

Faguet, Jean-Paul; Khan, Qaiser; Kanth, Devarakonda Priyanka

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**Jean-Paul Faguet, Qaiser Khan and Devarakonda
Priyanka Kanth**

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Department of International Development

London School of Economics and Political Science

Houghton Street

London

WC2A 2AE UK

Tel: +44 (020) 7955 7425/6252

Fax: +44 (020) 7955-6844

Email: J.P.Faguet@lse.ac.uk

Website: www.lse.ac.uk/InternationalDevelopment

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Decentralization's effects on education and health: Evidence from Ethiopia

Jean-Paul Faguet (London School of Economics, j.p.faguet@lse.ac.uk)¹

Qaiser Khan (World Bank, qkhan@worldbank.org)²

Devarakonda Priyanka Kanth (World Bank, dkanth@worldbank.org)³

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Abstract

We explore the effects of decentralization on education and health in Ethiopia using an original database covering all of the country's regions and *woredas* (local governments). Ethiopia is a remarkable case in which war, famine and chaos in the 1970s-80s were followed by federalization, decentralization, rapid growth and dramatic improvements in human development. Did decentralization contribute to these successes? We use time series and panel data analyses to show that decentralization improved net enrollments in primary schools and access to antenatal care for pregnant women. The main channel appears to be institutional, not fiscal. We offer the database as an additional contribution.

Keywords: decentralization, education, health, public investment, Ethiopia, local government

JEL: H41, H75, H77, O1

Decentralization is one of the most widespread policy reforms in the world. It is currently being pursued, or was recently implemented, in all of the world's regions, across political systems and income brackets. It is particularly strong in Africa (Fessha and Kirkby 2008). In 1999 the World Bank estimated that decentralization was happening in 80-100 percent of the world's countries. For many working on the topic then, this moment felt like a wave that was surely cresting. But enthusiasm has only grown in the new millennium, with new or deepening reforms announced in countries as diverse as Bolivia, Cambodia, France, Japan, Kenya, and Turkey, to name just a few (Faguet and Pöschl 2015, Hooghe and Marks 2016, Rodden 2006, World Bank 1999).

The academic response has been similarly bountiful, with hundreds of articles published across the geography, economics, political science, development studies and public policy literatures. Adding the so-called "gray literature" of policy studies by the likes of the World Bank, IMF, think tanks, government agencies, and others pushes the total well into the thousands. For understandable reasons of data, funding, and policy interest, most of these studies focus on the high-income countries of the OECD. But most of the world's 190+ countries, and hence most of the world's decentralization, lie outside this thirty-six nation club. Indeed, a great deal of it can be found in Africa (Dickovick and Wunsch 2014). But Africa is notably under-represented in the decentralization literature.

This study seeks to add to our knowledge about decentralization in low-income countries, and in Africa, by exploring its effects in Ethiopia. With a population of 109 million (World Bank Open Data 2019), Ethiopia is a big, important country in its own right. It is also a remarkable case of development, suffering war, famine and chaos in the 1970s and 1980s, before transforming itself into one of the fastest growing economies in the world. For ten of the past fifteen years,

Ethiopia has sustained growth rates above 10 percent, with no year lower than 6.8 percent (World Bank Open Data 2019). Throughout this period, the economy has diversified rapidly. And Ethiopia is important for the policy experiment it represents: a low-income country with terrible human development indicators that both federalized and decentralized, and then saw dramatic improvements in human development.

These human development advances have been both broad and sustained. The latest Ethiopia Demographic and Health Survey data (2016) show that child mortality fell from 123 per thousand in 2005 to sixty-seven per thousand in 2016.⁴ Ethiopia achieved the MDG 4 (Child Mortality) target ahead of time (UNICEF 2013), and primary net enrollment rates rose from 68 percent in 2004 to 85 percent in 2015. These development milestones are coupled with a drastic reduction in poverty. Based on official data, the population below the poverty line fell from 39 percent in 2004 to 27 percent in 2015.

Was decentralization a cause of these successes, or was it incidental? We seek to answer this question for the important sectors of education and health. Ethiopia has over ninety ethnic and linguistic groups and considerable geographic diversity, providing natural sources of variation that a study like this can exploit analytically. Its diversity is also representative of the developing world more broadly, which tends to be more heterogeneous in geography and ethnicity than the countries of the OECD. Ethiopia also has a federal structure and significant decentralization pursued since the early 1990s. It is thus an ideal context in which to study the effects of decentralization on social development. We define decentralization as the devolution of authority by central government over specific functions, together with the administrative, political and economic attributes that these entail (e.g., tax-raising, expenditure, and decision-

making powers), to elected regional and local governments that are independent of the center within a legally delimited geographic and functional domain.

In addition to the analysis that follows, an important contribution of this article is to present an original dataset that integrates local economic, social and demographic characteristics for all of Ethiopia's regions and *woredas* (sub-regional districts) into an integrated, standardized resource. The dataset is based on official sources, such as the Central Statistical Agency and the Ministries of Health, Education, and Economic Development, amongst others, and required considerable investment and years of painstaking work to construct. We hereby make it publicly available⁵ in the hope that others will use it to push research on Ethiopia's subnational political economy further.

Our evidence implies that decentralization did indeed improve public education and health sector performance in Ethiopia. Specifically, decentralization to regional and woreda (district) governments led to higher school enrollment rates (NER) and improved provision of antenatal care (ANC) to women. Our methodology allows us to distinguish between the effects on NER and ANC of greater expenditures vs. decentralization per se. The expenditure effect is positive, as one would expect. But there is a separate, statistically significant, and substantively important effect of decentralization on these important education and health outcomes. Indeed, the magnitudes are significant: the incremental effect of decentralizing health and education service provision to the mean woreda is an estimated 13 percentage points for ANC and 18 percentage points for NER. Our method also allows us to distinguish between institutional aspects of decentralization vs. decentralized resource control. The main channel of the effects

we identify appears to be institutional. Our results are robust to different data types, estimation techniques (time series, panel, diff-in-diff), and model specifications.

LITERATURE REVIEW

The evidence Ethiopia can offer is especially welcome in light of the inconclusive nature of the empirical evidence accumulated over four decades. This is especially true of the older decentralization literature from the 1960s-1990s. Consider the broadest surveys of that work. Rondinelli, Cheema and Nellis (1983) note that decentralization has usually disappointed its partisans. Most developing countries implementing decentralization experienced serious administrative problems. Although few comprehensive evaluations of the benefits and costs of decentralization efforts were conducted, those that were indicate limited success in some countries but not others. A decade and a half later, surveys by Piriou-Sall (1998), Manor (1999) and Smoke (2001) are slightly more positive, but with caveats about the strength of evidence in decentralization's favor. Manor notes that the evidence, though extensive, is still incomplete, but ends his study with the opinion that 'while decentralization ...is no panacea, it has many virtues and is worth pursuing'. Smoke, by contrast, finds the evidence mixed and anecdotal, and asks whether there is empirical justification for pursuing decentralization at all.

More recent empirical studies distinguish themselves in two important ways: (i) They are often technically more sophisticated than the older, more case-study based literature, as datasets have improved enormously over recent decades; and (ii) They are generally more positive about decentralization's potential. One good example is Gonçalves (2014), who marshals remarkably detailed data to show that participatory budgeting in decentralized municipalities in Brazil led to public expenditure allocations that closely matched citizen preferences, resulting in

significant reductions in infant mortality rates. Another is Kyriacou et al. (2017), who estimate a simultaneous equations model and find that fiscal decentralization accompanied by measures to improve government quality can reduce regional inequalities in the OECD. A third is Charron (2009), who finds that “ethno-federal” state structures are linked to higher quality-of-government indicators at the aggregate level, compared to centralized, unitary states. By contrast, Ezcurra and Rodríguez-Pose (2013) find no relationship between *political* decentralization and economic growth, and no robust link between political decentralization and regional disparities. And in an article especially relevant for this study, Ishiyama (2012) finds that subnational fiscal grants in Ethiopia were targeted not in terms of need or service provision, but rather to buy off woredas that had supported the opposition in the 2005 election.

A small but growing literature focuses on decentralization in Ethiopia. Its methods are mainly qualitative, and its findings are also somewhat mixed. Using a qualitative case-study approach, Tesfay (2015) shows that attempts to deepen decentralization to woreda level have been frustrated by the centralizing practices of the ruling party, and weak administrative capacity at the local level. As a result, decentralization has had mixed effects on primary education and inconclusive effects on local service delivery more generally. Bongwa, Kassahun and van Dijk (2011) find that very little of the promised decentralization from Addis Ababa city government to sub-city and kebele levels has actually occurred; top-down municipal control and supervision continue to be the norm. Chaurey and Mukim (2015) deploy econometric analysis with firm-level data to show that giving more autonomy to Ethiopian cities allowed them to become economically more competitive, leading to lower spatial inequality.

Focusing on the Tigray region, Fissaha and Brehanu (2017) use a blend of qualitative and quantitative methods to show that decentralization improved service delivery in rural areas. As a result, quality of life has also improved in these areas, but only minimally. Fiseha (2020) also focuses on Tigray, but with more negative findings. The local governments he studies act like deconcentrated units of the Tigrayan regional government, with little autonomy of their own and little accountability to local citizens. Lastly, and turning to two woredas in the Benshangul Gumuz region, Atnafu (2017) finds that decentralization improved education and health infrastructure due to improved community participation there. But a shortage of qualified manpower and weak community participation in other activities held back local progress.

Few recent studies that we know of address the link between decentralization and substantive education and health outcomes directly and with rigorous quantitative evidence. Clark (2009) applies regression discontinuity to a natural experiment from Britain to show that schools that opt out of the centralized educational regime – in effect decentralizing themselves – enjoy large increases in student achievement. Barankay and Lockwood (2007) find that greater decentralization of education to Swiss cantons is associated with higher educational attainment, especially for boys. Amongst studies that look at both developing and developed countries, Escaleras and Register (2012), find that fiscal decentralization is associated with lower death rates from natural disasters, implying more effective disaster preparations and/or responses by countries with decentralized governments. Interestingly, this effect is more robust in developing countries. Galiani, Gertler and Schargrodsky (2008) find that decentralization of school control from central to provincial governments in Argentina had a positive impact on student test scores. The poorest, however, did not gain, and may indeed have lost. And Faguet and Sánchez (2014)

find that decentralization improved enrollment rates in public schools and access of the poor to public health services in Colombia. In both sectors, small increases in own-shares of spending led to surprisingly large increases in the access of the poor. The evidence implies that decentralization provided local officials with the information and incentives required to allocate resources responsively according to voters' needs, and improve the impact of public expenditures.

CENTRALIZATION AND DECENTRALIZATION IN ETHIOPIA

History and background

Ethiopia's remarkable ethnic heterogeneity is closely tied to its turbulent history. As the country consolidated during the medieval period, it was made up primarily of the Tigray, Agaw and Amhara peoples. From 1889 onwards, a period of territorial expansion began in which power and administrative control were projected outward from the Amhara region; peripheral areas were brought under the Ethiopian empire. Following the battle of Adwa in 1896, a series of border treaties with surrounding colonial powers was signed, resulting in European recognition of Ethiopian statehood.

Relations between the newly integrated areas and the historic center of the empire were troubled. Successive Ethiopian governments struggled to gain effective control over these regions. Economic policies pursued by the center were exploitative, leading to poor integration with the national economy, relative under-development, and marginalization in the periphery (Mulugeta 2002). The revised constitution of 1955 exacerbated unequal centralization, entrenching Amharic as sole the official language and the Ethiopian Orthodox Church as the national religion. Over time, regional disparities between center and periphery grew.

Radical communists seized control of the country in the 1970s and ushered in a new era. The period of rule by the Derg (1974-1991) was marked by huge economic and political changes, but no diminution in the center's hold over the periphery. Despite the regime's appeal to a socialist ideology, it outlawed any conduct promoting ethnic individualism that might challenge the integrity of the state. And so the Derg became identified with the "Amhara oppressor" by regional liberation movements (Weldemariam 2011).

Victory by the Ethiopian People's Revolutionary Democratic Front over the Derg in 1991 ushered in sweeping political and institutional changes. Elections were called, political prisoners freed, the market economy restored, and attempts at ethnic homogenization that had lasted over a century were reversed. More than the collapse of a government, or even of state communism in Ethiopia, the overthrow of the Mengistu regime effectively marked the failure of a project that dated back to 1889 of creating a 'modern', centralized Ethiopian state around an Amharic core (Clapman 1994). The constitution created a federal government with nine regional states divided along ethno-linguistic lines: Tigray; Afar; Amhara; Oromia; Somali; Beneshangul-Gumuz; South Nations, Nationalities and Peoples; Gambella; and Harari. Ethnic federalism now came to the fore, for example in the new constitution of 1995, which recognized the rights of ethnic self-determination, including the right to secession (Solomon 2008). Decentralization was the centerpiece of the new fiscal and political order, and woredas were defined as the basic hierarchical building block of government (Terfassa 1994).⁶

Economic integration and equitable, rapid, broadly-shared growth and development became a primary focus of the new government, both for its own sake, and in the interest of maintaining peace in an ethnically fractured country (Zenawi 1997). The government adopted a

policy of affirmative action towards developing regions whereby Beneshangul-Gumuz, Gambella, Afar and Somali would be provided preferential treatment in terms of budget allocations and public investments, such as increased enrollments in higher education. And it implemented a wide-ranging decentralization program to match regional preferences with subnational self-government.

Initial evidence implies that these policies are succeeding. Whereas few residents of Ethiopia's "developing regions" were initially involved in administering their own regional governments, today many more are. Cumulative investments in education, health, water and sanitation, and other physical infrastructure have abetted the emergence of local, native educated classes in peripheral regions capable of running them. And there is much evidence, both econometric and anecdotal, that systematic preferences for poorer regions are accelerating improvements in key social development indicators, spurring their convergence with the highland core (Bevan et al. 2010, Hill et al. 2017, Khan et al. 2014a, Khan et al. 2017). But there is also evidence that Ethiopia's decentralization is increasingly insincere, a cosmetic overlay masking the reality of "reinforce[d] central authority at the expense of democracy, development, and accommodation of diversity" (Fessha and Kirkby 2008, 264). Does decentralization in Ethiopia deserve any credit for its impressive development successes?

The Ethiopian decentralization program

Decentralization in Ethiopia proceeded in two stages. First, during the transition period from 1991-94, central government devolved state powers to ethno-linguistic regions and created *woreda* (district) councils, with the intention of promoting participation and efficiency (Terfassa 1994). New regional governments were granted a range of executive, legislative, and judicial

powers over social and economic development. Regions and woredas were given responsibility for ensuring basic service delivery. The federal government retained authority over setting policies and standards in education, health, water and sanitation, and other social services.

Regional governments' revenue sources include: own tax revenues, fiscal transfers from the center, domestic borrowing, and other sources of income. But due to capacity constraints few such revenues are mobilized, and regions remain highly dependent on central grants to finance their expenditures, especially in the social sectors. And while regional councils are in principle accountable to citizens and the central government's Council of Representatives, in practice only the latter is binding (Assefa 2010, Dom et al. 2010, Khan et al. 2017).

Ethiopia's second round of reform occurred in 2002. Decentralization was extended to woreda governments, which took on the bulk of service delivery responsibilities and began receiving block grants from regional governments. These are determined by formulas set by regional governments, which are broadly similar in variables and weightings to the ones central government uses (World Bank 2011).

Subnational investment and education and health outcomes

The resource implications of this second round of decentralization were significant. Table 1 shows the evolution of federal block grants (FBGs) to regions and woredas over time. We see that FBGs increased ten-fold between 1996 and 2013, from US \$450 million to US \$4,456 million. Regional transfers to woredas⁷ increased less dramatically during this period, although by a still-impressive 150 percent. It is notable that, on average, regions transfer the equivalent of 55 percent of their own block transfers to woredas during this period.

FBGs are the main way regional governments are financed, hovering around 75-85 percent of their income through much of this period. More recently, FBGs have fallen as a proportion of total regional expenditure, from a peak of 88 percent in the early 2000s to around half, as subnational governments developed their own tax bases and new central transfers came on stream, implying even more resources for regions and woredas. But FBGs have increased as a share of federal government expenditures, from around 20 percent in the early 2000s to 40 percent more recently. A doubling in budget share is doubly impressive when we consider that the federal budget has more than tripled since 1996.

[Table 1 about here]

How have subnational governments spent these increasing flows? Figure 1 shows the sectoral breakdown for a typical year, in this case 2011. Education takes the largest share at 62 percent, followed by agriculture and health in a distant near-tie for second place, at 18 percent and 17 percent respectively. Together these three sectors account for 97 percent of total expenditure, with expenditure on water & sanitation and roads summing to only 3 percent. This broadly accords with the pattern of expenditures across developing countries, which typically prioritize education and health above other sectors.

[Figure 1 about here]

Have such expenditures affected education and health outcomes of interest? Are they having an effect on Ethiopia's development more broadly? Figure 2 shows the evolution of education expenditures at the regional and woreda levels (left axis), plotted against the net enrollment rate (right axis) between 1995-2012. We see a seventeen-fold rise in education expenditure throughout this period, with an acceleration after 2004, when woredas begin

investing significant sums directly in education. This is associated with an equally remarkable rise in the net enrollment rate, from 26 percent in 1995 to 85 percent in 2012.

[Figure 2 about here]

Figures 3-5 show similar information for the health sector. We see a thirteen-fold increase in total health expenditures by woreda, regional and national governments, accompanied by a huge increase in access to antenatal care (ANC, figure 3) by pregnant women, from 29 to 89 percent. Figure 4 shows a sharp rise in Diphtheria vaccination rates (DPT, figure 4) from 27 percent in 1999 to 65 percent in 2011. Figure 5 shows that the measles vaccination rate, previously stagnant around 30 percent, begins a secular rise in 2003, increasing from 27 percent to 68 percent by 2011. This coincides with Ethiopia's second round of decentralization to woredas.

In all of these cases, greater decentralization of health expenditure appears to be associated with improving indicators of health system outputs. As for education, there may well be other, omitted factors contributing to these improvements, such as changes in demand, the efficiency of service provision, or data quality. But even so, the broad correlation between increasing subnational and total expenditures and improving health indicators is notable.

[Figure 3 about here]

[Figure 4 about here]

[Figure 5 about here]

What do these descriptive statistics tell us? The preceding figures are no more than suggestive. But what they suggest is that rapidly rising decentralized expenditures in education and health have led to significant increases in public sector outputs, such as education enrollments, antenatal care, and vaccinations against communicable diseases. And for three of

the four indicators, improvements accelerate from the early-2000s onwards, with Ethiopia's second round of decentralization to woredas. Are these changes due to decentralization itself, or to the increase in expenditures that coincided with decentralization? While the descriptive statistics above cannot distinguish between these possibilities, the more detailed, analytical results that follow can.

DATA AND METHODOLOGY

Data

One reason an analysis of this sort has not been undertaken until now is the absence of woreda-level data on local economic, demographic, fiscal and other characteristics. Indeed, it is difficult to overstate the difficulty of doing subnational empirical work on Ethiopia. When we began this project, relatively little subnational data was collected, the data was often of poor quality, and few attempts were made to systematize the results into any obviously comparable framework. A few illustrations are telling. Fiscal data on subnational expenditures in health, education, agriculture, water, and roads were until recently available only for fiscal year 2010/11. Their geographic identifying codes and names did not match those of census data, whose geographic codes and names vary in unpredictable but pervasive ways from fiscal data. The last census counted some 740 woredas, zones, and regions, but the fiscal dataset included more than 850. Consolidating these two yielded a dataset of 989 subnational units, 250 more than in the census. Many woredas were listed under the same name, and geographic codes in both data sets were not unique. Missing data abounded.

Building a usable dataset from this required a great deal of time and effort, and also a fair amount of good fortune. Our efforts coincided with a favorable set of circumstances that

undoubtedly eased our progress. With the support from the World Bank and other donors, the Government of Ethiopia was in the midst of implementing large-scale decentralization reforms, and eager to improve Ethiopians' access to health and education services. The government was keen to understand the impact of decentralization on key outcomes. This made the government, including agencies that produce key information, amenable to sharing their data with us.

Obtaining high-quality data across indicators and woredas nonetheless required many visits to the government ministries and the Central Statistical Agency (CSA). The World Bank was able to finance the significant extra work required to locate, standardize and digitize subnational data on fiscal flows and expenditures. Expenditure data in particular was initially full of gaps, which were filled in through an iterative process as the government improved its data management.⁸ As standardization of woreda codes and the transliteration of Amharic names into Latin script is not yet consistent between ministries in Ethiopia, much time was dedicated to matching woredas from various sources into a single format.

The resulting database includes woreda-level data from five ministries – Health, Education, Agriculture, Water and Energy, and Finance and Economic Development – as well as the Central Statistical Agency (CSA), the Disaster Risk Management and Food Security Sector of the Ministry of Agriculture. For consistency, the team used the Population and Housing Census of Ethiopia (2007) codes as its base. The database includes year-on-year investments and expenditures by sector, key results by sector, and information on ethnicity, poverty, rainfall, frequency of droughts, and a number of other control variables. It was built using regional and woreda-level annual budgets, as well as actual capital and recurrent expenditures, for the years 1995-2012 for ten regions.

The database is not organized at woreda level mainly because woreda boundaries changed significantly over this period, and thus woredas are not comparable. Also, woreda-level data are not available for the pre-decentralization period. Hence the database is organized to facilitate regional analysis, and woreda-level expenditure is aggregated up to the regional level. Building this database has required a huge amount of work and improvisation on the part of the research team. It is our hope that it will in time become a useful tool for researchers and students elsewhere in Africa and beyond.

Methodology

Our primary objective is to assess the effects of decentralization to regional and woreda governments on key health and education outcomes. We operationalize this empirically by using regional and woreda-level expenditures as measures of decentralization. This makes sense, as Ethiopian fiscal rules create a strong association between regional and woreda-level spending in education and health, and key service outputs such as the number of teachers and health extension workers. In terms of outcomes, we focus on two indicators: Net Enrollment Rate (NER), and Antenatal Care (ANC). NER is defined as the number of children of relevant age for a particular level of education that are enrolled in that level of education, expressed as a percentage of the total population in that age group. We use NER for primary school, grades 1-8. ANC is defined as the proportion of pregnant women who received at least one antenatal care visit by a skilled health worker during the previous year.

The logic of our estimations is that decentralization shifts resources from central government to woredas and regions, which they can spend on services like education and health. If decentralization's proponents are correct, greater expenditure *by subnational governments*

should lead to better education and health outcomes. This is as distinct from greater expenditure by central government, or greater expenditure overall. Hence it is important that we distinguish empirically between woreda and regional government expenditures vs. total expenditures in each sector. Doing so allows us to identify a decentralization effect, as distinct from a more general expenditure effect. The latter is especially important given the large increase in overall expenditures visible in table 1. Points 1) and 2) below explain precisely how we do this.

Of the various outcome indicators at our disposal, we select NER and ANC as our preferred indicators because: i) a large development studies literature agrees that NER and ANC are two important indicators of education and health system performance; ii) reliable data are available continuously at the regional level for the entire period of interest for these two indicators; iii) they are calculated in ways that tend to respond more smoothly to policy changes; and iv) they are less subject to exogenous shocks, and are thus far more stable over time than the alternatives. Unlike other education and health indicators, they do not tend to move suddenly with changes in demand or the environment, but rather incrementally in response to policy levers.

For example, by its nature the Pupil-Teacher Ratio can move suddenly and erratically, as relatively small increases or decreases in the denominator – the number of teachers – cause large swings in the ratio. NER, by contrast, is a rate, not a ratio. Moreover, it is based on demand for education that, in a country like Ethiopia, is high and steady and generally exceeds supply. Changes in NER thus tend to be incremental, caused by policy-driven supply changes. Similarly, measures linked to the incidence of diseases like measles, tuberculosis, or diphtheria are subject to biological shocks, leading to demand shocks, that may cause indicators to swing significantly

even when health policy does not. ANC, by contrast, is based on a comparatively stable phenomenon – a steady flow of pregnant women. Like education, demand for ANC tends to be large and stable. Changes in ANC are thus also more likely to be incremental, caused by policy-driven changes in supply. All of these characteristics allows us to link changes in NER and ANC more clearly to changes in policy than interventions against infectious diseases, or the Pupil-Teacher Ratio.

Ideally we would estimate the effects of decentralization on NER and ANC at the woreda level using panel regressions. But the lack of pre-decentralization data at woreda level makes this impossible. Instead we use an alternative, two-fold estimation strategy: 1) Time-series estimations for national-level education expenditures and NER outcomes, using a dummy for decentralization to woredas. Unfortunately, a lack of ANC data for the pre-decentralization period prevents us from doing the same for health. And, 2) Panel-data fixed effects at the regional level for health and education expenditures and outcomes, using both NER and ANC. Regional expenditures are constructed by aggregating post-decentralization woreda expenditures up to the regional level and adding them to regional governments' current and capital expenditures, for the period 1995-2012.

Following the empirical models of Barankay and Lockwood (2007) and Faguet and Sánchez (2014), our strategy proceeds as follows:

1) Time-series OLS estimation using this specification:

$$O_t = \alpha + \beta_1 E_t + \beta_2 D_t + \beta_3 T_t + \beta_4 E_t * D_t + \varepsilon_t \quad (1)$$

where outcomes O are NER and ANC expressed as rates; E is total expenditures in each sector; D is a dummy variable that equals 0 before 2002, when Ethiopia decentralized to Woredas, and 1

after; and T is a simple trend variable, all subscripted by year t. Our E variable controls for the effects of overall expenditure levels on education and health outcomes. We expect a positive relationship, and hence statistically significant coefficients with positive signs. Any effects of our two decentralization terms are thus in addition to pure expenditure effect captured here.

If decentralization affects outcomes generally, through administrative, political, or other channels, then we expect the dummy decentralization variable to be significant and large in effect. But if decentralization's main channel of influence is via *local discretion* over resource allocation, as distinct from both non-expenditure aspects of local government and total expenditures, then we expect the E*D interaction term to take over significance when it is added to the model.

2) Panel estimates using this specification:

$$O_{rt} = \alpha_r + \zeta E_{rt} + \beta_1 D + \beta_2 D * E_{rt} + \beta_3 E_{rt}^2 + \varepsilon_{rt} \quad (2)$$

where outcomes O are NER or ANC; α captures regional fixed effects; E is yearly population-weighted expenditure in the relevant sector (see below); D is a dummy for woreda-level decentralization per above; E^2 is a quadratic expenditure term (by sector) to capture non-linearities; and ε is the error term, subscripted by time, t, and region, r. As above, our E term controls for overall expenditure levels, allowing the two decentralization terms to identify expenditure and non-expenditure aspects of decentralization to regions.

Absence of regional-level data for the period 1995-2012 prevents us from including geographic or demographic controls in our models. Poor data even affects regional population estimates, which are entirely based on two censuses thirteen years apart (1994 and 2007), with no annual population data other than projections derived from these. To address potential

inaccuracies in regional population data, we instead use each region's population share. More specifically, we calculate the average of population ratios in both censuses, and then weight expenditures by those ratios. Our assumption is that even if absolute population estimates are inaccurate, population shares will be more accurately estimated. This measure is likely to mask rural-urban migration within a region, unfortunately. But it seems a reasonable second-best option for dealing with poor data availability. Finally, we use a fixed effects model to address omitted variable bias and endogeneity issues. A Hausman test confirms that the fixed effects strategy is correct.

We regard panel estimation as the best method for isolating the impact of decentralization on education and health outcomes. This is because our panel is sufficiently long (a large number of observations both before and after the policy change) and balanced (the same units are observed before and after). Panel estimations enable us to control for time-invariant characteristics (e.g. geography) and statistically unobserved phenomena (e.g. 'cultural shifts'), especially when results are clustered at the level of regions. Nonetheless we then re-estimate our panel model using a difference-in-differences estimator, as a robustness check.

RESULTS

Time-series estimations

What does national-level data reveal about the links between decentralization and education? Table 2 shows that the net enrollment rate rises with education expenditure, as we would expect, in our simplest model. But expenditure becomes insignificant when we add a time trend. Decentralization to woredas is insignificant in the first two models, but significant and positive in the third, when we add an interaction term capturing decentralized expenditures.

Although the sign of the interaction term is negative, as opposed to the decentralization dummy, its point estimate is zero.

By contrast, even though the significance level on woreda decentralization is only 10 percent, its point estimate is large: 34 percent of the NER average, or 73 percent of its standard deviation. Keeping in mind that the statistical power of time-series regressions with only eighteen observations is low, we interpret these results as providing suggestive evidence that decentralization improves primary school enrollments. The mechanism is not primarily financial, as indicated by the insignificant expenditure term and the significant but null-value interaction term. Rather, it is associated with woreda governments controlling and managing local education services.

[Table 2 about here]

As a robustness check, a Dickey-Fuller test shows that the NER and education expenditure variables are non-stationary. This implies that the statistically significant coefficient in specification (1) above is due to both variables following a common trend, rather than a genuine correlation. This further explains why expenditure becomes insignificant when a time trend is added. Hence we can discard the theory that expenditure changes are driving improvements to NER in our time series results.

Panel estimations

Table 3 shows regression results for NER based on regional-level data. Once again, total expenditure on education is positively correlated with NER, this time strongly and consistently. Decentralization to woredas is also positively and significantly correlated with NER across all three models. The decentralized expenditure interaction term is again negative and significant,

but with a coefficient only one-third the size of expenditure on its own. And the quadratic expenditure term is statistically significant but with a point estimate of zero.

Keeping in mind that these results are based on a much larger, richer database, we interpret them as strong evidence that decentralization to woredas improved primary school net enrollment rates. Specifically, our decentralization dummy estimates imply that decentralization's incremental effect would be to raise NER in a typical woreda from its mean value of 65 percent to as high as 83 percent. Once again, the main effect seems to go through the fact of decentralization (the dummy term), as distinct from decentralized education expenditures, where the effect is estimated with high statistical confidence to be zero.

As a robustness check, we additionally ran a difference-in-differences model of NER, taking advantage of the staggered nature of implementation of the first (regional) round of decentralization to isolate the impact of decentralization to regions (see Appendix table A2). Unfortunately we could only do this for NER, as the data on ANC does not go back far enough in time. The results are robust and very similar to our panel estimations above for both regional level and woreda-level decentralizations, increasing confidence in our findings.

[Table 3 about here]

Table 4 shows regression results for ANC based on regional-level data. Total expenditure is positively correlated with ANC, as we would expect, in two of the three models. Decentralization to woredas is also positively and significantly correlated with ANC across all three models. Interestingly, coefficients on expenditures and decentralization are very similar in magnitude to those for NER. The decentralized expenditure interaction term is insignificant, as is the quadratic expenditure term. We interpret these results as strong evidence that

decentralization to woredas improved antenatal care across Ethiopia net of a positive expenditure effect. Our estimates imply that decentralization would raise ANC in a typical woreda from a mean of 52 percent to as high as 65 percent. All of these estimates, for both education and health, are robust to alternative specifications, including year fixed effects.

As for education, the effect we find seems to go primarily through the *fact* of decentralization, as distinct from decentralized health expenditures. This suggests that local governments' management of primary health and education services improves outcomes via greater accountability, better information on local conditions or needs, greater outreach to citizens, higher bureaucratic efficiency, more qualified local workers, or some other effect that is not primarily financial in nature. While a rich literature explores such mechanisms,⁹ the limitations of Ethiopian data unfortunately do not allow us to probe this issue further.

[Table 4 about here]

CONCLUSIONS

It is difficult to overstate the difficulty of doing subnational empirical work on Ethiopia. Creating the database required for this study required years of work and a huge amount of improvisation on the part of a well-qualified research team. The resulting database no doubt contains errors and omissions that could be improved upon by future researchers working in this field. Such data refinements and extensions might not only improve confidence in statistical estimations, but also permit further, more nuanced questions to be answered. We hope this will be the case, and to this end hereby make the full, standardized database of Ethiopian subnational expenditures, social development outcomes, and other characteristics freely available.¹⁰ This is

one contribution of this research; we hope the dataset will become a useful tool for researchers and students in Africa and beyond.

Our results imply that decentralization is improving performance in Ethiopia's public education and health sectors, specifically by raising enrollment rates in schools and increasing provision of antenatal care to pregnant women. Evidence for this comes from regional-level panel estimates, as well as national-level time series regressions. Our evidence is consistent across data types, methods of estimation, and specifications. Health and education outcomes improve as total resource expenditures increase, as one would expect. But there is a separate effect of decentralization on NER and ANC that arguably dominates the pure expenditure effect.

The magnitudes are significant: the incremental effect of decentralizing health and education service provision to the mean woreda is an estimated 12.6 percent for ANC and 18 percent for NER. The main channel for these improvements appears to be institutional, related to local control over education and health services, as opposed to local expenditures per se. Such effects might be supply-side, such as greater efficiency in public management, or better-informed decisions; demand-side, such as higher citizen demand for education and health services; or both, such as improved accountability of officials to citizens. With currently available data, it is unfortunately not possible to disentangle these effects and determine which predominates. Future research could probe the specific institutional mechanisms by which decentralization improves service provision, and whether these vary by sector or region. But what cannot be doubted is that Ethiopia has made remarkable progress in health and education during the past generation, and decentralization is an important part of this success.

What does this research add to our broader understanding of decentralization? First, a case study of decentralization in a large, important country not just for Africa but in the developing world more broadly. Second – and distinct from most studies of Ethiopia, which are qualitative and based on a small sample – we offer a quantitative study that includes all of Ethiopia’s regions and woredas. Third, empirical results that are clear and robust. For years, studies of decentralization have commenced by bemoaning the mixed and inconclusive results of the decentralization literature. As our introduction implies, the time has come to put that view behind us. The bedrock of indeterminacy lies in a raft of studies from the 1960s-1980s that relied on mainly qualitative evidence, and compared countries that had sometimes implemented very different types of reforms.

The availability in recent decades of much higher-quality, more fine-grained data has made possible a newer generation of decentralization studies that use large-N approaches within a single country to probe the effects of decentralization deeply and robustly. As Channa and Faguet (2016) show, the results of such studies are much less ambiguous. In focused studies of countries that really reformed¹¹, for example Argentina, Switzerland, Bolivia, the UK, Brazil, Colombia, and now Ethiopia, decentralization improved the provision of primary services. Ethiopia is notable in this list not only for its size and diversity, but as a low-income country with relatively low state capacity. That decentralization improved education and health services in such an environment implies that it is both a powerful reform and a general one, and hints at its potential to improve governance more broadly.

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DECLARATION OF INTERESTS

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

FUNDING DETAILS

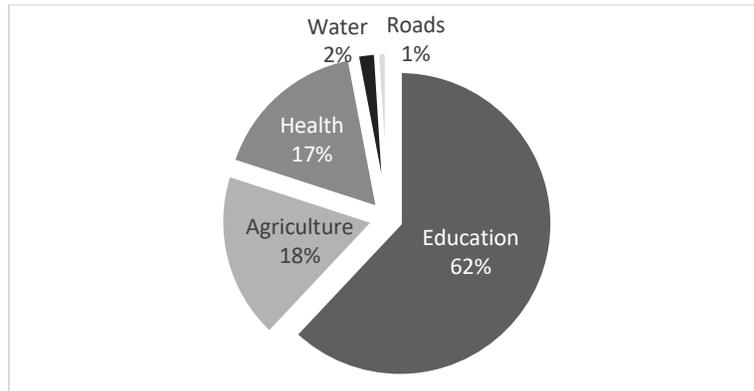
There are no funding sources to report.

Table 1: Federal block grants (FBGs) to regions and woredas

Year (Western calendar)	Federal block grants to regions (USD million)	Regional block grants to woredas (USD million)	Woreda transfers/ Regional transfers
1996/97	450	--	--
1997/98	447	--	--
1998/99	414	--	--
1999/00	300	--	--
2000/01	427	--	--
2001/02	450	--	--
2002/03	527	--	--
2003/04	582	--	--
2004/05	635	--	--
2005/06	815	--	--
2006/07	1,067	--	--
2007/08	1,471	--	--
2008/09	1,663	1,009	61%
2009/10	1,547	883	57%
2010/11	1,544	875	57%
2011/12	1,777	976	55%
2012/13	1,955	1,120	57%
2013/14	2,228	1,238	56%
2014/15	3,098	1,407	45%
2015/16	3,456	1,850	54%
2016/17	4,456	2,570	58%

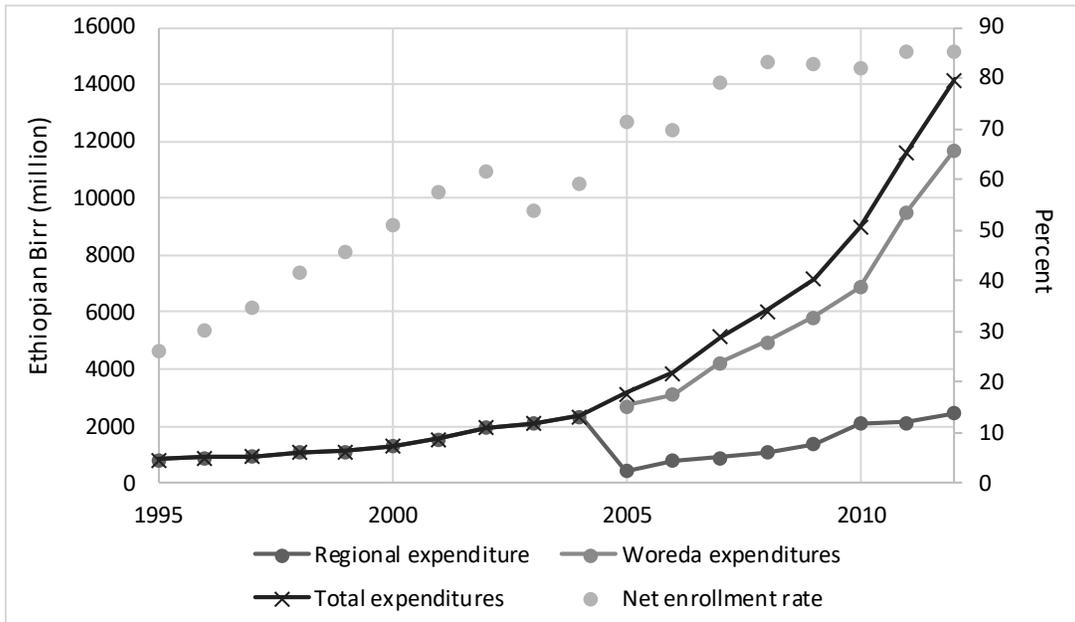
Sources: Ministry of Finance & Economic Development; National Bank of Ethiopia

Figure 1: Woreda-level expenditures by sector, 2011



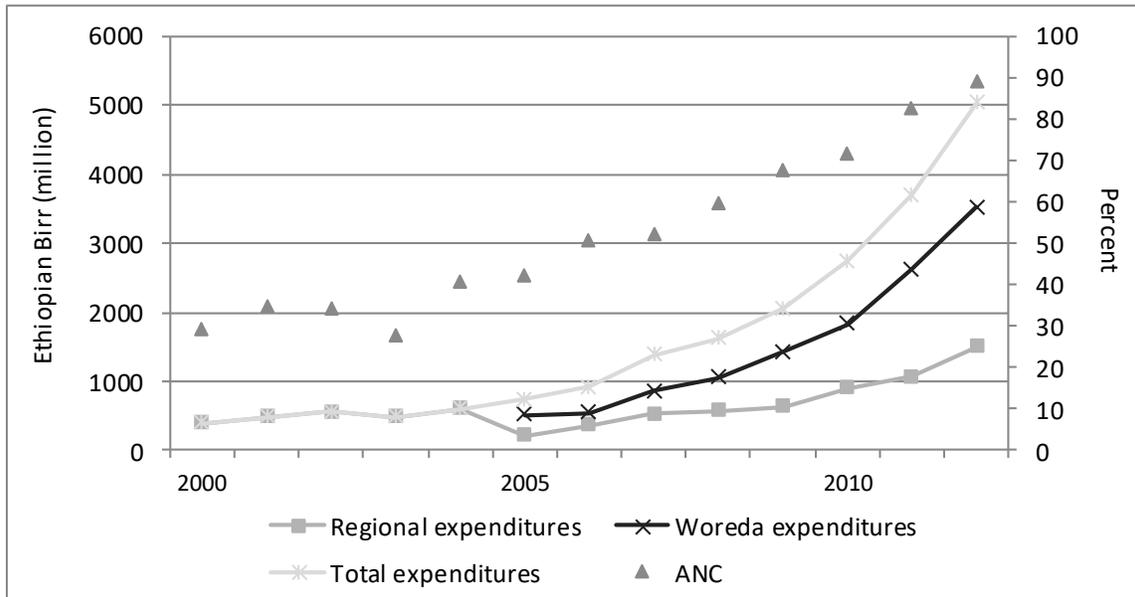
Source: Ministry of Finance & Economic Development

Figure 2: Education expenditures and net enrollment rate, 1995-2012



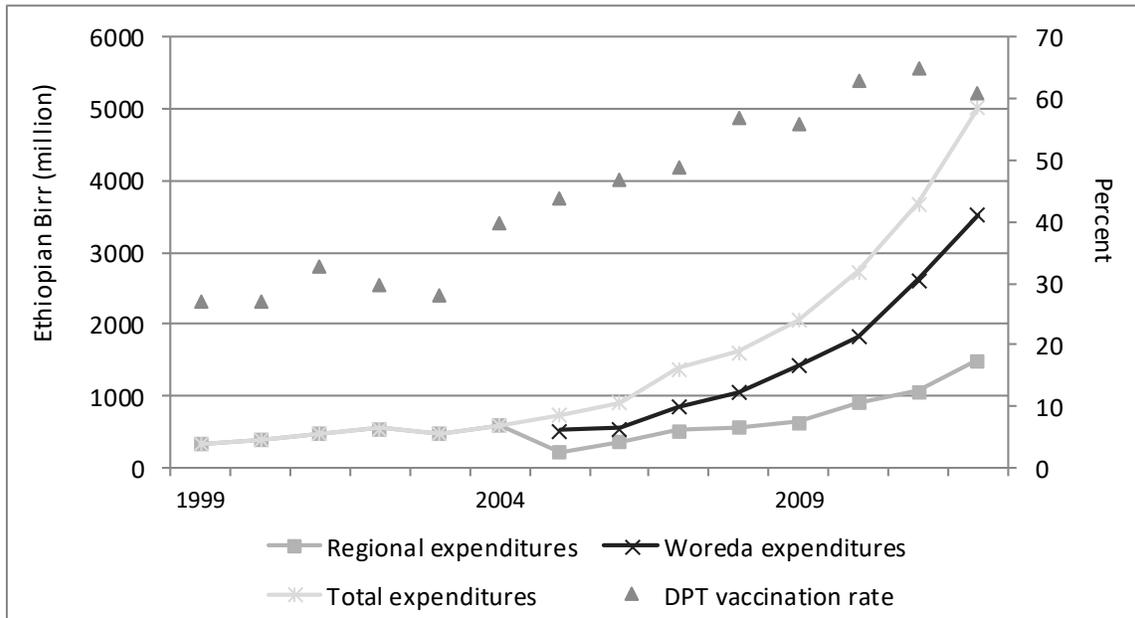
Source: Ministry of Finance & Economic Development; UNESCO

Figure 3: Health expenditures and ANC rates, 2000-2012



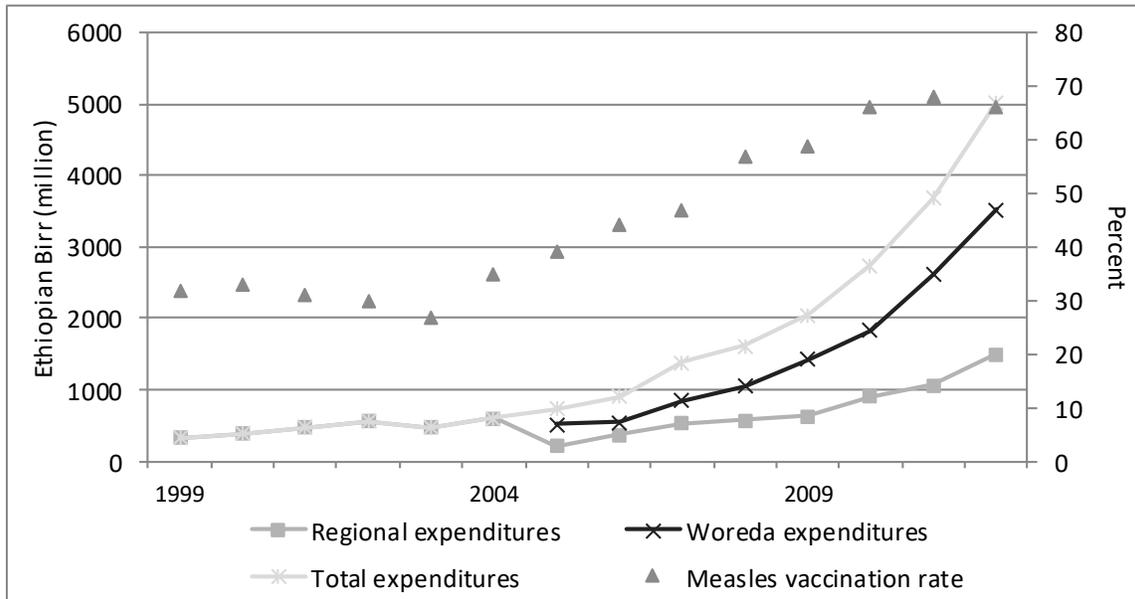
Source: Ministry of Finance & Economic Development; WDI World Bank

Figure 4: Health expenditures & DPT vaccination rates, 1999-2012



Source: Ministry of Finance & Economic Development; WDI World Bank

Figure 5: Health expenditures and measles vaccination rate, 1999-2012



Source: Ministry of Finance & Economic Development

Table 2: Decentralization's effect on education (Time series)

VARIABLES	Net enrollment rate (Grades 1-8)		
	(1)	(2)	(3)
Education Expenditure (Total, Population Weighted)	0.01*** (0.00)	-0.00 (0.00)	0.00 (0.00)
Woreda Decentralization Dummy	3.39 (5.37)	0.71 (5.20)	21.67* (11.39)
Time Trend		3.73*** (0.80)	3.66*** (0.80)
Education Expenditure * Woreda Decent'n Dummy			-0.00** (0.00)
Constant	7.69 (5.68)	27.51*** (5.52)	11.00 (6.65)
Observations	18	18	18
R-squared	0.91	0.95	0.96

Time series estimations. Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Decentralization's effect on education (Panel data)

VARIABLES	Net enrollment rate (Grades 1-8)		
	(1)	(2)	(3)
Education Expenditure (Total, Population Weighted)	0.01** (0.00)	0.03*** (0.01)	0.04*** (0.01)
Woreda Decentralization Dummy	16.14*** (3.01)	18.01*** (3.31)	13.60*** (3.10)
Education Expenditure * Woreda Decent'n Dummy		-0.01** (0.00)	
Quadratic education expenditure term			-0.00*** (0.00)
Constant	39.65*** (4.17)	31.12*** (6.32)	30.11*** (3.87)
Observations	168	168	168
R-squared	0.51	0.53	0.55
Number of region	11	11	11

Panel regressions with fixed effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Decentralization's effect on health (Panel data)

VARIABLES	Antenatal care		
	(1)	(2)	(3)
Health Expenditure (Total, Population Weighted)	0.02*** (0.00)	0.04*** (0.01)	0.03 (0.04)
Woreda Decentralization Dummy	10.74** (3.64)	12.59*** (3.57)	10.17*** (3.03)
Health Expenditure * Woreda Decent'n Dummy		-0.01 (0.01)	
Quadratic health expenditure term			-0.00 (0.00)
Constant	30.95*** (3.50)	27.78*** (3.28)	29.22** (9.74)
Observations	118	118	118
R-squared	0.24	0.24	0.24
Number of region	11	11	11

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX

Table A1: Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
Outcomes					
Net enrollment rate (Grades 1-8)	216	64.66	29.99	7.1	159
Antenatal care	153	51.54	27.42	3.2	139.1
Expenditure					
Education expenditure (Total, population weighted)	186	1615.44	2788.38	0.2144	13064.85
Health expenditure (Total, population weighted)	193	567.34	1043.78	0.1152	5281.58
Woreda decentralization dummy	216	0.61	0.49	0	1
Education expenditure x Woreda decentralization dummy	186	1208.40	2704.48	0	13064.85
Health expenditure x Woreda decentralization dummy	193	431.89	1024.30	0	5281.58
Quadratic education expenditure term	168	3168435	7919586	0.0460	4.43E+07
Quadratic health expenditure term	175	471022	1617659	0.0133	1.25E+07

Table A2: Difference-in-Differences Panel Estimations

VARIABLES	(1) grade 1-8 net enrollment rate	(2) Diff-in-diff
Education Expenditure, Total, Population Weighted	0.02*** (0.00)	0.02*** (0.00)
Woreda Decentralization Dummy		10.23*** (2.73)
treat = 1, omitted	-	-
active_treat = 1	22.49*** (3.28)	15.34*** (3.68)
Constant	27.32*** (3.13)	30.02*** (3.09)
Observations	168	168
R-squared	0.51	0.56
Number of region1	11	11

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

¹ Department of International Development and STICERD, London School of Economics, Houghton Street, London WC2A 2AE, UK, +44-20-7955-6435 (o), 7955-6844 (f), j.p.faguet@lse.ac.uk (contact author)

² World Bank, 1818 H Street, Washington, DC

³ World Bank, 1818 H Street, Washington, DC

⁴ We use Western dates throughout, as distinct from the Ethiopian (Julian) calendar.

⁵ [https://governancefrombelow.net/wp-content/uploads/2019/10/Ethiopia-Dataset-Oct-1-Stata10.dta .zip](https://governancefrombelow.net/wp-content/uploads/2019/10/Ethiopia-Dataset-Oct-1-Stata10.dta.zip)

⁶ It is striking that the arc of Ethiopia's experience, from high degrees of centralization that create an 'internal periphery', through a comprehensive backlash, to radical decentralization, is repeated in a number of developing countries, such as Bangladesh, Colombia, South Africa and Bolivia (Sánchez de Lozada and Faguet 2015, Faguet 2007).

⁷ Woreda transfers began in 2002; we have data for them only from 2008 onwards.

⁸ Local statisticians with expertise in fiscal accounts and education and health data joined the team to help fill data gaps and resolve statistical discrepancies from different sources. In many cases, our experts were able to identify more reliable sources of data and prioritise those. But as for any country, Ethiopian data are not perfect, and it is worth remembering that our empirical results are only as good as the underlying data.

⁹ Faguet (2017, 2014 & 2004), Faguet et al. (2015), Khan et al. (2017), Khan et al. (2014a & 2014b), and Putnam (1993) are just a few examples.

¹⁰ [https://governancefrombelow.net/wp-content/uploads/2019/10/Ethiopia-Dataset-Oct-1-Stata10.dta .zip](https://governancefrombelow.net/wp-content/uploads/2019/10/Ethiopia-Dataset-Oct-1-Stata10.dta.zip)

¹¹ I.e. "sincere" reform, as opposed to dead-letter laws or decrees; see Faguet, Fox and Pöschl (2015).