefficiencies in local health care provision are higher than the potential benefits of transferring power and authority to local bodies, the overall impact of decentralization can be negative. Based on this, we postulate that the net effect of decentralization on health indicators depends on the amount of budget decentralized and on the efficiency of local bodies in managing the resource compared to the regional planners.

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<sup>2</sup> The superscript  $s$  and the subscript  $t$  are dropped for ease of presentation

Therefore, the problem of the regional planner would be to maximize the following equation:

$$Max_{D_{jt}} : H^s_{it} = \phi\left(\Omega^s_{jt}; \sum_{j=1}^N (D_{jt}, f(D_{jt}, \Psi_{jt}))\right) + \lambda\left(Y_s - \sum_{j=1}^N D_{jt}\right) \quad (5)$$

In equation (5),  $Y_s$  and  $\lambda$ , respectively measure the total budget of the state that can be decentralized among districts and the marginal impact of budget on health outcomes. Therefore, given that the functional form of equation (5) satisfies the conditions for relative maxima, there would be an optimal amount of budget ( $D^*_{jt}$ ) to be allocated (decentralized) to different districts so as to maximize the health outcome of the region.

Finally, using a first order Taylor expansion at a certain point  $D_0$ , equation (3) can be written as:

$$\begin{aligned} H &= \frac{\phi(D_0)}{0!} + \frac{\phi'(D_0)}{1!}(D - D_0) \\ &= \phi\left(\Omega^s_{jt}; \sum_{j=1}^N (D_{0jt}, f(D_{0jt}, \Psi_{jt}))\right) + \frac{\partial \phi}{\partial D_0} + \frac{\partial \phi}{\partial f} \frac{\partial f}{\partial D_0}(D - D_0) \\ &= \left[ \phi\left(\Omega^s_{jt}; \sum_{j=1}^N (D_{0jt}, f(D_{0jt}, \Psi_{jt}))\right) - \frac{\partial \phi}{\partial D_0} D_0 - \frac{\partial \phi}{\partial f} \frac{\partial f}{\partial D_0} D_0 \right] + \frac{\partial \phi}{\partial D_0} D + \frac{\partial \phi}{\partial f} \frac{\partial f}{\partial D_0} D \\ &= \beta_0 + \beta_1 D + \gamma_i D \Psi_i \end{aligned} \quad (6)^3$$

Among various types of decentralization, we focus on fiscal decentralization. It is argued that decentralizing the budget is the most important step in decentralization, which enables local governments to meet the needs of the people. Among various health indicators, the study focuses on rural infant mortality rates for reasons mentioned in the next section. The level of political decentralization is taken as a variable that affect the effectiveness of fiscal decentralization<sup>4</sup>. Active political participation of the population is expected to persuade the decision of local authorities to their interests and priorities.

Based on this general framework, the following general panel data model is specified from equation (6).

<sup>3</sup> Other structural variables ( $\Omega$ ) can also be used as additional explanatory variables.

<sup>4</sup> See section five for sources of data and measurement of variables.

$$\ln H_{rst} = \alpha + \beta_1 fdi_{rst} + \beta_2 \ln pci_{st} + \beta_3 Wlit_{st} + \beta_4 (fdi_{rst} * pdi_{st}) + v_s + \varepsilon_{st} \quad (7)$$

Where

$H_{rst}$  = Infant mortality rate at time t in the rural areas of state s,

$fdi_{rst}$  = Rural fiscal decentralization indicator,

$pci_{st}$  = Real per capita income

$wlit_{st}$  = Percentage of literate women

$pdi_{st}$  = Political decentralization index,

$v_s$  = State specific residual,

$\varepsilon_{st}$  = The standard residual with the usual assumption of zero mean, uncorrelated with  $v$  and other explanatory variables, and homoskedastic,

$s$  = State (14 major states of India) and,

$t$  = time from 1990 to 1997.

Equation (7) can be estimated as ‘between effects’, ‘fixed effects’, and ‘random effects’ models, depending on the assumptions we made about the distribution of  $v_s$  and  $\varepsilon_{st}$ . In the between effects specification, we consider the mean of the variables over time and the coefficients will be estimated using only the cross sectional information. In the fixed effects model, also known as ‘within effect’,  $v_s$  is assumed to be fixed, and the coefficients of the parameters will be estimated using the time-series information in the data. This implies that time-invariant variables will not be considered. The random effects model on the other hand takes  $v_s$  as a random variable and assumes  $v_s$  not to be correlated with the other explanatory variables. Then it takes a weighted average of the between and the fixed estimates. If the model is correctly specified, there should not be a statistically significant difference between the fixed effect and the random effect coefficients (see Stata, 2001 for the details). Therefore, the between specification helps us to see the impact of fiscal decentralization on health outcomes when it changes across states, and the fixed effect model measures the impact of a change in fiscal decentralization within a state. In short, the within and the random effect models measure the impact of decentralization on rural infant mortality across states and within state, respectively.

## 5 Data Sources and Measurement of Variables

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The main data sources for this study are the Registrar General vital rates of India and the Finance Commission and the Election Commission reports. Among various health indicator variables, rural infant mortality rate<sup>5</sup> is taken as the dependent variable for two reasons. First, reliable time series infant mortality data are available for each major state in India in contrast to other indicators such as immunization, health services coverage, etc<sup>6</sup>. Second, it is argued that the infant mortality rate is more sensitive to policy changes such as decentralization than other health indicators such as life expectancy and total death rate. Therefore, the state level rural infant mortality rate between 1990 and 1997 is used as an indicator of health outcomes.

As we have seen before, among various types of decentralization, we focus on fiscal decentralization since decentralizing the budget is the most important step in the overall decentralization process. The Finance Commission report (2000) gives detailed information about the expenditure and revenue of rural local bodies between 1990 and 1997<sup>7</sup>. This helps us to measure the fiscal decentralization variables at rural areas level. The level of fiscal decentralization is measured by an index of different variables instead of a single indicator. We use factor analysis to generate the decentralization index from the following three variables: share of Panchayats from the total state expenditure, total Panchayats' expenditure per rural population, and share of Panchayats' own revenue from the total Panchayats' expenditure. These variables are expected to give good indicators about the level and degree of fiscal decentralization in each state-year. Then we give one for state-years above the average level of fiscal decentralization index (high level of fiscal decentralization) and zero otherwise.

Other variables included in the model are state level per capita (measured in real terms (logs)) and literacy of women (measured by the percentage of literate women). These variables are measured at state level since separate information for rural and urban settings is not available. These variables are expected to take into account the differences in the level of economic and social development across states through time. Other variables such as level of industrialization, poverty indicators, etc. are not included in the analysis because they are highly correlated with one or more of the variables included in the model.

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<sup>5</sup> Rural infant mortality rate is measured by the number of children less than one year old who died in a year, per 1000 live births of the same year.

<sup>6</sup> The Registrar General vital rates provide time series data on infant mortality rates differentiated between rural and urban settings.

<sup>7</sup> The report of the Finance Commission contains information on revenues and expenditures of Panchayats at village (Gram), intermediate (Samitis), and district (Zilla) levels and of urban local bodies between 1990 and 1997. For this study, however, we concentrate on the Panchayati Raj Institutions at all tiers since separate information is not fully available for the three rural local bodies.

The level of political decentralization is taken as a variable that affects the effectiveness of fiscal decentralization on health outcomes. It is approximated by an index constructed from the total voters' turnout, women's participation in polls, and the number of polling stations per electors in each state using a factor analysis. Then, one is given for state-years below the average level of political decentralization index (low political decentralization) and zero otherwise. Finally, an interaction variable is created by multiplying the above average fiscal decentralization index and the below average political decentralization index variables. The basic idea is to test whether high fiscal decentralization affects rural infant mortality rates irrespective of the level of political decentralization. Table 2 provides the descriptive statistics of the dependent and the independent variables. It decomposes the change in each variable into between, within, and overall changes<sup>8</sup>.

Table 2: Descriptive Statistics

Variable		Mean	Std. Dev.	Min.	Max.
Rural infant mortality rate	overall	74.008	23.835	11	129
	between		23.942	15.25	112.875
	within		5.572	60.133	90.133
Share of Panchayats expenditure from the state expenditure	overall	0.108	0.086	0.010	0.34
	between		0.087	0.026	0.312
	within		0.019	0.064	0.198
Panchayats' expenditure per rural population	overall	2.424	2.492	0.180	11.9
	between		2.294	0.547	7.267
	within		1.131	-0.812	7.057
Share of Panchayats' own revenue from the total Panchayats' expenditure	overall	0.118	0.177	0	0.728
	between		0.178	0	0.6598
	within		0.0404	0.0431	0.34068
Ln fiscal decentralization index	overall	-0.565	1.066	-3.305	1.425
	between		0.989	-1.587	1.063
	within		0.470	-2.631	0.894
Political decentralization index	overall	-0.076	1.067	-3.522	1.902
	between		0.865	-1.556	1.363
	within		0.661	-2.043	1.941

The overall and the within changes are calculated for the total state-years and the between change is computed only for states. As the table shows, there is a significant variation in rural infant mortality rates across state-years. It varies between 11 and 129 per 1000 live births in state-years and between 15.25 and 112.87 among states. The variation within a state is also large, between 60 and 90. The standard deviations for between and within changes are quite different indicating that the variation of rural infant mortality rates across states is much higher than the

<sup>8</sup> Specifically it 'decomposes the variable  $x_{it}$  into a between ( $\bar{x}_i$ ) and within ( $x_{it} - \bar{x}_i + \bar{x}$ ); the global mean  $\bar{x}$  being added back to make results comparable' (STATA 7, 2002:469).

variation within a state between 1990 and 1997. A closer look at the variables that are used to construct the rural fiscal decentralization index also reveals interesting results. While the overall mean share of Panchayats expenditure from the total state expenditure is 10.8 percent, it varies between 1 and 34 percent across state-years. As a result, the fiscal decentralization index shows significant variations both within and between states, though the variations between states are relatively higher than the variations within states.

## 6 Results and Discussion

### 6.1 Descriptive Statistics

Table 3 provides the mean values of the fiscal decentralization indicators. In most of the indicators, states such as Karnataka, Gujarat, Maharashtra, Andhra Pradesh, and Rajasthan perform best. States such as Haryana, Punjab, and Kerala also show good average performance in the share of revenue collected by Panchayats from the total revenue. Generally, based on the overall index, Karnataka, Gujarat, Maharashtra, Andhra Pradesh, and Rajasthan have the highest average rural fiscal decentralization performance between 1990 and 1997. As far as the health indicator is concerned, states such as Kerala, Punjab, Tamil Nadu, Maharashtra, and West Bengal have a relatively low rural infant mortality rate compared to other states.

Table 3: Average and Growth rate of fiscal Decentralization Indicators by state (1990-1997)

State	Share of Panchayats expenditure from State expenditure		Panchayats' expenditure per rural population (in Rs)		Share of Panchayats' own revenue from the total revenue		FDI*	Rural Infant Mortality Rate	
	Mean	Growth rate	Mean	Growth rate	Mean	Growth rate		Mean	Growth rate
Andhra Pr.	0.173	-0.027	3.301	0.124	0.061	-0.012	0.584	73.00	-0.0087
Bihar	0.074	0.154	0.746	0.252	0		-0.428	72.87	-0.0036
Gujarat	0.211	-0.041	5.841	0.107	0.023	-0.065	1.213	70.50	-0.0166
Haryana	0.026	-0.091	0.791	0.115	0.659	-0.013	-0.972	71.87	-0.0102
Karnataka	0.313	0.009	7.267	0.164	0.010	-0.058	2.111	74.50	-0.0451
Kerala	0.050	0.156	1.331	0.346	0.262	-0.140	-0.600	15.25	-0.0521
Madhya Pr.	0.062	0.126	1.086	0.288	0.053	-0.091	-0.494	109.62	-0.0302
Maharashtra	0.189	0.019	5.891	0.172	0.033	0.007	1.070	63.87	-0.0209
Orissa	0.096	0.085	1.412	0.239	0.024	-0.186	-0.189	112.87	-0.0391
Punjab	0.031	-0.072	1.013	0.076	0.279	0.085	-0.779	58.75	-0.0227
Rajasthan	0.163	-0.009	3.061	0.141	0.026	-0.078	0.493	88.75	0.0036
Tamil Nadu	0.04	0.003	0.790	0.125	0.066	0.075	-0.746	63.75	-0.0233
Uttar Pr.	0.043	-0.020	0.547	0.105	0.058	-0.001	-0.690	95.50	-0.0279
West Bengal	0.055	0.057	0.863	0.194	0.096	-0.114	-0.573	65.0	-0.0342

\* 1 if the average rural fiscal decentralization index is above the average and 0 otherwise.

Source: Own computation

However, it is difficult to find a systematic pattern or statistically significant correlation between the mean values of the decentralization indicators and the mean rural infant mortality rate. This is mainly because decentralization is a dynamic process and the average figures alone may not give a good picture about the performance of states in devolving budget to local bodies through time. Therefore, we compute the average annual growth rate<sup>9</sup> of each indicator between 1990 and 1997 for each state and the results are presented in Table 3.

Compared to the mean values, average annual growth rate figures reveal some interesting relationships between indicators of decentralization and rural infant mortality rates. States, which have performed better in the average annual growth rate of fiscal decentralization indicators, have also performed better in the reduction of the rural infant mortality rate. There are also significant and negative correlations<sup>10</sup> between the growth rate of Panchayats' share from the total expenditure and the average growth rate of the rural infant mortality rate (-0.675), and the growth rate of average Panchayats' expenditure per population and the average growth rate of the rural infant mortality rate (-0.647)<sup>11</sup>. This can be taken as a first indicator of the inverse relationship between fiscal decentralization and infant mortality rate.

## 6.2 Econometric Analysis

Equation (7) is estimated using Stata 7 software to investigate the impact of rural fiscal decentralization on rural infant mortality rates in India between 1990 and 1997. The results are presented in Table 4. The second column shows the between effects regression results. It is estimated on state averages and it has the highest goodness of fit compared to the other specifications. However, it has the lowest F-ratio as can be verified from the insignificant coefficients of all the explanatory variables (except the literacy of women variable). These results reveal that only differences in the level of women literacy, *ceteris paribus*, affect infant mortality. This is in line with the finding of most researchers in India who could not find any systematic relationship between the average decentralization variables and infant mortality rates (see for instance James, 2003 and the literature cited there). It is also consistent with our descriptive analysis in which we could not find any systematic correlation between the mean values of various decentralization indices and the rural infant mortality rate.

However, this does not mean that progress in decentralization within a state or differences in decentralization through time do not have any impact on changes in infant mortality rates. It rather implies that the between-effects, which measures only mean responses,

<sup>9</sup> We use the least squares method to compute the growth rates since it is 'representative of the available observations over the entire period' (World Bank, 270). First, we estimate  $\hat{\beta}$  from  $X_t = \alpha + \beta t + \varepsilon_t$  and then the average annual growth rate is computed as  $\text{antilog } \hat{\beta} - 1$ .

<sup>10</sup> We use the Pearson method and Bihar is not included in the analysis since it is an outlier in the case of the own revenue indicator.

<sup>11</sup> However, there is no statistically significant correlation between the growth rate of the share of Panchayats own revenue from the total revenue and the growth rate of rural infant mortality.

may not capture the dynamic element of the variables and consequently may not reflect the impact of progress in decentralization on infant mortality rates through time.

We estimate the decentralization model with the fixed- and random-effects estimator and the results are presented in the last two columns of Table 4. Unlike the between-effects model, the fixed (within) and the random-effects models take the time-series or within-states changes into account in the estimation process. In both models, the  $R^2$ s are relatively low but they have high F- and Wald statistics. The F- and the Wald-test results reveal that taken jointly, the coefficients are significant. A Hausman test is also used to examine if the difference in the coefficients of the fixed and random effect models are systematic. The results presented in the last row of the table reveal that one cannot reject the null hypothesis, which says that the coefficients of the fixed and the random-effects model are the same. This implies that our model is correctly specified and no significant correlation exists between  $v_s$  and  $\varepsilon_{st}$ . Let us stay, however, with the random effect model for the interpretation of the results.

Table 4: Impact of Rural Fiscal Decentralization on Rural Infant Mortality in India:1990-1997

Dependent variable: ln rural infant mortality rate	Between-effects	Fixed-effects	Random effects
Ln state per capita income	0.474 (0.280)	-0.395*** (0.079)	-0.272*** (0.083)
Women literacy	-0.030*** (0.007)	-0.002 (0.002)	-0.006*** (0.002)
High (above average) rural fiscal decentralization index	0.047 (0.242)	-0.220*** (0.048)	-0.188*** (0.052)
Low (below average ) political decentralization index	0.260 (0.283)	-0.008 (0.027)	-0.001 (0.03)
Interaction between high fiscal and low political decentralization variables	-0.339 (0.370)	0.085* (0.045)	0.082* (0.050)
Constant	1.195 (2.482)	7.942*** (0.651)	7.039*** (0.690)
R-sq : within	0.1018	0.5447	0.5211
: between	0.8293	0.0934	0.3229
: overall	0.8104	0.0690	0.2886
F-test (Wald for the random effect)	7.77	20.82***	91.05***
No. of observations	14		107
Hausman test			0.00 (1.000)

\*\*\*, \*\*, and \*denote significance at 1, 5, and 10 percent levels, respectively

Source: Own computation

The table shows very interesting results. All variables take the hypothesized signs and are statistically significant (except the political decentralization index variable). If we start with the per capita income variable, the result shows that income plays a significant role in reducing rural infant mortality rates. The elasticity of per capita income with respect to the rural infant mortality rate is 0.27. This implies that within the time under consideration, a one percent increase in real per capita income decreases the rural infant mortality rate on the average by 0.27 percent, *ceteris paribus*. The coefficient of the literacy variable is also negative and significant indicating the importance of women's literacy in reducing infant mortality. The political decentralization index variable, however, is statistically insignificant though it takes the hypothesized positive sign.

As table 4 shows, the fiscal decentralization index variable picks the expected negative sign and is statistically significant. The result shows that states with the above average rural fiscal decentralization index, *ceteris paribus*, are likely to reduce rural infant mortality rate by 17.16 percent<sup>12</sup> compared to states with below the average fiscal decentralization score. As we have seen before, in addition to the level of fiscal decentralization, the capacity of the local institutions in efficiently utilizing the decentralized budget also matters. Political decentralization is taken as one important factor that affects the effectiveness of fiscal decentralization. This assertion is supported by the positive and significant coefficient of the interaction variable. These results reveal that the impact of fiscal decentralization in reducing rural infant mortality rate can be low in states with relatively low political participation of the community. Specifically the results show that the impact of fiscal decentralization in reducing infant mortality is 17.16 percent in states with above the average political decentralization index while it is only 8.64 percent ( $0.1716 - 0.0864$ ) in states with low (below the average) political decentralization index. These results reveal that low degree of political decentralization can have a depressing effect on the effectiveness of fiscal decentralization in reducing infant mortality rates.

Generally, these results indicate that fiscal decentralization can play a significant role in improving health outcomes such as infant mortality rates. However, the results also indicate that high level of fiscal decentralization alone may not bring the desired level of results unless it is accompanied by other types of measures such as political decentralization. As we have seen before, this is a plausible result since fiscal decentralization may worsen the provision of health services and consequently may lead to deterioration in health outcomes if the local communities do not actively participate in the decision-making and implementation process.

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<sup>12</sup> Antilog of the coefficient minus one (See Gujarati, 1995).

### 6.3 Robustness of the Results

The robustness of our results is checked through various ways. First, we test the robustness of the results to the way the rural fiscal decentralization variable is measured. As indicated by Ebel and Yilmaz (2002), empirical results on the impact of decentralization are highly sensitive to the way the decentralization variable is measured. Therefore, instead of measuring fiscal decentralization by an index, we use the share of Panchayats expenditure from the total state expenditure as an indicator of fiscal decentralization. This is a legitimate indicator of fiscal decentralization since it measures the amount of financial resources used by the local bodies compared to the state level authorities. To be consistent with our previous analysis, one is given for states-years with the above the average share of Panchayats expenditure and zero otherwise. The results are presented in the second column of Table 5. As in the previous case, both the between and random effect results are shown.

Table 5: Robustness Tests Results

Variables	Different decentralization indicator		Two years average data	
	Fixed-effects	Random effects	Fixed Effects	Random Effect
Ln state per capita income	-0.385*** (0.079)	-0.272*** (0.082)	-0.394*** (0.110)	-0.180* (0.105)
Women literacy	-0.002 (0.002)	-0.006*** (0.002)	-0.001 (0.003)	-0.010*** (0.003)
Above average share of Panchayats' expenditure from the state expenditure	-0.176*** (0.036)	-0.168*** (0.039)	-0.151*** (0.042)	-0.130*** (0.048)
Low (below average) political decentralization index	-0.015 (0.026)	-0.009 (0.028)	-0.011 (0.032)	-0.013 (0.037)
Interaction between high share and low political decentralization variables	0.111*** (0.038)	0.113*** (0.041)	0.061 (0.044)	0.075 (0.051)
Constant	7.858*** (0.645)	7.035*** (0.674)	7.929*** (0.892)	6.348*** (0.944)
R-sq : within	0.5596	0.5417	0.6766	0.6206
: between	0.1507	0.3792	0.0915	0.5670
: overall	0.1237	0.3453	0.1048	0.5546
F-test (Chi-square for the random effect)	22.11***	100.32***	75.65***	65.14***
No. of observations		107		56
Hausman test		0.00 (1.000)		0.00 (1.000)

\*\*\*, \*\*, and \*denote significance at 1, 5, and 10 percent levels, respectively

Source: Own computation

Both the F statistics and the within  $R^2$  results are not different from those reported previously. Both the fixed-and random-effects model give similar results as shown by the Hausman test results. The F-and Wald-test results also show that both models (except the between model) are highly significant. The signs, coefficients, and significance level of most of the variables are almost the same to our previous results. Interestingly, the coefficient of the fiscal decentralization indicator variable (share of Panchayats' expenditure) is also negative and statistically significant. The results show that, all other things remaining constant, states with above the average share of Panchayats' expenditure are likely to reduce rural infant mortality rate by 15.45 percent compared to states with below the average share of Panchayats' expenditure. This shows that irrespective of the way rural fiscal decentralization is measured, it has a statistically significant impact on reducing infant mortality rates in the rural areas of India. Consistent with our previous results, the coefficient of the interaction variable is positive and significant confirming that the impact of fiscal decentralization is low in state with low level of political decentralization.

Second, we measure the fiscal and the political decentralization indices in a continuous fashion rather than as dichotomous (high and low) variables. The results (not shown here) are nearly the same as those produced by the dummy variables. Third, instead of the eight-year data, we take the two years average data between 1990 and 1997 to run the panel regression model. This approach is expected to take into account the lag effects of some of the variables on the dependent variable though it may reduce the 'within' effects. The results are presented in the last column of Table 5. Since the average of two years is taken as one variable, we have now only 56 observations. As the table clearly shows, the four-year average results are more or less similar to the eight years observation results except now the absolute magnitude of the coefficients are relatively low as expected.

All these reveal that rural fiscal decentralization plays a statistically significant role in reducing rural infant mortality in India and the results are robust to the way the decentralization variable is measured and to the way the data set is arranged.

## 7 Conclusion

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Many countries in the developing world have been embarking on the path of decentralization over the last two decades. Decentralization has been advocated as a powerful means of improving efficiency and equity in the provision of public goods such as health care. It is hypothesized that devolving power to local governments would improve efficiency as well as equity by bringing policy makers closer to the people and by enhancing participation at the grass-root level.

However, being a recent event and often politically motivated, much of the literature on decentralization focused on elaborating its theoretical benefits and possible limitations. As a result, very little is known about the practical impact of decentralization on improving the delivery of health care services and health outcomes worldwide. Given the enthusiastic move towards decentralization, it is quite important to investigate empirically its impact on the provision of health care services and health outcomes. This paper is an attempt to shed some light in this area.

A theoretical framework is developed to examine how decentralization may affect health outcomes. The theoretical framework shows that a well-designed and implemented decentralization policy can give decision makers up-to-date information about the preferences and problems of the local people and can help to create an effective channel for the people to express their needs and priorities. These help decision makers to respond to the local needs quickly and effectively and consequently to improve equity, efficiency, and coverage of health care services and thereby health outcomes. However, decentralization may pose ‘significant risks and challenges’ that may lead to a deterioration in the provision of health services and consequently to poor health outcomes.

We develop an empirical model that helps to conceptualize the relationship between decentralization and health outcomes, and to analyze factors that affect its effectiveness. We use panel data between 1990 and 1997 from the 14 major states of India to test the model. Fiscal decentralization is approximated by an index constructed from three different indicators using factor analysis. The share of Panchayats expenditure from the total state expenditure, the total Panchayats’ expenditure per rural population, and the share Panchayats’ own revenue from their total revenue are used to construct the fiscal decentralization index. The rural infant mortality rate is used as the health indicator variable, and the level of political decentralization as a variable that may affect the effectiveness of fiscal decentralization. The random effect regression results reveal that rural fiscal decentralization has a negative and statistically significant impact on the rural infant mortality rate in India between 1990 and 1997.

We also test the hypothesis that the effectiveness of fiscal decentralization depends on the capacity of the local institutions in utilizing the decentralized budget by interacting the fiscal decentralization indicator variable with the political decentralization index variable. The results show that the impact of fiscal decentralization in reducing the rural infant mortality rate can be very low in states with relatively low political participation of the community. This implies that low level of political decentralization can erode the effectiveness of fiscal decentralization in reducing infant mortality rates in rural India.

The robustness of the results is also checked by measuring fiscal decentralization in different way and by using two years average data in the panel model regression. The results show that our findings are robust. Generally, the results of the study indicate that fiscal decentralization can help to reduce infant mortality rates and political decentralization can be one important factor that affects its effectiveness.

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