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Putting Your Money Where Your Mouth Is

Geographic Targeting of World Bank Projects to the Bottom 40 Percent

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Abstract

The adoption of the shared prosperity goal by the World Bank in 2013 and Sustainable Development Goal 10, on inequality, by the United Nations in 2015 should strengthen the focus of development interventions and cooperation on the income growth of the bottom 40 percent of the income distribution (the bottom 40). However, little is known about within-country allocation patterns among the projects of development institutions. This paper proposes a new geographic targeting indicator and related methodology to assess the within-country aid allocations of donors by correlating the distribution of funding within countries with the geographical distribution of the bottom 40. Applying this methodology to World Bank funding for projects approved over 2005–14 shows that, of the 58 countries in the sample, 42 exhibit a positive correlation between the shares of the bottom 40 and World Bank funding, and, in almost half of these, the correlation is above 0.5. Slightly more than a quarter of the countries, mostly in Sub-Saharan Africa, exhibit a negative correlation. The presence of the bottom 40 is typically correlated with the population size of an administrative area. A regression analysis shows that, controlling for population, the correlation between the bottom 40 and World Bank funding switches sign and becomes significant and negative on average. This is entirely driven by Sub-Saharan Africa, because the correlation is insignificant in the rest of the world regions. Hence, the significant and positive correlation in the estimations without controlling for population suggests that World Bank project funding is concentrated in administrative areas in which more people live (including the bottom 40) rather than in poorer administrative areas.

This paper is a product of the Independent Evaluation Group, the Development Economics, and the Poverty and Equity Global Practice Group, as well as the German Development Institute and KU Leuven. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The corresponding author may be contacted at zbogetic@worldbank.org.

Putting Your Money Where Your Mouth Is:

Geographic Targeting of World Bank Projects to the Bottom 40 Percent

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1. Introduction[1]

The World Bank established overarching twin goals in 2013: ending poverty by 2030 and sharing prosperity. At the core of the Bank's mandate, the first goal is focused on the reduction of global extreme poverty from 10.7 percent in 2013 to 3 percent by 2030, based on the international poverty line of $1.90 per person in 2011 purchasing power parity U.S. dollars. The second goal is a new one. Its basic metric is growth in the real incomes of the bottom 40 percent of the income distribution of the population (the bottom 40) in each country.[2] While the first is a global goal, the second is country-specific. These twin goals are part of a wider international development agenda and are intimately related to United Nations Sustainable Development Goals 1 and 10, respectively, which have been adopted by the global community.[3]

The adoption of the shared prosperity goal of the World Bank or the United Nations goal of reducing inequality should strengthen the focus of development interventions and cooperation in seeking income growth among the bottom 40 and narrowing the gap between this growth and the growth in the mean of the income distribution. The latter, which coincides with Sustainable Development Goal 10, is defined as the shared prosperity premium, and it provides insights into changes in inequality over time (Lakner, Negre, and Prydz 2014; World Bank 2016). Evaluating and monitoring these changes will thus be a key component of both World Bank operations and the implementation of the 2030 Agenda for Sustainable Development.[4]

Even though the World Bank's second goal is nominally new, the Bank has been pursuing broader distributional objectives through initiatives aiming at pro-poor growth, inclusive growth, and equity for a long time. Because of limitations in spatial distributional data, however, little is known about geographical allocation patterns among the institution's projects within countries. The same holds for other bilateral and multilateral development actors. Nonetheless, because of the increased availability of disaggregated spatial data, measuring and analyzing the subnational distribution of project funding and its relationship to the bottom 40 are now easier. Reaching such an understanding of funding can dramatically improve efficiency and help maximize the poverty-reducing effects of development programs (Elbers et al. 2007; Karlan and Thuysbaert 2016).

This paper aims to contribute to an incipient literature examining the subnational allocation of development intervention funding. In particular, it investigates whether investment projects of the World Bank's two lending arms, the International Bank for Reconstruction and Development for middle-income countries and the International Development Association for low-income countries, flow to administrative areas where the bottom 40 are located.[5] The paper accomplishes this by (1)

[1] The authors wish to express gratitude for helpful discussions and comments from Steve Knack, Minh Cong Nguyen, Jose Montes, Stephan Klingebiel, Auguste Kouame, Pablo Fajnzylber, Joao Pedro Azevedo, and also for research assistance from Mira Franzen and Claudia Witkowski. We are also grateful to Massimo Mastruzzi and the World Bank's BOOST team, Dimitry Zaviralov, and the World Bank's Geospatial Support Team (GOST) for their advice and support.

[2] Income here generally refers to income or consumption aggregates obtained through surveys.

[3] See "Sustainable Development Knowledge Platform: Sustainable Development Goals," Division for Sustainable Development, Department of Economic and Social Affairs, United Nations, New York, https://sustainabledevelopment.un.org/?menu=1300.

[4] See "Transforming Our World: The 2030 Agenda for Sustainable Development," Department of Economic and Social Affairs, United Nations, New York, https://sustainabledevelopment.un.org/post2015/transformingourworld.

[5] Investment projects are the dominant type of assistance across development institutions, including the World Bank. The other two types are budget support loans (or development policy lending in the current parlance of the Bank), which constitute, on average, about 25 percent of the World Bank's yearly lending portfolio, and Program-for-Results financing, which has been negligible until recent years. The analysis in this paper is focused

merging unique geospatial data sets on the subnational distribution of World Bank investment projects and the population identified as the bottom 40 and (2) correlating the two variables.

A relatively high correlation would be consistent with effective geographic targeting insofar as most resources are directed toward areas with a high presence of the bottom 40.[6] However, the presence of the bottom 40 is typically correlated with population size in the areas. Hence, a high correlation may be indicative only that World Bank project funding is concentrated in populous administrative areas rather than explicitly targeting the bottom 40. Likewise, a low positive correlation or even a negative correlation may not necessarily point to poor targeting because there are many other factors potentially affecting the allocation of aid. The paper accounts for some of these effects through the use of control variables in a regression analysis. It does not account, nonetheless, for general equilibrium effects, that is, that different aid allocation patterns within countries may have different effects on economic co-benefits such as higher growth, market and energy access, for example.

The correlation analysis indicates that, of the 58 countries in the sample, 42 show a positive correlation between the shares of the bottom 40 and World Bank funding, and almost half of these show a correlation at above 0.5. Of the total sample, slightly more than a quarter of the countries, mostly in Sub-Saharan Africa, exhibit a negative correlation.

The regression analysis shows that, once one controls for population, the correlation between the bottom 40 and World Bank funding switches sign and becomes significant and negative on average. This is entirely driven by Sub-Saharan Africa because the correlation is insignificant for the rest of the world regions. Hence, the significant and positive correlation in the estimations without controlling for population is indicative that World Bank project funding is concentrated in areas where there are more people, including the bottom 40, rather than in poorer areas.

Section 2 discusses how this paper fits within and contributes to the academic debate on the allocation of aid. A number of factors that may affect the within-country allocation of aid are also addressed in the section. Section 3 discusses methodology and data, while section 4 presents the results. Section 5 concludes.

2. Background and context

Donors generally tend to allocate funds across countries following a number of more or less explicit criteria. Within countries, however, little has been produced in the literature on how donor resources are allocated. Nonetheless, because poverty reduction is one of the criteria often at the top of donor-stated priorities, the geographical distribution of the projects and programs within countries may be expected to bear a positive correlation with the physical location of the poor in both absolute numbers and relative terms, that is, the share and number of the poor in the population of an administrative area.[7]

on the traditional and still dominant form of development assistance, investment projects. See below for details on the reason why the paper does not consider budget support lending.

[6] Literally targeting the poorest would specifically require the poverty gap or a higher order poverty function to be used as the main allocation criterion, whereas targeting the bottom 40 focuses on the poorest 40 percent in a society, but does not ensure a specific focus on the poorest among the bottom 40 or even all the poor if the bottom 40 fails to encompass all the poor of a society.

[7] This paper spotlights the bottom 40, who are the focus of the World Bank's second corporate goal. It thus follows the specific, albeit somewhat arbitrary choice made by the World Bank and the international community (in target 1 of Sustainable Development Goal 10) that growth in the incomes of the bottom 40 is particularly relevant for the overall economic growth and welfare of societies.

The few studies that exist on the within-country targeting of aid are mostly limited to one particular country at a time (De and Becker 2015; Nunnenkamp, Öhler, and Sosa Andrés 2017; Odokonyero et al. 2015). Briggs (2017) and Öhler and Nunnenkamp (2014) are exceptions: the latter use different development indicators—infant mortality, maternal health, malnutrition—and find no need-sensitive World Bank aid allocation within 27 countries. Briggs (2017) finds that World Bank and African Development Bank aid within 17 countries in Africa flows disproportionately to areas where more of the richest people live, measured by the possession of assets and the quality of housing.

Assessing the allocation of aid requires consideration of a number of conceptual criteria and operational factors that may play a role in influencing within-country allocations. First, aid has been found to be at least partly fungible across sectors within countries (Feyzioglu, Swaroop, and Zhu 1998; Pack and Pack 1993).[8] Insofar as aid is fungible, it may not be possible to target specific groups or affect the income distribution because governments tend to adjust their own spending according to the aid investments they receive. Likewise, the use by a donor of information on government budgetary allocations across administrative areas can also affect the aid patterns of the donor. Thus, a government may adapt its allocations in response to the aid it receives from the international donor community, or, the other way around, donors may allocate aid to those areas where government investments relative to needs are lowest. For this reason, determining the direction of causality in allocations is difficult. Furthermore, not all aid modalities are able to target the poor within countries. Budget support is typically provided to central governments and therefore tends to benefit broader government reform programs and institution building. As such, it cannot be easily tied to specific geographic areas within a country.[9]

Even explicit geographic poverty targeting may follow criteria tailored to the specific parts of the population targeted. For instance, achieving a quick reduction in the headcount (poverty) ratio and the goal of narrowing the poverty gap or softening the severity of poverty imply different strategies and allocation patterns. While the first may lead to a concentration of resources on households living immediately below the poverty line to obtain the greatest bang for the dollar, the other goals may lead to a focus on helping all the poor equally (to narrow the poverty gap) or assigning a higher priority to the poorest of the poor (to soften the severity of poverty). This notwithstanding, Collier and Dollar (2002) report only small differences in their ideal allocation results according to the goal of generating more positive standard poverty measures in light of an increased weight on the poorest (headcount, poverty gap, and severity of poverty) in cross-country allocations, although this may not be directly applicable to within-country allocations. Beyond poverty rates, the targeting of geographic areas with higher absolute numbers of the poor is also a criterion in the effort to maximize poverty reduction. In this case, relatively populous areas with below-average shares of the poor may receive above-average resources to exert a greater impact on the large absolute number of the poor in these areas.

Along with equity considerations, efficiency concerns may play a role in deciding on the allocation of development assistance. Thus, investing in areas where the expected returns to aid are low may be viewed as inefficient, and this may lead to geographical patterns in interventions that are different from those solely based on poverty (Carter 2014; Dillinger 2007). In addition, assessing the within-country aid allocation of donors by looking at the correlations between the distributions of funds by donors and the location of the poor does not take into account general equilibrium effects. For example, energy and infrastructure projects may be located in areas with a low share of the poor, but may have

[8] Van de Sijpe (2013), however, finds limited fungibility in the case of education and health care aid supplied through technical cooperation.

[9] For this reason, the assessment of geographic targeting herein does not include budget support funding and focuses instead on the share delivered through projects, which constitutes the lion's share of funding in the case of the World Bank.

high general equilibrium impacts on the poor (Christiaensen, De Weerdt, and Kanbur 2017). By contrast, the World Bank (2009) forcefully argues that certain policies and programs, such as those related to land, labor, health care, education, and sanitation, should be spatially blind and provided with universal coverage.

Physical access also likely influences the within-country geographical allocation of aid. Two opposing forces are at play in this case. First, more accessible areas will tend to perform better economically and typically present lower levels of poverty and need. Second, the costs of delivering aid to more remote areas are higher, and therefore aid may become less efficient. In addition, related political economy considerations among donors may affect projects in remote areas, which tend, for instance, to be less visible than projects in a capital city.

On the side of the recipient government, political economy considerations may also constitute a factor influencing the allocation of aid within countries (Nunnenkamp, Öhler, and Sosa Andrés 2017). Thus, Kirk (2005, 287) mentions that the distribution of World Bank aid within India "has been strongly conditioned by states' political clout with the central government, owing to their ruling parties' ties to the central coalition." However, Nunnenkamp, Öhler, and Sosa Andrés's (2017) empirical analysis does not support this claim. Also Dreher et al. (2016) do not find evidence for favoritism in the case of World Bank funding in assessing the influence of the birth areas of country leaders on the amount of funding these areas receive.

More generally, the allocation decisions of donors are supposed to be driven by the preferences and development challenges of the recipient countries. The World Bank relies on the country partnership framework to operationalize this approach. The framework is designed to help identify the key objectives and development results through which the World Bank intends to support a country in its efforts to reduce poverty and boost shared prosperity. In preparing a framework intervention, the World Bank starts from the recipient country's own vision, but aims to select a program that is aligned with the twin goals.[10]

Within recipient countries, aid fragmentation poses important challenges. High transaction costs, associated with fragmented aid and the negative impact of fragmentation on bureaucratic quality, growth, and aid tying, have been well documented (Kimura, Mori, and Sawada 2012; Knack and Rahman 2007; Knack and Smets 2013; Negre and Klingebiel 2016).[11] Indeed, the international development community has addressed this issue on numerous occasions, including the Paris Declaration on Aid Effectiveness, the Accra Agenda for Action, and the Busan Declaration of Development Effectiveness, although arguably with limited results (Nunnenkamp, Öhler, and Thiele 2013). Nonetheless, better coordination could lead to a more effective division of labor, and this could potentially influence the pattern of geographical allocations across individual donors participating in the coordination effort. This may have already been the case in particular countries. Indeed, it is plausible that the World Bank may have stepped in or out of countries or subnational administrative areas on the basis of agreements with other key donors. Besides the effects of the degree of coordination in aid allocations, there are important synergies in the geographical presence of donor organizations and their partners in recipient countries. For example, clustering can have important

[10] See World Bank (2014) for a comprehensive description of the objectives and the country engagement model underpinning the country partnership framework.

[11] However, Gehring et al. (2017) find no systematic negative effect of aid fragmentation on the effectiveness of aid. Furthermore, coordination alone does not guarantee results. A recent joint evaluation of 10 years of joint donor budget support showed mixed results in aid coordination, in part because donors may choose suboptimal solutions that represent the lowest common denominator among them. See EC and IEG (2015).

practical benefits in logistics, security, enhanced local capacities, more leverage on local authorities, and even a greater social awareness of aid practices across officials, communities, and beneficiaries.

Security considerations are likely to affect the allocation of aid in countries where security risks are an issue. This presents a clear trade-off as areas exhibiting less security tend also to be poorer so that allocation patterns may positively correlate with more prosperous, safer areas. More generally, donors may shy away from difficult environments with weak local institutions and entrenched forms of poverty where the likelihood of success is low (Nunnenkamp, Öhler, and Sosa Andrés 2017).

Imperfect local information on poverty may prevent proper targeting. While many recipient governments have a general idea where the poor are located, local poverty estimates may differ from government expectations. Given the infrequency of surveys in poorer countries and the fact that small area poverty mapping is a relatively new technology and requires substantial technical skill, the necessary information for adequate poverty targeting is limited in many developing countries.

3. Data and methodology

For the purpose of the examination of aid allocations and targeting effectiveness, we use data on the bottom 40 based on representative household surveys in 58 countries on which sufficiently disaggregated geospatial data are available on the bottom 40.[12] More specifically, this study has relied on harmonized survey collections produced by the World Bank's Poverty and Equity Global Practice.[13] These surveys contain a welfare indicator (income or consumption), a geographic identifier, and a sample weight for each household. The variables allow us to calculate the number of individuals belonging to the bottom 40 in each first-level administrative division.

Subnational information on the locations of World Bank projects within recipient countries is mined from AidData.[14] The database lists 1,517 World Bank investment projects approved in the sample of 58 countries between 2005 and 2014. Taken together, these projects account for commitments of US$156 billion. The data set does not provide a geographic breakdown of the overall amount of project commitments. However, the entries in the database typically contain information on the locations (administrative areas) where (part of) a project takes place.[15] This information is used to split total project commitments either equally or on a population-weighted basis across the subnational administrative areas in which each project is active.

Subsequently, the share of World Bank funding—measured as commitments of investment projects—each area receives and the share of the nationwide bottom 40 population located in each subnational area are calculated. Simple bivariate correlations between the two variables are calculated to assess

[12] Not all household surveys relied on may be perfectly representative at the first administrative level. In case some were not, our estimates would be less precise. However, there is no particular reason to assume that they are biased.

[13] Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC.

[14] World Bank Geocoded Research Release, Version 1.4.2 (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.

[15] Data in the GADM database are used to assign project locations to the first-level administrative areas. For a few countries in which the first-level administrative areas in the GADM shapefiles do not match the areas in the household surveys, the Global Administrative Unit Layers data set of the Food and Agriculture Organization of the United Nations is used. Here, in the sample of 58 countries, there are 1,084 first-level administrative areas. For the GADM data, see GADM Database of Global Administrative Areas, Environmental Science and Policy, University of California, Davis, CA, http://www.gadm.org/. For the Global Administrative Unit Layers dataset, see GAUL (Global Administrative Unit Layers) (database), Food and Agriculture Organization of the United Nations, Rome, http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691.

the geographical allocation of World Bank project funding within the country.[16] These initial calculations do not take into account other confounding factors mentioned in section 2 that may influence the targeting of aid. Nonetheless, high correlations are taken as an indication of effective geographic targeting insofar as a high proportion of resources go to those areas with a high presence of the bottom 40.

To account for other factors affecting the allocation of World Bank funding within countries, in particular the population size of the areas examined, regressions are estimated using, as the dependent variable, the share of World Bank funding each area receives. Zero-inflated beta regressions are undertaken because beta distributions are well suited in the case of continuous variables bound between 0 and 1.[17] Furthermore, the model is able to account for a not insignificant share of zero values, that is, areas that do not receive any investment project funding during the period of observation.[18]

The estimation equation is as follows:

$$y_{ic} = \beta * ln\ B40_{ic} + \theta' X + u_c + \varepsilon_{ic}, \qquad (1)$$

where y_{ic} is the share of World Bank funding going to area *i* in country *c*; $ln\ B40_{ic}$ is the logarithm of the number of persons within the country's bottom 40 living in area *i* of country *c*; *X* is a set of control variables; u_c represents country fixed effects; and ε_{ic} is an idiosyncratic error term.[19] Standard errors are clustered at the country level.

A control is applied for population (in log) to identify the effect of the number of the bottom 40 living in an administrative area independent of the population size of the area. Furthermore, two variables are used to control for the ease of access to this area. The first is a dummy variable equal to one (zero) if the capital is (not) located in the area. Second, the travel time to the capital (in log) by road (with private transportation) from all other administrative areas is calculated from a database constructed from estimates gathered through Internet searches.[20] Besides access, the variables are also proxies for the visibility of projects, which is important for donor reputations. Projects in a capital city are expected to be more visible than those in remote areas. In addition, conflict-related deaths per 100,000 inhabitants are used to gauge security and the risks in administrative areas more generally. Government expenditures and the aid of other donors—only available in a limited sample of 15 and 11 countries, respectively—are included in robustness tests because the World Bank may take

[16] While the World Bank projects variable runs from 2005–14, survey data on the distribution of the bottom 40 are scarcer and only available for some years within this period. Surveys are therefore used that are as close as possible to the center of the range of years, prioritizing older surveys if they are equidistant from the center to reflect more accurately the information available in allocation decisions and their lag relative to actual funding. In practice, most surveys (14) are from 2007. Other years account for fewer surveys (2011: 11, 2010: 10, 2009: 8, 2012: 6, 2008: 5, 2005: 3, and 2006: 1).

[17] Beta distributions are characterized by high flexibility, thereby allowing varying degrees of skewness.

[18] A fractional logit model might have also been estimated (Papke and Wooldridge 1996). However, unlike a beta regression, it would not generate an estimate of a separate process for the probability of the value of zero. Nonetheless, fractional logit models have been estimated to ensure robustness. For example, see Ospina and Ferrari (2012) for zero-or-one-inflated beta estimates.

[19] Using the log of the number of the bottom 40 or the log of the share of the national bottom 40 living in an area is econometrically equivalent once one controls for country fixed effects.

[20] Depending on data availability in a particular administrative area, the estimations took official speed limits, recommended speeds, likely speeds on certain road types, historical average or actual speed records, and real-time traffic information into account.

government budgetary allocations in administrative areas and the area-based activities of other donors into account in determining its own subnational resource allocations.[21]

4. Results

4.1 Correlation results

The analysis of the geographical allocations involved in World Bank investment projects in 58 countries shows that, in 72 percent of the cases, the presence of World Bank–supported activities is positively correlated with the presence of bottom 40 populations. This is assessed by correlating the distribution of project funds at one administrative level below the national level with the distribution of the national bottom 40 population across the same subnational administrative levels.[22] As shown in table 1, 42 countries present a positive correlation. In 20 of these countries (34 percent of the total), the correlation is at least 0.5, while the average is 0.26.

Table 1: Subnational Allocations, by Country, Correlation Coefficients between the Share of World Bank Project Funding and the Bottom 40

Correlation	*Countries*
0.5 to 1.0	Armenia, Bangladesh, Bolivia, Bosnia and Herzegovina, Brazil, Cabo Verde, Chile, El Salvador, Ethiopia, India, Indonesia, Kyrgyz Republic, Lesotho, Madagascar, Mauritania, Nepal, Tajikistan, Timor-Leste, Uruguay, Republic of Yemen
0 to 0.5	Afghanistan, Angola, Bhutan, Burkina Faso, Cameroon, Chad, Ecuador, Guatemala, Haiti, Iraq, Kenya, Lao People's Democratic Republic, Mali, Niger, Peru, Philippines, Republic of Congo, Russian Federation, Sri Lanka, Uganda, Ukraine, Vietnam
−0.5 to 0	Belarus, Burundi, Democratic Republic of Congo, Georgia, Ghana, Guinea-Bissau, Mexico, Mozambique, Nigeria, Senegal, South Africa, Tanzania
−1.0 to −0.5	Guinea, Rwanda, Sierra Leone, Zambia

Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.

However, table 1 also shows that World Bank allocations in 16 countries are negatively correlated with the bottom 40. This finding raises questions about the allocations involved in investment projects in these countries that do not seem to target or reach the bottom 40. Some of these results are explained by substantial allocations of project resources to capital cities, whereas most of the bottom 40 live elsewhere. Closer inspection suggests that this is the case mostly in African countries, particularly the Democratic Republic of Congo, Ghana, Guinea, Guinea-Bissau, Mozambique, Senegal, Sierra Leone, Tanzania, and Zambia. In the remaining countries, a negative correlation seems not to stem from the overabsorption of resources by capital cities, but from the higher share of resources going, on average, to areas with lower shares of national bottom 40 populations.

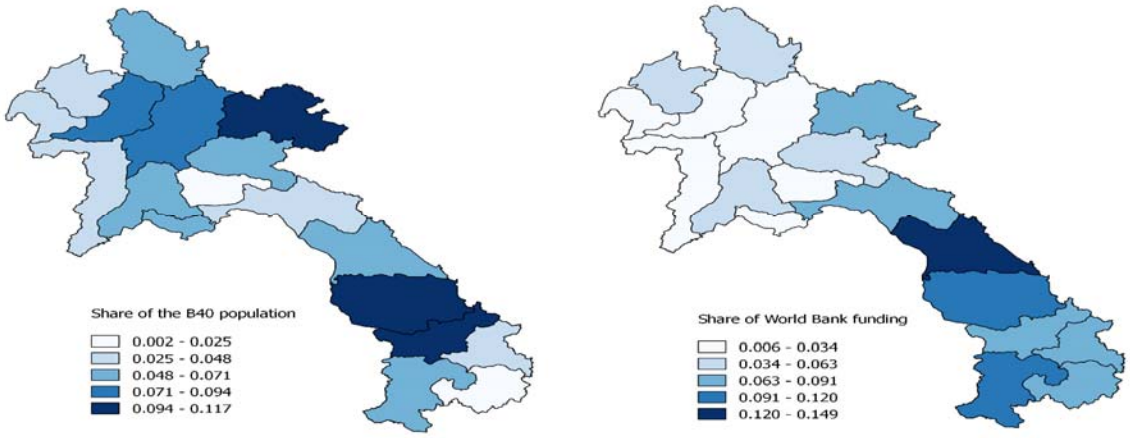
To illustrate, map 1 displays the geographical distribution of the bottom 40 and World Bank project funding across administrative areas in the Lao People's Democratic Republic. This allows a simple visualization of the disproportion in the shares of World Bank funding relative to the shares of the bottom 40 in these areas. Although the correlation between the locations of the bottom 40 and of World Bank

[21] See appendix A for definitions of the variables and data sources.

[22] In this analysis, an equal split of total project commitments is assumed across the subnational areas in which projects are active. The correlations in most countries tend to be somewhat higher if a population-weighed split of resources across subnational areas is applied (see appendix B).

funding is positive (0.34; see appendix B), the map clearly highlights the imperfect targeting on the bottom 40. Areas in the north are especially underfunded relative to their shares of the bottom 40.

Map 1: The Distribution of the Bottom 40 and World Bank Project Funding, Lao PDR



Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.

In two countries, robustness tests at the second administrative level (districts) on which data are available confirm the positive correlations. In Bangladesh, the correlation (0.82) is somewhat higher in the districts than in the first administrative level (0.71), whereas, in Nepal, the correlation appears weaker (0.40) in the districts than in the first administrative level (0.92), but is still substantial.

The geographic correlation between the location of the bottom 40 and investment projects is lowest in Sub-Saharan Africa (table 2). Almost half the sample is composed of countries in this region (27). The average correlation coefficient in these countries is 0.04, much lower than the 0.26 average across the entire sample. Meanwhile, at a coefficient of 0.54, the geographic correlation is highest in the 10 countries covered in Latin America and the Caribbean. The correlations in the other regions fall between these values.

Table 2: Subnational Allocations, by World Region, Correlation Coefficients between the Share of World Bank Funding and the Bottom 40

Region	*Countries, number*	*Country areas, number*	*Average areas per country*	*Correlation coefficients*		
				Simple average	*Weighted average by country population*	*Weighted average by country commitments*
SSA	27	437	16	0.04	0.04	0.10
EAP	5	144	29	0.37	0.41	0.30
ECA	8	148	19	0.39	0.12	0.20
LAC	10	193	19	0.54	0.48	0.66
MENA	2	39	20	0.37	0.31	0.37
SAR	6	123	21	0.49	0.71	0.69
World	58	1,084	19	0.26	0.43	0.40

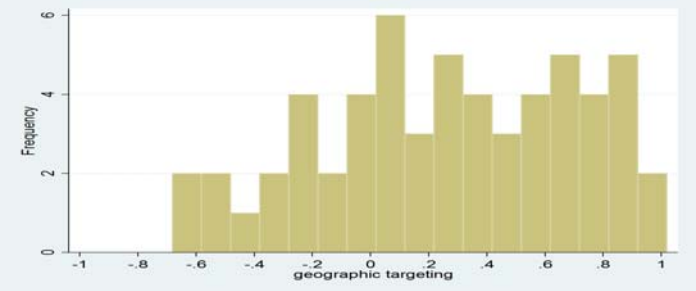
Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.
Note: EAP = East Asia and Pacific. ECA = Eastern Europe and Central Asia. LAC = Latin American and the Caribbean. MENA = Middle East and North Africa. SAR = South Asia. SSA = Sub-Saharan Africa.

The regional ranking changes substantially if the correlations are weighted by national population or the amount of project funding allocated to each country. The population-weighted average in Latin America and the Caribbean is dragged downward by populous Mexico, which presents a slightly negative correlation coefficient (−0.04). The region drops to second position in the two weighted lists (see table 2). South Asia's targeting proves far better when weighted by either population or allocations thanks to the very high correlations shown in Bangladesh (0.86) and India (0.73). The Russian Federation (0.03) is mostly responsible for a large drop in the weighted average coefficients for Europe and Central Asia.

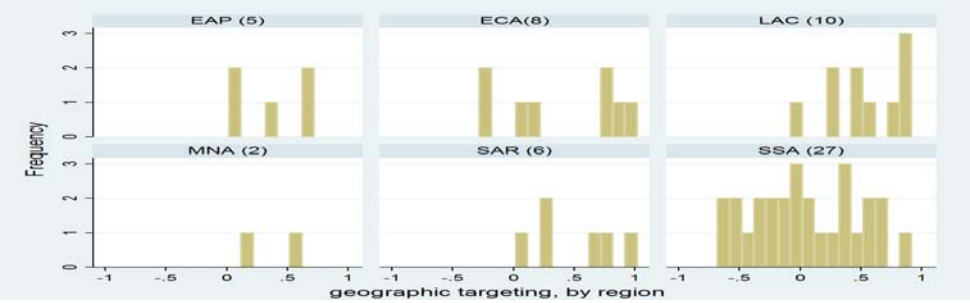
Figure 1 displays a more disaggregated view of the distribution of the values of the correlation coefficients both for the entire sample (panel a) and for each region (panel b). This reveals mostly positive values in the correlation coefficients across the sample and a broadly uniform distribution in the case of Sub-Saharan Africa, ranging from −0.7 to 0.9.[23]

Figure 1: Histograms of Correlation Coefficients

a. For the entire sample



b. For each world region



Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release, (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.
Note: EAP = East Asia and Pacific. ECA = Eastern Europe and Central Asia. LAC = Latin American and the Caribbean. MENA = Middle East and North Africa. SAR = South Asia. SSA = Sub-Saharan Africa.

[23] Appendix C plots, for the overall sample of 58 countries, the share of World Bank resources going to each subnational area against the share of the national bottom 40 population in the area. The simple correlation of 0.58 between these two variables is significant at 1 percent. The red line represents the 45-degree line. The more distant points are from the 45-degree line, the larger the difference between the aid share allocated to an area and the share of the national bottom 40 living in the area.

These results may be interpreted only cautiously as an indicator that, at least at the first administrative level, allocation patterns are sensitive to the presence of the bottom 40 and strongly so in a large share of the country sample. In particular, the presence of the bottom 40 is typically correlated with the size of the population in an administrative area. Hence, a high correlation may indicate that World Bank project funding is simply concentrated in populous areas rather than explicitly targeted on the bottom 40.

4.2 Robust regression results

Table 3 presents the results of zero-inflated beta regressions in which the share of World Bank funding an administrative area receives is the dependent variable. Country fixed effects are included to assess within-country correlations between the bottom 40 and World Bank funding. The estimates in column (1) do not include any control variables and are therefore analogous to the correlation coefficients described above. Indeed, the positive and significant coefficient of the bottom 40 is in line with the positive correlations between the bottom 40 and World Bank funding found in most countries. The results show that World Bank funding is predominantly allocated to the subnational administrative areas in which most of the bottom 40 reside. In quantitative terms, an increase in the number of the bottom 40 by 10 percent leads, on average, to an increase in the share of World Bank funding by 0.0012.[24] The effect is rather small because it constitutes only 2.2 percent of the mean of the dependent variable (0.054).

Table 3: Zero-Inflated Beta Regressions

	(1)	*(2)*	*(3)*	*(4)*
Ln bottom 40	0.246***	−0.226***	−0.126**	−0.130**
	(0.035)	(0.060)	(0.061)	(0.059)
Ln population		0.673***	0.524***	0.536***
		(0.079)	(0.087)	(0.085)
Capital			0.317*	0.376***
			(0.176)	(0.137)
Ln travel time			−0.014	
			(0.022)	
Conflict-related deaths			−0.00003	
			(0.00030)	
Number of countries	58	58	58	58
Number of observations, areas	1,081	1,081	1,056	1,081

Note: The dependent variable is the share of World Bank funding an administrative area receives. Country fixed effects are included in all estimations. Standard errors clustered at the country level are shown in parentheses.
***p < .01 **p < .05 *p < .1

In column (2), population is included as a control variable. As expected, the coefficient on population turns out to be significant and positive. The coefficient on the bottom 40 switches sign and becomes significantly negative.[25] The correlation between the bottom 40 and population conditional on the country fixed effects is 0.83. The results clearly show that more World Bank funding is allocated to areas with larger populations, which thus also tend to comprise larger shares of the bottom 40. If one controls for population, a higher number of the bottom 40 becomes associated with less World Bank funding. Quantitatively, an increase in the number of the bottom 40 by 10 percent leads, on average, to a decrease in the share of World Bank funding by 0.0011 (2.0 percent of the mean). This finding

[24] Average marginal effects are calculated using Stata's margins command.

[25] The sign switch is visually presented in appendix D, which shows the partial residual plots with respect to the bottom 40 for linear regressions with and without controlling for population, which are analogous to the zero-inflated beta estimations in columns (1) and (2) of table 3.

shows that the subnational allocation of World Bank project funding is not oriented toward poorer areas within countries in terms of the share of the bottom 40 in the population of the areas because these areas receive, on average, less funding from the World Bank.

The estimates in column (3) add three more control variables: a dummy variable equal to 1 if the capital city is located in the respective area, the estimated travel time from the other administrative areas to the capital, and the number of conflict-related deaths. The only significant one among these is the dummy variable for the capital city. The finding shows that areas with a capital city tend to receive a higher share of World Bank funding independently of the size of the population or the number of the bottom 40.

In column (4), the insignificant variables—travel time and conflict-related deaths—are excluded. The significance level of the capital area increases from 10 percent in column (3) to 1 percent in column (4).[26] In quantitative terms, the fact that an area encompasses the capital city raises the share of World Bank funding the area receives by an average 0.018 (33.7 percent of the mean). This substantial effect indicates that donors are inclined to work in capital cities. Efficiency or visibility considerations may play a role (see section 2).

Table 4 shows the results across world regions.[27] In columns (1)–(5), only the bottom 40 variable is included, whereas the estimates in columns (6)–(10) add population and the capital area as control variables. The estimates with only the bottom 40 variable show that the coefficient on the bottom 40 is, although positive and significant at the 5 percent level, substantially smaller in the case of Sub-Saharan Africa than in other regions.[28] The inclusion of the two control variables renders the difference even more striking. While the coefficient on the bottom 40 is not significant in the other regions, it is significant at the 1 percent level and negative in Sub-Saharan Africa. Hence, the negative and significant coefficient in columns (3) and (4) of table 3 appear to be solely driven by the subnational allocation of World Bank project funding in Sub-Saharan Africa. There, poorer subnational areas appear to receive less project funding, whereas this is apparently not the case in the other world regions.[29]

Table 4: Zero-Inflated Beta Regressions, by World Region

	(1) *SSA*	*(2)* *EAP*	*(3)* *ECA*	*(4)* *LAC*	*(5)* *SAR*	*(6)* *SSA*	*(7)* *EAP*	*(8)* *ECA*	*(9)* *LAC*	*(10)* *SAR*
Ln bottom 40	0.095**	0.332***	0.516***	0.376***	0.334***	−0.214***	0.207	0.024	0.256	−0.097
	(0.040)	(0.067)	(0.109)	(0.062)	(0.046)	(0.058)	(0.185)	(0.275)	(0.166)	(0.126)
Ln population						0.628***	0.187	0.563*	0.096	0.625***
						(0.078)	(0.217)	(0.300)	(0.210)	(0.180)
Capital						0.588***	0.663	−0.231	0.356	0.395**
						(0.143)	(0.569)	(0.274)	(0.367)	(0.189)
Number of countries	27	5	8	10	6	27	5	8	10	6
Observations, number	436	144	148	193	121	436	144	148	193	121

Note: The dependent variable is the share of World Bank funding a region receives. Country fixed effects are included in all estimations. Robust standard errors are shown in parentheses. EAP = East Asia and Pacific. ECA = Eastern Europe and Central Asia. LAC = Latin American and the Caribbean. SAR = South Asia. SSA = Sub-Saharan Africa.
***p < .01 **p < .05 *p < .1

[26] Apart from efficiency gains because of fewer explanatory variables, the number of observations (areas) rose relative to column (3) because the data on estimated travel times to the capital are not available for all areas.
[27] Standard errors are not clustered in these regressions because of the relatively small number of clusters (countries). Robust standard errors are estimated, however.
[28] The significance level of the coefficient is 1 percent in all other world regions. The estimates on the Middle East and North Africa are not included because only two countries (with 39 subnational areas) in that region are included in the sample.
[29] An additional result is that the coefficient on the capital area is only significant in South Asia and Sub-Saharan Africa.

Table 5 specifically highlights two broad categories of projects: those that are spatially blind, and those that are not spatially blind. Education and health care projects should be spatially blind, according to the World Bank (2009), because of the goal of universal coverage in these sectors. In transportation, energy, and mining projects, subnational allocation decisions depend on practical considerations such as the availability of natural waterways or raw materials. The results of the regressions without population in columns (1) and (4) indicate that the coefficients for the two categories of projects are virtually the same size. This means that funding for education and health care projects is not disproportionally allocated to areas with higher numbers of the bottom 40 relative to the funding for transportation, energy, and mining projects.

However, as columns (2) and (5) show, a different picture emerges after controls are applied for population and the capital area. While the coefficient on the bottom 40 is not significant in the case of education and health care projects, it becomes negative and significant at the 10 percent level in transportation, energy, and mining projects. The negative coefficients of such projects may be explained by general equilibrium effects because projects located in areas with a smaller share of the poor may still exert high general equilibrium impacts on the poor. Moreover, population size and the dummy variable for capital area are only significantly positive in the case of transportation, energy, and mining projects. It appears that these types of projects are predominantly located in the capital area and in other populous areas of the countries. The estimates in column (3) show some evidence that education and health care projects tend to be located in more remote areas. According to column (6), transportation, energy, and mining projects appear, meanwhile, to be located less frequently in conflict-affected areas.

Table 5: Zero-Inflated Beta Regressions, Education and Health versus Transportation, Energy, and Mining

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Education and health projects			*Transportation, energy and mining projects*		
Ln bottom 40	0.157***	0.090	0.064	0.157***	−0.113*	−0.123*
	(0.029)	(0.066)	(0.066)	(0.041)	(0.065)	(0.070)
Ln population		0.094	0.135*		0.419***	0.415***
		(0.079)	(0.079)		(0.084)	(0.087)
Capital		−0.094	0.099		0.352**	0.309
		(0.170)	(0.189)		(0.171)	(0.199)
Ln travel time			0.044*			−0.011
			(0.023)			(0.028)
Conflict-related deaths			−0.0003			−0.001**
			(0.0003)			(0.0002)
Number of countries	51	51	51	54	54	54
Number of observations, areas	964	964	946	1,000	1,000	975

Note: Only countries with projects in the respective sectors are included. Country fixed effects are included in all estimations. Standard errors clustered at the country level are shown in parentheses.
***p < .01 **p < .05 *p < .1

Table 6 includes public expenditure by recipient governments and the aid of other donors as additional control variables. The number of countries is reduced to 15 (public expenditure) and 11 (aid from other donors) because of data availability constraints. This affects the significance levels of the bottom 40 variable, and the variable even becomes insignificant in some cases. The analysis shows that public expenditure by national governments is insignificant, while there is a positive and significant effect at the 1 percent level of the aid of other donors. Hence, there is no evidence of donor coordination. On the contrary, the analysis shows evidence of area clustering by the World Bank and the other donors. The conformity in location choices may yield important benefits for donor organizations linked to logistics, security, and reputation (see section 2).

Table 6: Zero-Inflated Beta Regressions, Public Expenditure and the Aid of Other Donors

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Ln bottom 40	0.126*	−0.094	−0.041	0.016	−0.078	−0.372***	−0.210*	−0.217**
	(0.071)	(0.083)	(0.080)	(0.074)	(0.082)	(0.105)	(0.109)	(0.106)
Ln population		0.431***	0.373***	0.276***		0.767***	0.462***	0.453***
		(0.116)	(0.107)	(0.082)		(0.137)	(0.162)	(0.172)
Capital			0.241*	−0.132			0.872***	1.271***
			(0.142)	(0.207)			(0.279)	(0.428)
Ln travel time				−0.099*				0.073
				(0.054)				(0.066)
Conflict-related deaths				0.00056				−0.001
				(0.00008)				(0.001)
Ln public expenditure	0.156	−0.020	−0.044	−0.067				
	(0.115)	(0.115)	(0.108)	(0.102)				
Ln aid of other donors					0.218***	0.140***	0.140***	0.146***
					(0.057)	(0.038)	(0.039)	(0.051)
Number of countries	15	15	15	15	11	11	11	11
Number of observations, areas	320	320	320	313	267	267	267	262

Note: Country fixed effects are included in all estimations. Standard errors clustered at the country level are shown in parentheses.
***p < .01 **p < .05 *p < .1

In a series of robustness tests, the observations are weighted in various ways; certain groups of countries are excluded; the dependent variable is altered; and the estimation method is changed.[30] In a first instance, the observations are weighted so that each country, rather than each administrative area, has the same weight in the regressions. In the second, countries with five or fewer first-level administrative areas are excluded from the regressions (five countries). In the third, countries in which only five or fewer World Bank projects have been conducted over 1995–2004 are excluded (six countries). In the fourth, the construction of the dependent variable is altered, and the subnational administrative areas are weighted by population (rather than equally) in splitting total project commitments across the areas in which a project is active. In the fifth, the amount of World Bank funding is used as the dependent variable instead of the share of funding an area receives, and a Poisson regression model is estimated. In the last, a fractional logit model is estimated instead of a zero-inflated beta model. (Both are valid estimation methods in the case of percentage scaled dependent variables.) The results remain qualitatively the same as the results shown in table 3 except that the coefficient on the dummy variable for the capital area becomes insignificant in some cases.

5. Concluding remarks

Beyond the World Bank and United Nations goals of poverty reduction, poverty reduction is often at the top of the priorities announced by donors. Thus, it might be expected that the within-country geographical distribution of donor projects and programs should bear a certain correlation with the physical location of the poor. This should apply to the geographic presence of the poor both in absolute numbers and in relative terms, that is, for example, the share of the poor in the population of an administrative area.

[30] Appendix E shows the regression results if population and the dummy variable for capital areas are used as controls.

This paper proposes a new geographic targeting indicator and a related methodology to assess the within-country aid allocations of donors by correlating the geographical distribution of donor funding within countries with the geographical distribution of the bottom 40.

Applying this methodology to World Bank project funding, the correlation analysis indicates that, of the 58 countries in the sample, 42 show a positive correlation between the shares of the bottom 40 and World Bank funding, and almost half of the countries show a correlation above 0.5.[31] Slightly more than a quarter of the countries in the total sample, mostly in Sub-Saharan Africa, exhibit a negative correlation. Indeed, the geographic correlation between the bottom 40 and World Bank investment funding is lowest in Sub-Saharan Africa, with an average correlation coefficient of almost 0, which is significantly lower relative to the entire sample. This result can be explained in the case of many countries in Sub-Saharan Africa by the substantial allocation of project resources to the capital, whereas most of the bottom 40 live elsewhere.

The presence of the bottom 40 is, however, typically correlated with the size of the population in an administrative area. The regression analysis shows that, once one controls for population, the correlation between the bottom 40 and World Bank funding switches sign and becomes significant and negative on average. This is entirely driven by Sub-Saharan Africa because the correlation is insignificant in other world regions. Hence, the significant and positive correlation in the estimates without controls for population indicates that World Bank project funding is concentrated in areas in which more people live, including the bottom 40, rather than in poorer areas. A regression analysis on a subsample of 11 countries shows that the subnational allocations of the World Bank and other donors are positively correlated. This suggests that the World Bank and other donors cluster their aid across subnational areas rather than engaging in complementary coordination.

Several factors may explain the imperfect targeting of aid on the poorest. In the regression analyses, controls are applied for remoteness, conflict, and complementarity with domestic and other external financing. Other considerations that are more difficult to measure quantitatively are worth reiterating. First, domestic political economy considerations and recipient country preferences may affect the allocation of development aid. Second, general equilibrium effects may be at play if the returns to poverty reduction are higher in nonpoor areas.[32] Third, the lack of information on where the poor are located may prevent proper targeting.

Given that the interpretation of low (partial) correlations may still be ambiguous, such findings may be useful as an entry point for further analysis rather than as a negative assessment. Nonetheless, given the increasing availability of poverty and aid data associated with small area maps, the World Bank ought to monitor more closely the extent to which the geographical distribution of project funding and the residence of the bottom 40 align.[33] Such an exercise has the potential to enhance substantially the efficiency of increasingly scarce development funds and help maximize the poverty-reducing effects of development assistance.

Similar studies of other development banks and large bilateral donor agencies aimed not only at investigating spatial poverty targeting, but also at other development goals would thus be welcome.

[31] The generally positive results are supported by two cases of countries on which the correlation analysis was conducted at the second administrative level (districts), in addition to the analysis at the first administrative level. The results show that correlations remain positive.

[32] The finding that education and health care projects perform better than energy, mining, and transportation projects in within-country allocations is consistent with the fact that the World Bank takes into account general equilibrium effects.

[33] The results of this paper could serve as a baseline because the analysis covers projects approved between 2005 and 2014. The recent Independent Evaluation Group report (IEG 2017) makes this recommendation based on the research that is described in this paper and that provided input into that report.

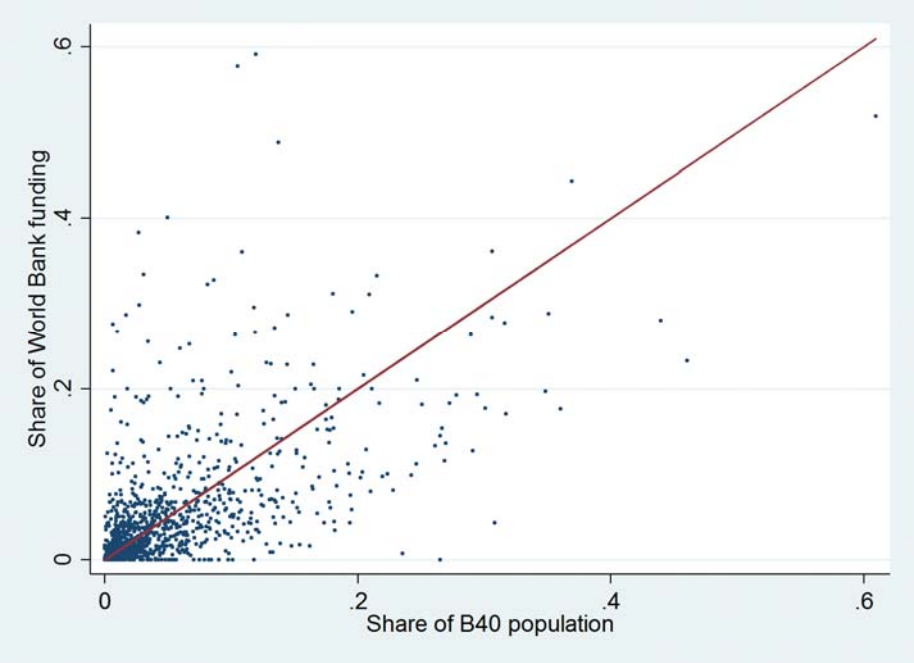
Appendix A: Definitions of Variables and Data Sources

Variable	*Definition*	*Source*
World Bank funding	Total commitments of investment projects of the World Bank in U.S. dollars split equally (or population weighted) across the subnational first-level administrative areas in which a project has been active; 2005–14	*AidData* World Bank Geocoded Research Release, (database), AidData, College of William and Mary, Williamsburg, VA (accessed November 23, 2016), http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2
Share of World Bank funding	Share of World Bank project funding a subnational administrative area receives	*AidData*
Share of the bottom 40	Share of the national bottom 40 population living in an administrative area; data from surveys within the 2005–14 period	*Global Poverty Monitoring* Source: Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC (accessed December 2016–January 2017)
Ln bottom 40	Number of the national bottom 40 population living in an area (in log)	*Global Poverty Monitoring*
Ln population	Number of people living in an area (in log)	*Global Poverty Monitoring*
Capital area	Dummy variable equal to one (zero) if the capital of the country is (not) located in the area	*Internet searches*
Ln travel time	Estimated road travel time with private transportation from each subnational area to the respective capital in minutes (in log)	*Internet searches*
Conflict-related deaths	Number of conflict-related deaths in an area (per 100,000 inhabitants); 2005–14	*UCDP* UCDP (Uppsala Conflict Data Program) (database), Department of Peace and Conflict Research, Uppsala University, Uppsala, Sweden (accessed June 20, 2017), http://ucdp.uu.se/?id=1) http://ucdp.uu.se/downloads/
Ln public expenditure	Subnational public expenditure (in log); 2005–14 or subperiods	*Boost* Open Budgets Portal: Boost (database), World Bank, Washington, DC (accessed June 20, 2017), http://wbi.worldbank.org/boost/country
Ln aid of other donors	Aid of other donors (in log); 2005-2014 (expect in the case of Senegal for which the period covered is 2005-2012)	AidData http://aiddata.org/subnational-geospatial-research-datasets (accessed: September 28th, 2017)

Appendix B: Subnational Allocations, Correlation Coefficients, by Country

Country	*Administrative areas, number*	*Correlation coefficients*	
		Project locations equally weighted	*Project locations weighted by population*
Afghanistan	34	0.22	0.15
Angola	18	0.20	0.37
Armenia	11	0.78	0.95
Bangladesh	7	0.71	0.82
Belarus	7	−0.27	−0.44
Bhutan	20	0.07	0.13
Bolivia	9	0.85	0.95
Bosnia and Herzegovina	3	0.96	0.98
Brazil	27	0.75	0.77
Burkina Faso	13	0.09	0.09
Burundi	17	−0.26	−0.20
Cameroon	10	0.23	0.37
Cabo Verde	22	0.62	0.56
Chad	20	0.02	0.05
Chile	13	0.89	0.97
Congo, Dem. Rep.	11	−0.16	0.03
Congo, Rep.	12	0.40	0.31
Ecuador	22	0.44	0.46
El Salvador	14	0.57	0.91
Ethiopia	11	0.92	0.97
Georgia	10	−0.21	0.18
Ghana	10	−0.24	−0.11
Guatemala	22	0.31	0.87
Guinea	8	−0.60	−0.37
Guinea-Bissau	9	−0.01	0.06
Haiti	10	0.46	0.78
India	35	0.73	0.86
Indonesia	33	0.64	0.92
Iraq	18	0.13	0.45
Kenya	8	0.43	0.81
Kyrgyz Republic	8	0.85	0.96
Lao PDR	18	0.34	0.62
Lesotho	10	0.59	0.81
Madagascar	6	0.55	0.60
Mali	9	0.32	0.46
Mauritania	13	0.69	0.72
Mexico	32	−0.04	0.18
Mozambique	11	−0.35	0.18
Nepal	5	0.92	0.99
Niger	8	0.36	0.44
Nigeria	37	−0.05	0.16
Peru	25	0.31	0.45
Philippines	17	0.09	0.26
Russian Federation	77	0.03	0.10
Rwanda	5	−0.57	−0.22
Senegal	14	−0.34	−0.34
Sierra Leone	4	−0.63	−0.65
South Africa	9	−0.17	0.18
Sri Lanka	22	0.28	0.51
Tajikistan	5	0.80	0.86
Tanzania	21	−0.39	−0.17
Timor-Leste	13	0.67	0.63
Uganda	112	0.09	0.06
Ukraine	27	0.18	0.32
Uruguay	19	0.90	0.97
Vietnam	63	0.11	0.28
Yemen, Rep.	21	0.60	0.87
Zambia	9	−0.54	−0.43

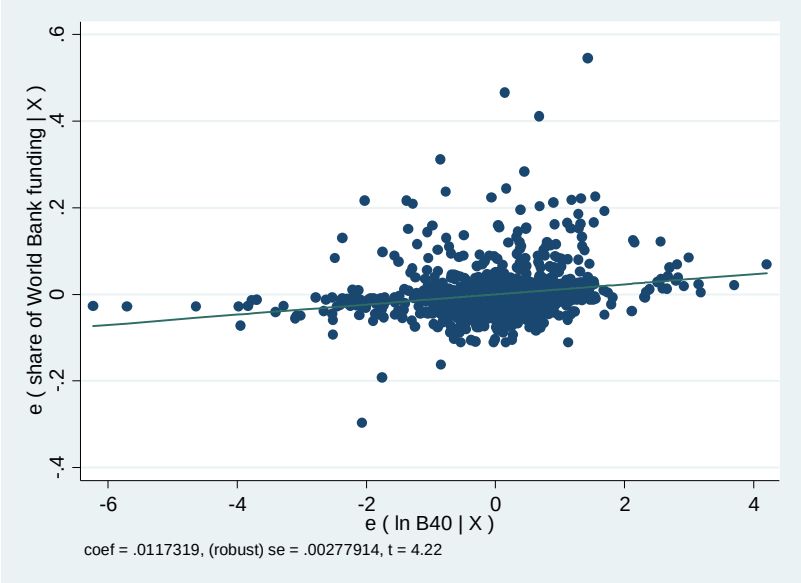
Appendix C: World Bank Project Funding versus Bottom 40 Share, Subnational Areas, 2005–14



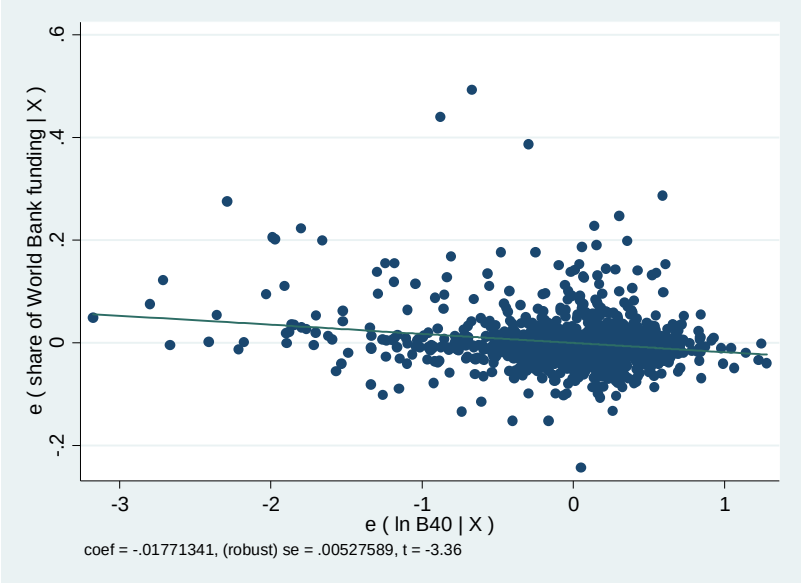
Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release, (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.

Appendix D: Partial Residual Plots, Bottom 40, Linear Regressions

a. Without controlling for population



b. Controlling for population



Source: Estimates based on Global Monitoring Database (internal database), Poverty and Equity Global Practice, World Bank, Washington, DC; World Bank Geocoded Research Release, (database), AidData, College of William and Mary, Williamsburg, VA, http://aiddata.org/data/world-bank-geocoded-research-release-level-1-v1-4-2.

Appendix E: Robustness Tests

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Ln bottom 40	−0.193***	−0.115*	−0.145**	−0.175***	−0.185**	−0.174**
	(0.065)	(0.061)	(0.057)	(0.060)	(0.075)	(0.078)
Ln population	0.672***	0.489***	0.578***	1.108***	0.738***	0.691***
	(0.120)	(0.083)	(0.084)	(0.095)	(0.118)	(0.103)
Capital	0.255*	0.436***	0.362***	0.505***	−0.047	0.384**
	(0.151)	(0.140)	(0.130)	(0.155)	(0.133)	(0.163)
Observations	1,081	1,059	979	1,081	1,081	1,081

Note: Country fixed effects are included in all estimations. Standard errors clustered at the country level are shown in parentheses.
***p < .01 **p < .05 *p < .1

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