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Impact of Intergovernmental Fiscal Transfers on Gender Equality in India: An Empirical Analysis

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Abstract

We analyse the effect of fiscal transfers from the federal to state governments in India—both conditional and unconditional transfers—on gender parity in enrolment at the primary and secondary levels in education, using panel data econometric models. In contrast to previous studies, examining Indian states, we employ a more disaggregate specification for transfers and grants, which is important given the size of this spending in state budgets. Our results provide evidence to suggest that unconditional fiscal transfers have a positive effect on gender equality outcomes but there is little evidence to suggest conditional transfers, even those falling within an educational grants program, have had a strong influence on outcomes. Real income is shown to have some effect but again, not as strong and consistent as one might have expected. Gender budgeting also surprisingly shows a mixed effect, both positive and negative effects and the precise mechanism through which these programs may be working to influence educational parity deserves greater attention at a finer level than is possible with our aggregate data. For policymakers, the results suggest integrating gender criteria in intergovernmental fiscal transfers and grants would strengthen the positive effects on gender equality. Income gains are not sufficient to generate equality of enrollment. Gender budgeting efforts have been insufficient in this critical area of policy. These are important conclusions of which the 15th Finance Commission of India can take note. Further investigation with more detailed fiscal and demographic data and at a finer level of disaggregation of transfer programs is called for.

Keywords

Intergovernmental fiscal transfers (IGFT), gender equality, fiscal federalism, gender budgeting, panel data

JEL codes: H00, I3, J16

Introduction

Fiscal federalism is, in theory, neither good nor bad for gender equality. The impact of fiscal federalism on gender-related outcomes depends on the institutional design of fiscal frameworks and intergovernmental transfer design. Although fiscal federalism is a vast literature, the intersection of fiscal federalism with gender equality is little studied.

India offers a good opportunity for examining the interaction between fiscal federalism and gender equality. Many major public expenditure assignments are at the state level and the tax assignments that produce the most revenue are at the Central or Union level. This asymmetry in expenditure and revenue assignments in India has created vertical imbalances in Indian fiscal relations, and intergovernmental fiscal transfers (IGFT) are designed to address these fiscal asymmetries. This paper examines whether IGFT—both unconditional and conditional transfers—are linked to gender equality. Key public spending decisions at the state level for education, health care, and infrastructure, and social welfare programs can have a major effect on gender equality.

A few existing studies have tested the impact of gender budgeting efforts on gender equality outcomes and found a positive link between the two. In principle, gender budgeting should lead to more spending on, or more effective, public programs and policies for gender equality. Stotsky and Zaman (2016) examine gender budgeting in the context of state governments in India, finding a positive effect of gender budgeting. While Chakraborty, Ingrams and Singh (2017) examine countries in the Asia Pacific region. Our paper takes the Stotsky and Zaman (2016) analysis one step further by incorporating a more disaggregated specification of Indian Central IGFT into an analysis of gender equality outcomes.

The paper is organised into sections. The first section looks at the existing literature on the topic, noting the paucity of existing studies. The next section presents the data. The third section explains the econometric model and presents and interprets the results. The final section concludes.

Review of theoretical and empirical literature

The theoretical literature on intergovernmental transfers largely deals with the conceptual elements and design of intergovernmental fiscal transfers in a context of competitive federalism (Bradford and Oates 1971; Musgrave 1997; Qian and Weingast 1997; Oates 1999; Bird and Smart 2002; Boadway and Shah 2007). The relative effectiveness of intergovernmental transfers on fiscal spending is analysed (Hines and Thaler 1995). Central intergovernmental transfers should, in principle, have both income and substitution effects on subnational governments. If transfers are designed in unconditional forms, they should have income effects by relaxing subnational budget constraints. If transfers are designed with to reduce the effective price of public spending, say, for instance, through matching elements in design, then they should also have price effects.

Habibi et al. (2002), in the context of Argentina, analyse the impact of fiscal transfers on human development and find a positive relationship between the two. Lü (2011) analyses the effect of intergovernmental fiscal transfers on education spending in the context of China for the period 1994 to 2000 and does not find strong effects. Litschig and Morrison (2013) analyse the link between fiscal transfers and local public expenditure in Brazil for the education sector. Their results reveal a positive and significant relationship between transfers and local education spending, and between per capita spending and education outcomes. Dahlberg, Mork, Rattso, and Agren (2008) find, using data from Sweden, that grants from the central government increased local spending, and that taking account of the endogeneity of grants is critical in assessing accurately the marginal impact of grants on local fiscal decisions.

In India, Rao (2018), Rao and Singh (2007), Isaac and Chakraborty (2008), Chakraborty and Gupta (2016), Chakraborty (2016), Chakraborty and Chakraborty (2016), and Chakraborty (2017) examine Central and subnational finances. However, the impact of fiscal transfers on women's advancement and gender equality is unaddressed in these papers. A few of the existing studies on IGFT in India have incorporated gender equality concerns. Chakraborty (2010) explores the plausibility of integrating gender criteria into IGFT in India. The study suggests two methods to do that: (i) incorporating gender criteria into formula-based tax transfers and/or (ii) designing a new fiscal transfer to the subnational government level to support gender budgeting initiatives. A specific suggestion is to incorporate the ratio of girls in the 0-6 age group by state as a proxy for gender inequality. Anand and Chakraborty (2016) attempt to empirically calculate each state's shares in tax transfers if the 0-6 sex ratio of the state is integrated into the existing tax transfer formula. This study finds that integrating this criterion will improve the income progressivity of fiscal transfers to subnational governments. Chakraborty et al. (2018) analyse the impact of a direct fiscal transfer to ensure a job guarantee, referred to as the Mahatma Gandhi National Rural Employment Guarantee Scheme, on male and female labor force participation rates. The study finds that participants benefited and the relative benefits for female participants were greater than for males, though the experience varied across states.

States in India have had a varied experience with gender budgeting, which refers to formal initiatives to address gender equality through fiscal policies and programs. The Ministry of Women and Child Development (MWCD) (2015) finds that several states had institutionalized gender budgeting including Karnataka, Kerala, Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, and others. In Karnataka, gender budgeting was adopted in 2006/07 and a Gender Budget Cell was established with the Finance Department to collaborate with the Women and Child Development Department to promote gender budgeting. The initiative led to the institution of Gender Budget Statements in the annual budget process with accompanying circular asking state departments to indicate what programs were devoted or had a substantial component devoted to goals for women and girls. A report on gender budgeting indicating allocations to relevant programs has been published since 2010 in the state finance accounts. A key part of the program was the introduction

of the "Karnataka Mahila Abhivruddhi Yojana" scheme, which is intended to allocate one-third of the resources in individual beneficiary-oriented and labour-intensive schemes of the government, across the areas of government spending, with a focus on education and skills training for jobs as well as social welfare and infrastructure programs.[1]

In Kerala, gender budgeting was adopted in 2008/09 and the gender budget statement was also introduced. Some specific programs adopted as part of the initiative were for protection of women against domestic violence, school programs geared to training women for specific job skills, health and sanitation spending, and a transportation-related scheme to address female-oriented goals. The MWCD report notes, however, that a lack of sex-disaggregated data is one principal hindrance to more effective gender budgeting efforts at the state level.

Joshi (2013) evaluates gender budgeting efforts in six states: Madhya Pradesh, Rajasthan, Andhra Pradesh, Gujarat, Jharkhand, and Odisha. The study concludes that implementation has varied and some states' efforts have focused mainly on pro forma, rather than substantive, actions. The Centre for Budget and Governance Accountability (2012) also evaluates state-level gender budgeting efforts. Like the other two studies, it finds variation in approaches among the different states. Focusing on Bihar, Karnataka, Kerala, and Madhya Pradesh, it concludes that Kerala and Madhya Pradesh had the most substantive efforts that had led to meaningful change in fiscal policies to address gender-related goals.

In terms of formal econometric studies, the impact of gender budgeting on gender equality outcomes is a new area of econometric research. Stotsky and Zaman (2016) analyse the impact of gender budgeting on gender equality outcomes and find that gender budgeting has a positive effect on gender equality in education at both the primary and secondary levels. Chakraborty, Ingrams, and Singh (2017) analyse the effectiveness of gender budgeting on sectoral gender outcomes in the context of the Asia Pacific region. They find that gender budgeting has a positive and significant effect on education and health outcomes; but there is no impact on labor force participation rates. This reinforces the view that care economy policies to augment female work force participation have been meagre in the region.

One shortcoming of the existing research on gender budgeting in India is that it does not incorporate sufficient detail on IGFT, a vital part of fiscal relationships. IGFT account for more than half of state revenues in India. The integration of IGFT in a disaggregated form by splitting transfers and grants into a model examining the determinants of gender equality outcomes is the main innovation here and provides a more realistic view of subnational decision making in India. For conditional transfers, we also pull out from aggregate grants an important component, the

[1] See dwcd.kar.nic.in:8080/women_welfare.jsp#ww_workWomen

Sarbha Siksha Abhiyan (SSA), designed for universalizing primary education, to examine its specific impact. It is equal to about 12 per cent of conditional grants in the period we study. In 2018, the SSA was consolidated with other education grants. Nonetheless, it is interesting to examine its historical performance.

Our empirical specification draws upon several strands of research. One posits that there is an underlying simultaneous relationship between gender equality and economic efficiency, productivity, and growth (World Bank 2011, Box 0.1, p. 49). Fiscal decisions that affect gender equality may affect growth, thus having a second-round effect on the fiscal variables, creating a possible simultaneous relationship. In modelling public spending and revenue decisions, a variety of approaches are found, extending from frameworks where fiscal decisions are determined by collective choice processes in which the government seeks to maximize utility or social welfare and demand for spending emerges from solving this problem, to alternative theories that see government motivations stemming from political economy and institutional considerations.[2]

Our empirical approach is reduced form in that we do not specify a social welfare function from which we derive specific demand equations, nor do we specify the precise model of the transmission of gender budgeting or fiscal variables through the budget to gender equality. Instead, we rely on the frameworks above to specify certain key determinants of gender equality, which are consistent with an underlying social welfare-based theory. Our reduced form approach does not necessarily rely on the presumption that higher spending on fiscal objectives, such as education and health, would lead to better gender equality outcomes but in general does encompass the idea that higher spending or better structured programs and policies would benefit gender equality outcomes.

Relatively few studies have examined the efficiency, productivity, or growth effects of public sector spending in India. Kaur and Misra (2003) examine the relationship between social sector spending and outcomes, in India, over the 1985/86-2000/01 period. They conclude that public spending on education is productive, though more so at the primary than the secondary level and in poorer states. The relationship between public spending on health and health outcomes is weaker, mainly reflecting inadequate, rather than ineffective, spending. They also find that state spending on education is more instrumental than spending on health in narrowing gender disparities.

There are a variety of ways one can measure gender equality. We focus on school enrolment equality in this paper because it is one critical indicator of equality. Also, school enrolment of girls should benefit from any of several programs that benefit the family given girls' economic role in poor households as well as the secondary status accorded them compared to boys.

[2] Hindriks and Myles (2006) provide a useful overview of different approaches.

Women's labour force participation compared to men's is another important indicator of gender equality. Khera (2016) examines the impact of gender-related policies on relative rates of labour force participation. It finds that government policies that increase female education, social spending, and labour market flexibility raise women's labour force participation. We do not examine this issue in our study because our empirical specification is designed to capture the determinants of fiscal spending; and relevant labour market data are not available in our data set.

Describing the data: the fiscal transfers architecture in India

Institutional setting

India has a three-tiered federal structure, with 29 state governments and seven centrally administered Union Territories and more than a quarter million local self-governments in states, in both rural and urban areas. The richest province is Goa, with a per-capita income of INR 270,150 (about USD 4,156) and poorest province is Bihar, with a per-capita income of INR 34,168 (about USD 526), as per the Central Statistical Office data for the year 2015/16 (Chakraborty et al. 2018).

Chakraborty et al. (2018), Isaac, Mohan, and Chakraborty (2019), and Reddy and Reddy (2019) describe fiscal transfers in India, considering the various components and channels of transfers. IGFT can be broadly categorized into unconditional (or untied) and conditional (or tied) transfers. The first channel of unconditional transfers consists mainly of formula-linked tax transfers from the Central or Union's government's revenues. The second channel of conditional transfers consists mainly of grants from the Union government (or centrally sponsored schemes).

In India, the Finance Commission, the Planning Commission (abolished in 2014), and line ministries of the Union government are responsible for IGFT. India has had 14 Finance Commissions since independence. Recently India has appointed the Fifteenth Finance Commission and it is expected to submit its report by 2019.

The Finance Commission's recommendations in India have so far been conclusively accepted by the National Parliament. Afterwards, the Finance Commission awards to the states, as per their formula, become mandatory and these transfers are also therefore referred to as "statutory fiscal transfers." They are unconditional or general purpose transfers.

Until recently, a substantial flow of intergovernmental grants has been transferred through the erstwhile Planning Commission of India. In place of the Planning Commission, the National Institution for Transforming India Aayog has been constituted as a think tank to foster cooperative federalism in the country, but it has no role in determining IGFT. The non-statutory transfers are

channelled through the line ministries mostly as conditional or tied grants for specific purposes. These conditional grants are also referred to as "centrally sponsored schemes."

Data

The data used cover the period 1991-2015 and are obtained from the IMF Database on gender created in 2016, as part of an IMF initiative on gender budgeting, the State Finance Accounts (budgeted unconditional transfer)[3], Central government ministry web sites (budgeted conditional transfers) and the Ministry of Women and Child Development (MWCD) gender budgeting information.[4] Table 1 provides the descriptive statistics. This table shows the variation in gender equality, measured by school enrollment, as well as other key variables.

Between 1991-2015, 16 of the 29 states adopted gender budgeting. We do not include Union Territories because they have limited fiscal autonomy. The primary and secondary school gender equality variables are constructed as follows: the number of female or male students enrolled at the relevant schooling level, regardless of age, is divided by the population of the relevant age group. Then the ratio of female to male ratios is taken.[5] All nominal spending and revenue variables and income are measured in real per capita terms. The samples of data for primary education encompass the period before gender budgeting was in place for any state and for most, at least several years afterwards. However, the sample for secondary education is available only for a period following the start of gender budgeting in some states.

Although most states are close to parity in the female to male ratio in lower primary school enrolment, there are still a few that lag, and the ratios worsen at each successive level of education. The populations of Indian states and income per capita and gross state domestic product vary widely. Services are the predominant source of state income, though agriculture and manufacturing are also important contributors. Social services spending comprises the largest share of spending, followed by education and infrastructure. The share of spending on health is notably low. Taxes and non-tax revenues are both important. Shared central government taxes are a little under half of state taxes and central government grants are over half of state non-tax revenues.

[3] In India, there may be a significant discrepancy between budgeted and actual expenditures.
[4] Details on compilation of the data are available from the authors.
[5] Lower primary school roughly encompasses age 6 to 10 and upper primary school 11 to 13. Lower secondary school roughly encompasses age 14 to16 and upper secondary school, higher grades. It is possible to have female to male ratios above 1 because of repeating students or enrolment of students above the typical age.

TABLE 1: DESCRIPTIVE STATISTICS

Variable	Description	N	Mean	Median	Std. Dev.	Min	Max
Gender Equality Index	Gender equality index: lower primary school	280	0.98	0.98	0.06	0.75	1.18
	Gender equality index: upper primary school	280	0.94	0.96	0.11	0.59	1.22
	Gender equality index: lower secondary school	168	0.93	0.96	0.14	0.57	1.20
	Gender equality index: upper secondary school	168	0.90	0.90	0.16	0.53	1.33
Population	Population (millions)	280	38.27	27.60	41.47	0.55	199.35
GDP	Per capita income (nominal, thousand Rs)	280	38.27	32.09	25.16	6.83	192.03
	Per capita income (real (2014=100), thousand Rs)	280	56.87	50.46	30.20	13.03	207.17
	Nominal GSDP (billion Rs)	280	1,267.4	799.3	1535.7	11.4	10,491.5
	Real GSDP (billion Rs)	280	1,907.4	1,234.9	2,136.3	20.9	12,495.8
Sectoral Share	Agriculture (% of state GDP)	280	18.7	18.9	6.5	2.2	34.4
	Manufacturing (% of state GDP)	280	12.7	11.5	8.1	1.1	39.0
	Service (% of state GDP)	280	48.2	47.8	7.3	30.7	64.1
Revenues (real per capita terms)	Nontax revenues (thousand Rs)	280	8.26	12.15	0.36	3.05	63.91
	Tax revenues (thousand Rs)	280	5.55	3.08	1.04	4.71	17.13
	Total revenues (thousand Rs)	280	13.81	13.54	2.31	9.38	80.00
	Conditional transfers (thousand Rs)	280	5.66	8.01	0.23	1.37	38.34
	Unconditional transfers (thousand Rs)	280	2.10	1.57	0.35	1.77	11.19
Expenditures (real per capita terms)	Education expenditure (thousand Rs)	280	2.28	1.68	0.59	1.79	12.63
	Infrastructure expenditure (thousand Rs)	280	2.32	2.29	0.29	1.46	18.79
	Health expenditure (thousand Rs)	280	0.66	0.55	0.13	0.43	3.24
	Total expenditure (thousand Rs)	280	15.89	14.30	3.09	11.03	81.92

Source: IMF database, Finance Accounts of state governments, and Central government ministry websites.

Econometric model and results

We econometrically analyse the effects of IGFT on gender outcomes across the states of India, controlling for whether states have gender budgeting initiatives in place. We next discuss the specification of some key variables.

The structure of gender budgeting initiatives is difficult to quantify.[6] Specifically targeted allocations for gender development are less than one per cent of the entire budget. There also is spending within the remaining 99 per cent of the budget with gender-related objectives. Unless we try to quantify this, using targeted public spending on gender equality goals is potentially misleading. Consequently, we avoid using this spending as a proxy for gender budgeting initiatives.

Another dimension of the effectiveness of gender budgeting in any state is whether it is made mandatory. In India, gender budgeting was not legally mandated. A third dimension categorizes states in relation to four phases of gender budgeting—first, if a state is in an early phase of model building; second, if a state is institutionalizing gender budget statements and other aspects of implementation in the Finance Ministry; third, if is in a phase of capacity building of sectoral ministries to integrate gender budgeting into programs and policies; and fourth, if it is designing accountability mechanisms to assess its effects. It is difficult to assess where the various states are in the implementation of their gender budgeting initiatives and therefore, we did not use these phases as a measure of gender budgeting implementation in our econometric models.

Given the data limitations, following Stotsky and Zaman (2016), we categorize states into gender budgeting and non-gender budgeting states based on the announcement by the government that it has initiated gender budgeting. We measure the effect of gender budgeting through the use of a dummy variable, where the variable takes a value of 1, if the state has a gender budgeting effort in place and 0, if the state does not. The gender budgeting regime dummies are also matched to the year when gender budgeting began. The year of implementation is used as a regime changing dummy because gender budgeting has not been rolled back where it has been initiated in Indian states.[7]

Although we treat gender budgeting as a discrete event, there may be programs and policies of the government adopted over time that comprise in substance a gender equality program, even if the government does not formally implement gender budgeting. Unfortunately, it is difficult to assess the evolution of a government budget in this manner and to categorize its change in a discrete manner. We thus caution the reader that the gender budgeting dummy should be regarded as meaningful in that it represents a formal commitment of the government to achieving gender equality through the budget, even though in substance, programs and policies may not precisely correspond to the same timing of adoption of the initiative.

Econometric model

[6] For a summary of gender budgeting initiatives in India, see Stotsky and Zaman (2016) and Chakraborty (2016).
[7] In the Asia Pacific context, Chakraborty et al. (2017) use Budget Call Circulars as given in a 2017 UN Women survey to categorize the countries into gender budgeting and non-gender budgeting countries.

We econometrically estimate the following equations to measure the impact of IGFT and gender budgeting on gender equality outcomes.

$$GI_{it} = \beta_1 GB_{it} + \beta_2 IGFT_{it} + \delta X_{it} + \eta_i + \nu_t + \varepsilon_{it}$$

where GI_{it} is the dependent variable in state *i* in year *t,* representing gender equality, measured as the ratio of the scaled female to male enrollment in primary and secondary school; $IGFT_{it}$ are the intergovernmental fiscal transfer and grant variables, GB_{it} is the gender budgeting dummy that indicates whether there is an ongoing gender budgeting effort in state *i* in year *t*; and X_{it} is a vector of control variables, representing other factors which might determine the dependent variable and include exogenous determinants of state revenue raising capacity, state spending preferences, and preferences toward gender equality; ε_{it} is the random error term; and β and δ are parameters to be estimated.

The model also includes state fixed effects, η_i, to control for time-invariant characteristics of state *i*, and time fixed effects, ν_t, to control for state-invariant characteristics of time t. The state fixed effects might capture any of a number of systematic and invariant (at least over the period of the sample) differences across states, such as the religious and cultural traditions. One example is:

> Kerala is well known in India as a state with a strong matriarchal tradition, where property is inherited through the mother, while most states in India have strong patriarchal traditions, where fathers are the head of the extended family. (Stotsky and Zaman 2016, p. 18).

As noted in Stotsky and Zaman (2016), ideally, we would have other variables for gender equality in education beyond the gender parity in enrollment index. However, the database unfortunately does not provide any other gender outcome variables for states of India across time in education. The paucity of data on religious affiliation across states and multiplicity of political parties in different states and over time also limit their usefulness in the present models as independent variables.

We use the following variables as exogenous determinants of fiscal variables that might affect gender equality: real income per capita and per capita IGFT from the Union government, which is entered in aggregate form and disaggregated into unconditional and conditional fiscal transfers, both measured in the natural log of real per capita amounts; population, measured in millions; and GDP from agriculture, manufacturing, and services, all measured as a ratio of state GDP. Population is used to control for economies of scale in provision of public services and might also have an effect of gender equality through indirect means (for instance, states with larger populations might be more exposed to influences that would change the dynamic toward gender equality in the state) (Stotsky and Zaman 2016).

The structural transformation of the economy is captured through the share of the state economy in various types of economic activity, which could affect gender equality outcomes by influencing how women participate in economic activity. In India, "participation income" (income received by participating in economic activity) is more consequential for the family than universal "basic income" (the income transferred to individuals through public policies, irrespective of their participation in economic activity). We cannot capture the full richness of the determinants of gender equality with our aggregate state specification. However, we do not have available a dataset with household data to examine this issue in more detail.

We examine the effect of IGFT and gender budgeting on gender equality outcomes in education, using a panel data approach and standard methodologies for panel data econometrics. For our econometric model, we use the Hausman test to choose whether the fixed effects or random effects specification is better to explain the behavior of the error term. The test statistics suggest the fixed effects specifications are better. In addition to fixed effects models, we also try generalized method of moments (GMM) approaches to account for a lagged dependent variable and to address potential endogeneity of the independent variables. The lagged dependent variable captured in the GMM models can better measure the dynamic process by which gender equality indicators evolve over time. The following sections report both the panel data results with fixed effects and the GMM specifications.

Fixed effect results

We present the results of the various estimations of the link between IGFT variables and gender budgeting, with the gender equality outcome variables measured by enrollment in education and using fixed effects, in Tables 2 and 3. We have used both one-way and two-way fixed effects. Stotsky and Zaman (2016) present results based on probit analysis suggesting the decision to adopt gender budgeting is not endogenous to economic decisions but driven by political differences, ruling out one potential complication.

In Table 2, we present the results of our basic specification, with the IGFT specified in aggregate form and gender budgeting specified as a contemporaneous dummy variable. The other variables in the model are real per capita income, log of population, and agriculture GDP, manufacturing GDP, and services GDP, all measured as a ratio to state GDP. Time dummies are suppressed but full results are available from the authors.

The first two columns of results (A and B) are for the dependent variable of gender parity in enrollment for lower primary school, with the one-way fixed effects reported in the first column and the two-way fixed effects reported in the second column. The fixed effects (one-way and two-way) for the gender parity outcome for upper primary and lower and upper secondary school are reported in columns C through H.

TABLE 2: IMPACT OF FISCAL TRANSFERS ON GENDER EQUITY WITH AGGREGATE TRANSFERS VARIABLE: FIXED EFFECTS MODEL

Variables	Gender equality index lower primary school (female to male ratio)		Gender equality index upper primary school (female to male ratio)		Gender equality index lower secondary school (female to male ratio)		Gender equality index upper secondary school (female to male ratio)	
	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way
	A	B	C	D	E	D	G	H
Real per capita Aggregate transfers (log)	0. 013 (0.024)	-0.002 (0.028)	0.031 (0.039)	-0.001 (0.042)	0.010 (0.044)	-0.008 (0.062)	0.099 (0.061)	0.039 (0.054)
Real per capita income (log)	0.018 (0.029)	-0.002 (0.048)	0.054 (0.038)	-0.059 (0.084)	0.156*** (0.046)	0.097 (0.151)	0.233*** (0.073)	-0.304 (0.208)
Population (log)	0.002** (0.001)	0.002* (0.001)	0.003 (0.002)	0.002 (0.002)	0.010** (0.005)	0.009* (0.005)	-0.000 (0.005)	-0.005 (0.005)
Agric. GSDP (% of State GSDP)	0.001 (0.001)	-0.000 (0.002)	0.002 (0.002)	0.002 (0.002)	-0.002 (0.003)	-0.003 (0.004)	0.002 (0.005)	-0.000 (0.005)
Manuf. GSDP (% of State GSDP)	-0.000 (0.001)	-0.001 (0.002)	0.000 (0.002)	0.001 (0.002)	-0.001 (0.003)	-0.000 (0.003)	-0.002 (0.003)	0.002 (0.004)
Services GSDP (% of State GSDP)	0.002 (0.001)	0.001 (0.002)	0.004* (0.002)	0.002 (0.002)	0.002 (0.003)	0.001 (0.003)	0.001 (0.003)	-0.005 (0.005)
Gender budgeting	0.024* (0.012)	0.020 (0.013)	0.031* (0.018)	0.029 (0.018)	0.005 (0.021)	0.002 (0.023)	-0.005 (0.025)	-0.024 (0.027)
Constant	0.485* (0.275)	0.911* (0.470)	-0.222 (0.337)	1.297 (0.878)	-1.288** (0.525)	-0.452 (1.931)	-2.58*** (0.594)	4.213* (2.461)
Observations	280	280	280	280	168	168	168	168
R-squared (within)	0.266	0.294	0.392	0.431	0.340	0.371	0.367	0.493
No. of states	28	28	28	28	28	28	28	28
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes		Yes		Yes		Yes
Robust standard error in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1								

Source: Our databases and estimates.

Our results show no significant relation of aggregate transfers and grants to gender equality in enrollment in the primary and secondary education sectors. The gender budgeting dummy is positive and significant only in the regression equations for lower and upper primary school for the one-way fixed effects models. These results provide some limited evidence for the efficacy of gender budgeting in Indian states. Real per capita income has significant and positive effects on

gender equality outcomes only for the one-way fixed effects model for lower and upper secondary enrollment ratios, suggesting that as income rises, gender equality improves.

Population is found positive and significant in the lower primary and lower secondary school equations of the one-way and two-way fixed effects models, suggesting some economies of scale. The sectoral shares are not significant, except the services sector in the upper primary one-way fixed effects model, suggesting that the composition of state output does not have a strong impact on gender equality, at least measured by school enrollment.

These results provide support for the idea that rising income may lead to greater gender equality in education, measured by enrollment, and some limited support for gender budgeting but no support for grants and transfers. However, our concern is that the grants and transfers variable is measured in overly aggregate form and we may be missing a crucial relationship. Our next approach is to disaggregate this variable into its two key components of grants and transfers.

In Table 3, we present the impact of IGFT but now we disaggregate the grants and transfers variables. We find that grants have no significant relationship to gender equality while we obtain that in the upper primary school two-way fixed effects estimation, transfers have an inverse and significant relationship with gender equality. In contrast, in the lower and upper secondary school one-way fixed effects results, we find that transfers have a positive and significant relationship. Gender budgeting has a positive and significant effect on gender equality in the one-way fixed effects estimations, as in the earlier specification. Real per capita income has a significant effect on gender equality in the one-way fixed effects specifications for upper primary, and lower and upper secondary schooling, while population is positive and significant in lower primary and lower secondary education, and services is positive and significant again in just one estimation.

We explore some further disaggregation of the conditional grants by separating SSA grants dedicated to education from other conditional grants (we take the logs of the two variables, grants – SSA grants and SSA grants alone) and enter both variables linearly in the equation. This specification relaxes the constraint that the SSA grants and other conditional grants have the same coefficient. Table 4 presents the results.

TABLE 3: IMPACT OF FISCAL TRANSFERS ON GENDER EQUITY, WITH DISAGGREGATE TRANSFERS AND GRANTS VARIABLES: FIXED EFFECTS MODEL

Variables	Gender equality index lower primary school (female to male ratio)		Gender equality index upper primary school (female to male ratio)		Gender equality index lower secondary school (female to male ratio)		Gender equality index upper secondary school (female to male ratio)	
	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way
Real per capita conditional transfers (log)	0.004 (.013)	-0.004 (.014)	0.021 (0.026)	0.007 (0.025)	-0.018 (0.033)	-0.012 (0.033)	-0.003 (0.033)	0.005 (0.035)
Real per capita unconditional transfers (log)	0. 003 (0.015)	-0.016 (0.020)	-0.002 (0.023)	-0.050* (0.028)	0.064* (0.037)	0.027 (0.080)	0.168*** (0.052)	0.054 (0.082)
Real income per capita (log)	0.025 (0.031)	0.003 (0.047)	0.069* (0.035)	-0.043 (0.082)	0.132*** (0.047)	0.107 (0.150)	0.186** (0.078)	-0.280 (0.208)
Population (log)	0.002** (0.001)	0.002 (0.001)	0.002 (0.002)	0.001 (0.002)	0.010** (0.005)	0.010* (0.005)	-0.000 (0.005)	-0.004 (0.005)
Agric. GSDP (% of State GSDP)	0.001 (0.001)	-0.000 (0.002)	0.002 (0.002)	0.001 (0.002)	-0.003 (0.003)	-0.003 (0.004)	0.001 (0.005)	-0.000 (0.005)
Manuf. GSDP (% of State GSDP)	-0.000 (0.001)	-0.001 (0.002)	0.000 (0.002)	0.001 (0.002)	-0.002 (0.003)	-0.001 (0.003)	-0.004 (0.004)	0.001 (0.004)
Services GSDP (% of State GSDP)	0.002 (0.001)	0.001 (0.002)	0.004* (0.002)	0.002 (0.002)	0.000 (0.003)	0.001 (0.004)	-0.002 (0.004)	-0.006 (0.005)
Gender budgeting	0.024* (0.012)	0.020 (0.013)	0.031* (0.018)	0.028 (0.018)	0.002 (0.021)	0.002 (0.023)	-0.014 (0.025)	-0.023 (0.027)
Constant	0.466 (0.288)	0.996** (0.468)	-0.261 (0.347)	1.466 (0.900)	-1.189** (0.510)	-0.716 (2.064)	-0.281*** (0.646)	3.860 (2.617)
Observations	280	280	280	280	168	168	168	168
R-squared (within)	0.264	0.297	0.393	0.443	0.355	0.372	0.422	0.493
No. of states	28	28	28	28	28	28	28	28
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes		Yes		Yes		Yes
Robust standard error in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1								

Source: Our databases and estimates.

TABLE 4: IMPACT OF FISCAL TRANSFERS ON GENDER EQUITY, WITH SEPARATE SSA AND GRANTS VARIABLES: FIXED EFFECTS MODEL

Variables	Gender equality index lower primary school (female to male ratio)		Gender equality index upper primary school (female to male ratio)		Gender equality index lower secondary school (female to male ratio)		Gender equality index upper secondary school (female to male ratio)	
	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way	Panel One-way	Panel Two-way
Real per capita conditional transfers minus SSA (log)	0.011 (.010)	0.012 (.012)	0.035 (0.031)	0.041 (0.031)	-0.007 (0.029)	-0.002 (0.030)	0.009 (0.030)	0.019 (0.029)
Real per capita SSA (log)	0.009** (.004)	0.009** (0.004)	0.012* (0.007)	0.019** (0.009)	0.000 (0.009)	0.006 (0.010)	0.006 (0.009)	0.013* (0.007)
Real per capita unconditional transfers (log)	0. 034 (0.027)	0.060 (0.042)	0.028 (0.026)	0.014 (0.075)	0.061 (0.037)	0.024 (0.081)	0.171*** (0.053)	0.057 (0.082)
Real income per capita (log)	0.005 (0.035)	-0.001 (0.107)	0.073 (0.046)	0.038 (0.121)	0.122** (0.046)	0.093 (0.151)	0.175** (0.075)	-0.339 (0.210)
Population (log)	0.006* (0.003)	0.006* (0.003)	0.005 (0.004)	0.005 (0.004)	0.010* (0.005)	0.010* (0.005)	-0.000 (0.005)	-0.005 (0.005)
Agric. GSDP (% of State GSDP)	0.001 (0.002)	0.001 (0.002)	0.002 (0.003)	0.001 (0.004)	-0.003 (0.004)	-0.003 (0.004)	0.001 (0.005)	0.001 (0.005)
Manuf. GSDP (% of State GSDP)	0.000 (0.002)	-0.000 (0.002)	-0.001 (0.002)	-0.001 (0.003)	-0.002 (0.003)	-0.000 (0.003)	-0.003 (0.004)	0.002 (0.004)
Services GSDP (% of State GSDP)	0.001 (0.002)	0.000 (0.002)	0.002* (0.002)	0.002 (0.002)	0.000 (0.003)	0.001 (0.004)	-0.002 (0.004)	-0.006 (0.005)
Gender budgeting	0.009 (0.010)	0.011 (0.012)	0.020 (0.018)	0.024 (0.017)	0.002 (0.021)	0.003 (0.022)	-0.014 (0.025)	-0.022 (0.026)
Constant	0.240 (0.316)	0.149** (1.197)	-0.708 (0.574)	-0.269 (1.913)	-1.167** (0.536)	-0.661 (2.042)	-2.334*** (0.638)	4.313 (2.617)
Observations	167	167	167	167	168	168	168	168
R-squared (within)	0.282	0.288	0.369	0.399	0.351	0.371	0.425	0.507
No. of states	28	28	28	28	28	28	28	28
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes		Yes		Yes		Yes
Robust standard error in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1								

Source: Our databases and estimates.

We find that SSA grants are positive and significant in the primary education estimations and one upper secondary estimation, an intuitively appealing result. Their significance seems to draw away significance from the gender budgeting variables that we previously found significant in some estimations, suggesting that gender budgeting might have been picking up some of the effect of this grant program that was concealed within the aggregate specification. Whether gender budgeting contributed to the efficacy of the program or this is an incidental correlation is hard to discern from these aggregate data.

GMM results

A GMM specification, in contrast to the fixed effects estimations, may better account for the persistence of the indicator over time and also possible endogeneity of righthand side variables. We explore a number of different GMM estimators and present the system GMM as the best specification, after examination of the test statistics.[8] Table 5 presents the results. In each column, we choose the set of endogenous variables by examining the difference in Sargan test on exogeneity of instrumental variables instruments and use the minimal set of endogenous variables to satisfy the chi squared test statistic for adequacy.

For all four dependent variables, the lagged dependent variable is positive and strongly significant, with a value above 0.6, suggesting strong persistence of the indicator over time. We also obtain that the transfers and grants variables and income and population are endogenous in all regressions. As with the fixed effects specification (using Table 3 results), we find that the conditional transfers are not significant while we find some limited significance of the unconditional transfers. For the two secondary school dependent variables, unconditional transfers are positive and significant. We also find a positive effect of per capita income, here for primary school, while in the fixed income it was mixed across primary and secondary school. Population has a negative and significant effect for upper secondary school while it had a positive and significant effect in several of the fixed effects specifications. Agriculture has positive and significant effects for primary school and a negative effect for upper secondary school, in contrast to no significance for the fixed effects. This is an interesting finding in that it is somewhat at variance with expectation that the more agrarian states would be less gender equal in school enrollment. Services, as with the fixed effects specification, is positive and significant only for upper primary school. Some similarity is found with gender budgeting at the primary level, here only for lower primary school. Curiously, gender budgeting is found to have a negative and significant effect for upper secondary school, a result which demands further attention at a more detailed level.

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[8] Our GMM specification makes use of STATA's Xtbond2 routine. For lower primary school, all variables up to population are treated as endogenous. For upper primary school, population is treated as exogenous. Although the results are relatively stable with other assumptions on exogeneity, this specification for the explanatory variables yields appropriate chi-squared statistics on the Sargan difference tests of exogeneity of iv instruments. Full results are available from the authors.

TABLE 5: IMPACT OF INTERGOVERNMENTAL FISCAL TRANSFERS ON GENDER EQUALITY: GMM ESTIMATES

Variables	Gender equality index lower primary school (female to male ratio)	Gender equality index upper primary school (female to male ratio)	Gender equality index lower secondary school (female to male ratio)	Gender equality index upper secondary school (female to male ratio)
Lagged dependent variable	0.629*** (0.052)	0.739*** (0.047)	0.780*** (0.071)	0.831*** (0.058)
Real per capita conditional transfers (log)	0.003 (0.004)	0.003 (0.006)	-0.002 (0.010)	-0.005 (0.010)
Real per capita unconditional transfers (log)	-0.003 (0.006)	0.011 (0.008)	0.028* (0.017)	0.038** (0.020)
Real income per capita (log)	0.022*** (0.008)	0.023** (0.010)	0.002 (0.022)	0.001 (0.021)
Population (log)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.002)
Agriculture GSDP (% of State GSDP)	0.001** 0.001)	0.002** (0.001)	0.001 (0.002)	-0.004*** (0.001)
Manuf. GSDP (% of State GSDP)	0.001 (0.001)	0.001 (0.001)	0.001 (0.002)	-0.002 (0.002)
Services GSDP (% of State GSDP)	0.001 (0.000)	0.001** (0.001)	0.001 (0.001)	0.002 (0.001)
Gender budgeting	0.008* (0.005)	0.004 (0.006)	-0.018 (0.012)	-0.023** (0.011)
Constant	0.071 (0.076)	-0.194* (0.104)	-0.077 (0.265)	-0.228 (0.285)
Number of instruments	137	113	109	97
Difference in Sargan test on exogeneity of iv instruments (chi2 and prob > chi2)	5.53 (0.237) 4 degrees of freedom	6.68 (0.245) 5 degrees of freedom	0.63 (0.427) 1 degrees of freedom	4.00 (0.135) 2 degrees of freedom

Sources: Our databases and estimates.

Altogether the results suggest some degree of correspondence with the fixed effects results, providing comfort with regard to the robustness of the specification. However, the strong significance of the lagged dependent variable and extent of endogeneity of the explanatory variables weighs heavily in favor of the GMM specification. The results suggest overall little impact of conditional transfers overall though some positive impact of unconditional transfers and income, where unconditional transfers are functioning largely as a form of income augmentation to the states. Gender budgeting's mixed effect is curious.

We also examine the disaggregate results where, like in Table 4, we break down conditional grants by removing SSA grants from the aggregate and include two variables, conditional grants without SSA grants and SSA grants alone, and otherwise use the same specification. The GMM results for this specification are presented in Table 6. Again, we use system GMM and varying endogenous right-hand variables, selected on the basis of examination of the difference in Sargan test on exogeneity. We see that the lagged dependent variable is still positive and strongly significant and conditional transfers without SSA grants are not significant. Interestingly, SSA grants are no longer significant at all, in contrast to the fixed effects outcome, where they were for primary education and upper secondary school for the two-way fixed effects. Unconditional transfers are significant for secondary school, showing some correspondence with the result for fixed effects, where they were for the upper secondary school one-way fixed effects estimation. Also, interestingly, income is not significant and population negative and significant only for upper secondary school. Agriculture is again significant for primary school, as in Table 5 while manufacturing and services show some mixed positive effects. Gender budgeting is again negative and significant only for upper secondary school, again a surprising finding.

TABLE 6: IMPACT OF INTERGOVERNMENTAL FISCAL TRANSFERS ON GENDER EQUALITY WITH SEPARATE SSA AND GRANTS VARIABLES: GMM ESTIMATES

Variables	Gender equality index lower primary school (female to male ratio)	Gender equality index upper primary school (female to male ratio)	Gender equality index lower secondary school (female to male ratio)	Gender equality index upper secondary school (female to male ratio)
Lagged dependent variable	0.521*** (0.061)	0.734*** (0.057)	0.741*** (0.072)	0.828*** (0.060)
Real per capita conditional transfers minus SSA (log)	0.004 (0.005)	-0.000 (0.007)	-0.001 (0.010)	-0.001 (0.009)
Real per capita SSA (log)	0.003 (0.004)	0.000 (0.005)	-0.007 (0.008)	-0.006 (0.008)
Real per capita unconditional transfers (log)	-0.005 (0.009)	0.028 (0.011)	0.038** (0.018)	0.031* (0.018)
Real income per capita (log)	0.003 (0.011)	0.009 (0.015)	0.000 (0.022)	-0.008 (0.021)
Population (log)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)
Agriculture GSDP (% of State GSDP)	0.002** 0.001)	0.002** (0.001)	0.003 (0.002)	-0.002 (0.002)
Manuf. GSDP (% of State GSDP)	0.002** (0.001)	0.001 (0.001)	0.002 (0.002)	0.003 (0.002)
Services GSDP (% of State GSDP)	0.001 (0.001)	0.002** (0.001)	0.002* (0.001)	0.002 (0.001)
Gender budgeting	0.003 (0.005)	-0.001 (0.007)	-0.017 (0.012)	-0.023** (0.011)
Constant	0.355 (0.121)	-0.177 (0.182)	-0.154 (0.296)	-0.069 (0.292)
Number of instruments	89	89	98	98
Difference in Sargan test on exogeneity of iv instruments (chi2 and prob > chi2)	5.60 (0.348) 5 degrees of freedom	5.19 (0.393) 5 degrees of freedom	2.36 (0.500) 3 degrees of freedom	3.57 (0.312) 3 degrees of freedom

Source: Our databases and estimates.

Conclusion

Our results suggest that at the aggregate level, fiscal transfers from the federal government to states are not suggesting a strong role in achieving gender equality in enrollment in primary and secondary education in India. There is some evidence in the disaggregated models to suggest that unconditional fiscal transfers have a positive effect on gender equality outcomes but there is little evidence to suggest conditional transfers, even those falling within an educational grants program, have had a strong influence on outcomes. Real income is shown to have some effect but again, not as strong and consistent as one might have expected. Gender budgeting also surprisingly shows a mixed effect, both positive and negative effects, and the precise mechanism through which these programs may be working to influence educational parity deserves greater attention at a finer level than is possible with our aggregate data.

For policymakers, the results suggest integrating gender criteria in intergovernmental fiscal transfers and grants would strengthen the positive effects on gender equality. Income gains are not sufficient to generate equality of enrollment. Gender budgeting efforts at the subnational government levels have been insufficient in this critical area of policy. These are important conclusions of which the 15th Finance Commission of India can take note. Further investigation with more detailed fiscal and demographic data and at a finer level of disaggregation of transfer programs is called for.

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