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Effect of official development assistance on adolescent fertility rate: within-country evidence

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Abstract

We examine the effect of official development assistance (ODA) on adolescent fertility rates in low- and middle-income countries. Using data on adolescent fertility rates of five asset quintiles within each country from 42 countries, we find that foreign aid helps lower the teenage fertility rate for girls from the upper asset quintiles but not for girls from the poorest asset quintile. In addition, the teen-birth-rate reduction effect of aid is observed in recipient countries with above-average institutional quality measured by corruption, democracy accountability, and bureaucracy quality while not significant in countries with below-average institutional quality.

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1. Introduction

Development aid aims to reduce poverty, provide economic opportunities, and, more broadly, enhance well-being in aid-recipient countries. Many existing studies center on how aid affects economic growth, and the empirical evidence is far from conclusive. Some researchers consider that aid is instrumental in promoting economic growth in the middle- and low-income countries (Hansen and Tarp, 2001; Hudson and Mosley, 2001; Mosley et al., 2004; Galiani et al., 2017) or aid can be effective in countries with good policy regimes (Burnside and Dollar, 2000, 2004; Collier and Dollar, 2001; Dalgaard and Hansen, 2001). Others, however, argue that aid is counterproductive or even harmful (Rajan and Subramanian, 2008; Dreher and Langlotz, 2017).

In this study, we look at aid effectiveness by assessing the impact of official development assistance (ODA) on a specific development outcome. In particular, our focus is on the effect of ODA on the fertility rate of adolescents[1] across five asset quintiles in each aid-recipient country. We obtain adolescent fertility rates from Gwatkin et al. (2007), who use individual-level data from Demographic and Health Survey Program (DHS) surveys. For each country, Gwatkin and coauthors apply principal component analysis to construct a wealth index score for every survey respondent of the DHS based on their answers to questions on household possessions (assets). Respondents in the same country are then ranked and divided into five quintiles according to their wealth scores. After that, individual responses to health-related questions (in our case, adolescent fertility behavior) in the DHS surveys are aggregated to provide the average health outcomes for each asset quintile in that country. With adolescent fertility rates from different asset quintiles in aid recipient countries, we can explore potential heterogeneous effects of aid across the asset/wealth distribution in our paper.

The adolescent fertility rate is a progress indicator for the United Nations' Millennium Development Goals and the most recent Sustainable Development Goals.[2] Teenage childbearing could have significantly adverse human capital consequences and thus impede a country's economic development. For example, it has been noted in the medical literature that teen mothers are more likely to experience postpartum depression symptoms and have a higher risk of systemic infections and maternal death than older women (Kingston et al., 2012; WHO, 2016). In addition, adolescent pregnancy also raises the risk of low birth weight and neonatal mortality (Creatsas and Elsheikh, 2009; Patton et al., 2009). Although the literature has not established a clear causal relationship, some show teenage childbearing could potentially disrupt schooling and limit employment opportunities for the young mother and lead to worse education outcomes for her child(ren) (Wall-Wieler et al., 2019).

Using data on teen birth rates from 42 middle- and low-income countries, our results show that aggregate ODA lowers the adolescent fertility rate in aid-recipient countries. This

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[1] The World Development Indicators defines adolescent fertility rate as the number of births per 1000 women aged between 15-19. According to the United Nations Population Division, where the data are collected, the adolescent fertility rate is computed as a ratio. Specifically, the numerator is the number of live births to women 15 to 19 years old, and the denominator is an estimate of the number of women at ages 15 to 19.

[2] The Millennium Development Goals are: to eradicate extreme poverty and hunger, to achieve universal primary education, to promote gender equality and empower women, to reduce child mortality, to improve maternal health, to combat HIV/AIDS, malaria and other diseases, to ensure environmental sustainability, and to have global partnership for development. The Sustainable Development Goals include: no poverty, zero hunger, good health and well-being, quality education, gender equity, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice and strong institutions, and partnerships for the goals.

effect mainly comes through aid reducing the fertility rate among teens from the upper (the 4th and the 5th) asset quintiles; ODA does not appear to effectively lower the adolescent fertility rate of the poorest (the 1st) asset quintile. Using health aid in the regressions yields qualitatively similar results. We also explore the effects of aid in countries with good institutional quality and countries with poor institutional quality, respectively. The observed teenage birth-rate-reduction effect of ODA seems to be driven mainly by ODA in countries with good institutional quality. For countries with below-average institutional quality in our sample, aid is not effective in lowering the adolescent fertility rate, regardless of asset quintiles.

Aid donors often pursue multiple objectives, many of which can go beyond the change in per capita GDP. By focusing on adolescent fertility instead of average income, our paper adds to the literature assessing the overall effect of aid on non-monetary outcomes in developing countries. A few studies in this group related to our paper include Azarnert (2008), Neanidis (2012), and Wang and Zhuang (2019) on aid and the total fertility rate, and Zhuang et al. (2020) on aid and the adolescent fertility rate. In an overlapping-generations framework, Azarnert (2008) concludes theoretically that aid per child shifts household resources from child quality to child quantity, leading to a higher total fertility rate in an economy. Neanidis (2012), instead, argues theoretically and shows empirically that aid can have both positive and negative effects on the total fertility rate, resulting in a net effect of zero. More recently, using data from 86 countries over 1970-2015, Wang and Zhuang (2019) show that ODA helps to lower total fertility rates in aid-recipient countries. Looking at the adolescent fertility rate, Zhuang et al. (2020) find that, overall, development aid reduces the average adolescent fertility rate in the middle- and low-income countries in their sample.

Our empirical analysis focuses on the adolescent fertility rate as opposed to Neanidis (2012) and Wang and Zhuang (2019), both looking at the total fertility rate. Zhuang et al. (2020), which our paper is most closely related to, analyze the overall average effect of ODA across countries. In comparison, we employ adolescent fertility rates for teenagers from the poorest (the lowest 20%) to the richest (the top 20%) asset quintiles in each country. As a result, our findings offer a closer look at the effect of aid on the teenage birth rate across the wealth distribution within countries and a better understanding of whether development aid indeed helps the poor in a country.

The remainder of the paper is organized as follows. We present our empirical model and data in Section 2 and empirical results in Section 3. Section 4 concludes.

2. Methodology and Data

The effectiveness of aid in our paper is assessed using the following model:

$$\ln(Adofert_{ijt}) = \beta_0 + \beta_1 \ln(ODAPC_{it\_lag}) + \sum_{M=2}^{5} \delta_M q_M * \ln(ODAPC_{it\_lag}) + \gamma^{'} X + \varepsilon_{ijt} \quad (1)$$

where $\ln(\cdot)$ represents the natural logarithm of a variable; $Adofert_{ijt}$ is the adolescent fertility rate (the number of births per 1000 women aged between 15 and 19) in country *i,* quintile j, and year *t*, with $j = 1, 2, \ldots, 5$;[3] $ODAPC_{it\_lag}$ is lagged net ODA per capita in constant 2010 dollars in country i; q_M is a quintile dummy and $q_M * \ln(ODAPC_{it\_lag})$ is the interaction between a quintile dummy and ODA. We use the first quintile as the base; hence, the first quintile dummy

[3] For example, for Bangladesh (*i*) in 2004 (*t*), the first asset quintile adolescent fertility rate was 189.9 (*j*=1); the second quintile adolescent fertility rate was 157.6 (*j*=2); the third quintile adolescent fertility rate was 153.5 (*j*=3); the fourth quintile adolescent fertility rate was 121.3 (*j*=4); and the fifth asset quintile adolescent fertility rate was 85.4 (*j*=5).

q_1 is not included on the right-hand side of the equation. If foreign aid has different effects on the adolescent fertility rate across asset quintiles, the estimated coefficients on the quintile-aid interactive terms, δ_M (or some of them), should be significantly different from zero.[4]

The vector X in equation (1) includes other control variables that can influence the adolescent fertility rate. Following the existing literature (for example, Viner et al., 2012; Santelli et al., 2017), X includes log value of GDP per capita in constant 2010 dollars, rural population share of the total population, infant mortality rate, female schooling, and government health expenditure as a share of GDP. Researchers have pointed out that, in general, countries with a higher national income tend to have better health outcomes, including lower adolescent fertility rates (Santelli et al., 2017), possibly because countries with a higher income can afford to spend more on health care. The effect of average income can also be attributed to better (future) employment prospects for women (adolescent girls) in higher-income countries, thus raising the opportunity cost of teenage childbearing. As a result, we expect a negative relationship between real GDP per capita and the adolescent birth rate and between government health expenditure and the adolescent fertility rate. In addition, we also expect female schooling to be negatively associated with the adolescent fertility rate as education can also increase economic opportunities for women (Galor and Weil, 2000). Infant mortality may be positively associated with adolescent fertility, given that the high infant mortality rate is considered a significant barrier to fertility decline in some developing countries (Bongaarts, 2008). In general, rural areas tend to show a higher fertility rate than cities, and we expect the rural population to have a positive coefficient in the adolescent fertility rate regression.

We obtain data on the adolescent fertility rate across asset quintiles from Gwatkin et al. (2007). Gwatkin and coauthors compute wealth index scores for participants of the DHS surveys based on their responses to household possessions (assets) using the principal component analysis. Respondents in the same country are ranked per their wealth scores and then divided into five quintiles. Individual responses to health-related questions in the surveys are combined to produce the average health outcomes for each asset quintile. Data on adolescent fertility across asset quintiles are available in different years for different countries. Table 1 presents the list of countries and the years with available data on the adolescent fertility rate in our sample.[5]

Table 1. List of countries and available years

Country	Years	Country	Years
Armenia	2000	Malawi	2000
Bangladesh	1996, 1999, 2004	Mali	2001
Benin	1996, 2001	Mauritania	2000
Bolivia	1998, 2003	Morocco	2003
Brazil	1996	Mozambique	1997, 2003
Cambodia	2000	Namibia	2000
Cameroon	1998, 2004	Nepal	1996, 2001
Central African Rep.	1996, 2004	Nicaragua	1997, 2001
Colombia	2000, 2005	Niger	1998

[4] Note that for any given country in our sample, the dependent variable, adolescent fertility rate, varies across asset quintiles while the values of control variables are the same across quintiles.

[5] Gwatkin et al. (2007) includes information for 56 developing countries. Our sample includes 42 countries, solely determined by the availability of data on control variables in our regressions.

Dominican Republic	1996, 2002	Peru	1996, 2000
Egypt, Arab Rep.	2000	Philippines	1998, 2003
Gabon	2000	Rwanda	2000
Ghana	1998, 2003	Senegal	1997
Guatemala	1998	South Africa	1998
Haiti	2000	Tanzania	1996, 1999, 2004
India	1998	Togo	1998
Indonesia	1997, 2002	Turkey	1998
Jordan	1997	Uganda	2000
Kazakhstan	1999	Vietnam	1997, 2002
Kenya	1998, 2003	Yemen, Rep.	1997
Kyrgyz Republic	1997	Zambia	1996, 2001

The net ODA disbursement data come from the World Development Indicators (WDI) by the World Bank, with the original data source being the OECD International Development Statistics database. Net ODA comprises disbursements of loans (excluding repayments of principal) and grants by official agencies of the Development Assistance Committee (DAC) countries, multilateral institutions, and non-DAC countries to developing countries and territories on the DAC list of ODA recipients. As mentioned previously, we use a lagged ODA measure in our regression. This is to alleviate the issue of two-way causality as well as to reduce short-run fluctuations.[6] Specifically, we take an average of ODA in the past three years and include this lagged measure in our regressions. For example, if adolescent fertility data are available for a country in year *t*, then the average of log ODA over $t-3$, $t-2$, and $t-1$ is used in the regression for this country. We have also checked the robustness of our findings with variables averaged over the past four years and the past five years in our regressions, and the results remain qualitatively similar.

Female schooling is measured by the average years of schooling in the female population over 25, obtained from Barro and Lee (2013). Because the Barro-Lee data are available every five years (1980, 1985, etc.), we fill in the missing schooling values in other years using linear interpolation. Data on all other control variables are from the WDI. Similar to the ODA variable of interest, all controls in our regressions are also averaged over three years between $t-3$ and $t-1$.[7]

Individual country fixed effects and time-varying quintile fixed effects, represented by the interactions between year dummies and quintile dummies, are also included to control for unobserved country heterogeneities that can potentially cause omitted variable bias.[8]

We present summary statistics of variables used in our regressions in Table 2 and the correlation matrix in Table 3. As shown in Table 2, the average adolescent fertility rate for the full sample is 109.4 births per 1000 women aged 15-19. The average teenage fertility rate tends to be highest for the poorest asset quintile and lowest for the fifth, or the richest, asset quintile. For example, the average adolescent fertility rate for the fifth asset quintile across countries is

[6] For example, a country with higher adolescent fertility rate may also receive more ODA from foreign countries.
[7] The Barro-Lee education data in this case are first filled in by linear interpolation and then taken an average over the past three years corresponding to the year of the adolescent fertility data.
[8] Based on data availability, we create time dummies for before 1996, between 1996 and 2000, and after 2000.

57.17 births per 1000 women. The average first-asset-quintile adolescent fertility rate is 2.6 times as much as the fifth quintile figure 149.49 births per 1000 women.

Table 2. Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
Adolescent Fertility full sample (births/1000 women)	310	109.449	60.8746	6	260
First quintile	62	149.486	56.1033	39	260
Second quintile	62	129.579	53.6829	27	246
Third quintile	62	116.208	55.127	23	229
Fourth quintile	62	94.8032	53.7236	11	246
Fifth quintile	62	57.171	41.6368	6	205
Adolescent Fertility full sample (log)	310	4.4877	0.71765	1.7917	5.5606
Per Capita Net ODA (log)	310	3.43308	1.01317	0.5808	5.3343
Real GDP Per Capita (log)	310	6.99226	0.94157	5.2028	9.3424
Rural Population (share of total population, %)	310	59.8299	18.7699	21.641	89.552
Infant Mortality (deaths/1000 live births)	310	67.5634	29.9297	19.433	143.167
Female Schooling (years)	310	3.76786	2.35112	0.1647	10.292
Health expenditures (share of GDP, %)	310	4.829	1.49426	1.9714	8.78463

Table 3. Correlation Matrix

	Ln(Per Capita ODA)	Rural Population	Infant Mortality	Female Schooling	Health Expenditure
Ln(Per Capita ODA)	1.0000				
Rural Population	-0.8265***	1.0000			
Infant Mortality	-0.7440***	0.6367***	1.0000		
Female Schooling	0.6234***	-0.6110***	-0.6948***	1.0000	
Health Expenditure	0.1652***	-0.2247***	-0.1487***	0.1785***	1.0000

Notes: ***p<0.01, ** p<0.05, * p<0.1

3. Empirical Results

3.1 Aggregate ODA Results

We present OLS results with fixed effects in column 4.1 and instrumental variables (IV) regression results in column 4.2 in Table 4.[9] Our model has a reasonably good fit, by and large, shown by the adjusted-R^2 value between 0.531-0.713 and the F-test of joint significance results.

Table 4. Regression Results for Aggregate ODA

	Aggregate Aid	Aggregate Aid	Health Aid
	OLS	IV	IV
VARIABLES	4.1	4.2	4.3
Ln(Per Capita ODA)	0.0908	-0.3521	0.4969
	[0.076]	[0.235]	[0.440]
Ln(Per Capita ODA) × q2	-0.1796***	-0.0988	-0.8289**
	[0.031]	[0.330]	[0.377]
Ln(Per Capita ODA) × q3	-0.1443***	-0.0723	-0.7979**
	[0.028]	[0.313]	[0.380]
Ln(Per Capita ODA) × q4	-0.1166***	-0.3004	-0.9175**
	[0.037]	[0.374]	[0.388]
Ln(Per Capita ODA) × q5	-0.2891***	-0.3773***	-1.7120***
	[0.033]	[0.041]	[0.463]
Ln(GDP per capita)	-0.0977	-0.6369***	-0.7245**
	[0.293]	[0.242]	[0.340]
Rural Population	-0.0119	-0.0351***	-0.0286*
	[0.013]	[0.012]	[0.017]
Infant Mortality	0.0102	0.0099**	0.0033
	[0.007]	[0.004]	[0.006]
Female Schooling	-0.0450	-0.0398	-0.1063*
	[0.048]	[0.029]	[0.055]
Health Expenditures	-0.0161	-0.0185	0.0391
	[0.066]	[0.042]	[0.131]
Observations	310	310	300
Country FE	YES	YES	YES
Quintile x Period Dummies	YES	YES	YES
F-statistics p Value	0.0000	0.0000	0.0000
Adjusted R-squared	0.713	0.531	0.684
Kleibergen-Paap Test *p* Value		0.0078	0.0006
Hansen Test *p* Value		0.318	0.458
Joint significance of all ODA variables		0.0875	0.0020

[9] In brackets below the point estimates, robust standard errors corrected for heteroscedasticity are reported. Our dataset is highly unbalanced with 24 countries out of 42 only having one-year observation. With such unbalanced dataset, clustered standard errors may introduce more bias than with balanced panel data with at least 50 clusters (Cameron and Miller, 2015).

Joint significance of ODA & ODA x q2	0.1390	0.4058
Joint significance of ODA & ODA x q3	0.1689	0.4563
Joint significance of ODA & ODA x q4	0.0565	0.2981
Joint significance of ODA & ODA x q5	0.0017	0.0051
Instrumentation equation partial R-squared		
ODA	0.1612	0.1206
ODA x q2	0.7850	0.2014
ODA x q3	0.7683	0.2097
ODA x q4	0.7850	0.2012
ODA x q5	0.6013	0.1409

Notes: Robust standard errors in brackets ***p<0.01, ** p<0.05, * p<0.1.
Regression 4.2 instruments: the aid disbursed by the U.K. weighted by the religious tie and its interaction with quintile dummy variables q2-q5; the sum of real per capita GDP of the U.K. and France weighted by the colonial tie, and its interactions with quintile dummy variables q2-q4. Regression 4.3 instruments: aggregate aid of Japan weighted by the religious tie and its interactions with the quintile dummy variables q2-q5; and the sum of real per capita GDP of France and the U.K. weighted by the colonial tie and its interactions with the quintile dummy variables q2-q4.

The IV regression is applied to further control for potential endogeneity issues. The instruments for ODA in regression 4.2 are chosen from a list of variables based on the first stage results and diagnostic tests to ensure their quality. Following Chauvet et al. (2013) and Wang and Zhuang (2019), potential instruments include GDP per capita of the five largest OECD ODA donors (the U.S., France, Germany, Japan, and the U.K.), and the aggregate ODA budget of the five largest OECD donor countries.[10] Regarding the quality of instruments, the Kleibergen-Paap under-identification test for regression 4.2 has a null hypothesis stating that instruments are not correlated with the endogenous variable. We can reject the null given the *p*-value of 0.0078, suggesting that our instruments correlate well with the ODA variable. To address the concern of weak instruments, we examine the *F*-statistics of the first-stage regressions for the IV specification, all of which are comfortably above 10, with 10 being the rule of thumb cutoff for weak instruments suggested in Staiger and Stock (1997).[11] We also report Shea's partial R^2 for the excluded instruments from the first-stage estimation. The partial R^2 measures the percentage of variations in ODA explained by the excluded instruments (Shea, 1997). The partial R^2 values in regression 4.2 attest to the strength of the excluded instruments. Finally, the *p*-value of the Hansen over-identification test (0.318) suggests that the null hypothesis of instruments being not correlated with the errors cannot be rejected at conventional levels. Overall, we are reasonably comfortable with the quality of our instruments in regression 4.2.

Focusing on individual variables, the estimated coefficient on the standalone aggregate ODA variable is positive in regressions 4.1 and negative in regression 4.2, neither significantly different from zero. The estimated coefficients on the interactions between ODA and the quintile

[10] The macroeconomic conditions of donor countries (income and total aid budget) help to capture some of the exogenous variations in aid received by an individual recipient country that is not affected by the domestic conditions of the recipient. For example, the income of Germany may, to a certain extent, influence Germany's ability to provide aid. But it is not affected by any individual recipient's adolescent fertility rate. Following Tavares (2003) and Chauvet et al. (2013), we use real GDP per capita and the total amount of aid of the five largest OECD donors weighted by geographic and cultural distance (common religion, was a colony of the donor country, or same official language) as instruments for ODA. The data on geographic and cultural distance are from CEPII

[11] The first stage results are reported in Table A1 of the appendix.

dummies in regressions 4.1 are all negative and significant at the 1% level, and the interaction between ODA and the fifth quintile dummy is negative and significant in regression 4.2, showing heterogeneous effects of aid on adolescent fertility rate across the asset quintiles. To explore this further, we test for the joint significance of the standalone coefficient on ODA and the coefficient on each of the quintile-ODA interactions in the IV regression. The joint significance of all ODA coefficients is significant at the 10% level, suggesting that aggregate aid has a significantly negative effect on the adolescent fertility rate in general. The coefficients on ODA and ODA × q4 and the coefficients on ODA and ODA × q5 are significant at the 10% level or better, while the coefficients on ODA and interactions between ODA and other quintile dummies are not different from zero. As both adolescent fertility and ODA enter the regression in log, the estimated coefficient on ODA represents elasticity. For example, considering the magnitude of coefficients on both the ODA and the interactions between ODA and quintile dummies, regression 4.2 shows that if per capita ODA rises by 1%, the teen fertility rate of the fifth asset quintile would drop by 0.73%, other things constant.

By and large, our results show that aggregate aid lowers the adolescent fertility rate in general. However, such a benefit mainly comes from reducing the adolescent fertility rate for the upper asset quintiles. Aggregate aid does not significantly lower the fertility rate of adolescents of the poorest asset quintile in the aid recipient.

Coefficients on other controls in regressions 4.1-4.2 are in general consistent with our expectations. Per capita income has a negative coefficient in all regressions, indicating that higher income is associated with lower adolescent fertility rates. For instance, regression 4.2 suggests that, on average, a 1% increase in per capita GDP is associated with a 0.64% reduction in the adolescent fertility rate, which is both statistically and economically significant. Both female schooling and government health expenditure have negative coefficients, although their effects are not estimated precisely. On the other hand, infant mortality has a positive and significant coefficient – this might be because high infant mortality can trigger a higher "demand" for children, raising the fertility rate. Interestingly, the coefficient on the rural population is negative and significant in regression 4.2, different from our expectation that a larger share of the rural population will lead to a higher adolescent fertility rate. A possible reason for the unexpected coefficient on the rural population might be that rural population, income per capita, female schooling, and infant mortality are correlated with each other, and the correlation coefficient between income and rural population is relatively high at (in absolute value) 0.83. A high degree of multicollinearity may render the coefficient on a collinear variable insignificant or cause the coefficient to switch its sign.

3.2 Health Aid Results

In this subsection, we focus on the effect of sectoral aid on the adolescent fertility rate. Spending on basic social needs, such as health, nutrition, and education, promotes "pro-poor" growth relative to other types of expenditures (Simson, 2012). In addition, ODA in the health sector or ODA supporting projects related to health/population policies may directly impact adolescent fertility behavior. To this end, we replace the log value of aggregate ODA per capita with the log value of health ODA per capita in the recipient country in our regression and provide the IV results in column 4.3 in Table 4. Ideally, we would use the net health ODA disbursement in the regression to capture actual aid flows. However, the sectoral aid disbursement data from the OECD Credit Reporting System (CRS) are only available since 2002, which significantly limits our sample size and prevents us from obtaining regression results. Closely following Neanidis

(2012), we construct a proxy for the health ODA disbursement by multiplying the net total ODA disbursement and the share of health aid commitments to total ODA commitments. Both total and sectoral ODA commitments data come from the CRS.

The estimated coefficients on the interactions between health aid and the asset quintile dummies are all negative. The joint significance test on all health aid variables has a *p*-value of 0.002. Similar to aggregate ODA, health aid has an overall significant effect of lowering the adolescent fertility rate in recipient countries.

Also qualitatively similar to results for aggregate ODA, we find that the coefficients on health aid and the interactive term between health aid and the fifth asset quintiles are statistically significant. In addition, there is some evidence supporting that health aid may have a larger impact on the adolescent fertility rate than aggregate aid. As seen previously, regression 4.2 suggests that a 1% increase in per capita aggregate ODA is associated with a 0.73% reduction in fertility rate for adolescents of the fifth asset quintile. For the effect of health ODA, regression 4.3 results show that if per capita health ODA rises by 1%, the teen fertility rate of the fifth asset quintile would drop by 1.22%, holding other things constant.

3.3. Do Political Institutions Matter?

As mentioned previously, many studies of the aid-growth nexus argue that aid can promote economic growth in recipient countries with good policies or quality institutions. In this subsection, we focus on subsample results based on ODA recipients' institutional qualities to see whether the effects of ODA tend to be different in countries with good institutional quality versus countries with poor institutional quality.

We use three indicators to measure the level of corruption, democratic accountability, and bureaucracy quality, respectively. Data on these indicators come from the Political Risk Service Group. Ranging between 0 (high corruption) and 6 (low corruption), the corruption indicator assesses corruption within a country's political system, such as bribes or excessive patronage. Democratic accountability measures how responsive a government is to its people, and this indicator also ranges between 0 and 6. Among several factors, high points of democratic accountability are given to countries, for example, with more than one political party, and low points are given to autarchy states. Finally, the bureaucracy quality indicator reflects a country's institutional strength and quality of the bureaucracy. This indicator ranges between 0 and 4, with high points given to countries where bureaucracy has the expertise to govern without drastic changes to the policy.

We divide our sample into two subsamples based on each of the three named institutional indicators. Countries with an indicator value above the sample average are considered to have good institutional quality, and countries with a below-average indicator are deemed to have poor institutional quality. We run these subsample regressions while explicitly controlling for institutional attributes.[12] Subsample results with aggregate ODA are in Table 5. For brevity, we report the estimated coefficients on aid variables and the institutional quality measure. Coefficients on other control variables are available upon request.

Table 5. Subsample Results of Aggregate ODA Based on Institutional Quality

[12]This is to avoid omitted variable bias issues related to recipients' institutional quality. For example, a country with better institutional quality might have lower adolescent fertility rate and receive less aid. As a result, omitting institutional quality can potentially bias the estimated coefficient on the ODA variable.

	Corruption		Democratic Accountability		Bureaucracy Quality	
	Above Average	Below Average	Above Average	Below Average	Above Average	Below Average
VARIABLES	5.1	5.2	5.3	5.4	5.5	5.6
Ln(Per Capita ODA)	0.117	-0.400	-0.025	-0.050	0.089	0.095
	[0.117]	[0.410]	[0.132]	[0.272]	[0.116]	[0.598]
Ln(Per Capita ODA) × q2	-0.072	-0.057	-0.004	-0.285	-0.073	0.013
	[0.090]	[0.131]	[0.132]	[0.206]	[0.148]	[0.396]
Ln(Per Capita ODA) × q3	-0.321***	0.002	-0.068	0.112	-0.093	-0.491**
	[0.107]	[0.132]	[0.133]	[0.202]	[0.138]	[0.250]
Ln(Per Capita ODA) × q4	-0.106	-0.025	0.078	-0.010	-0.207	-0.586*
	[0.109]	[0.140]	[0.169]	[0.197]	[0.170]	[0.328]
Ln(Per Capita ODA) × q5	-0.398***	-0.325***	-0.239***	-0.373***	-0.373***	-0.220***
	[0.025]	[0.035]	[0.028]	[0.034]	[0.034]	[0.026]
Ln(GDP per capita)	0.356	-0.953	0.633***	-0.417	-0.115	-0.636
	[0.334]	[0.799]	[0.192]	[0.748]	[0.208]	[3.041]
Rural Population	0.020	-0.110*	0.024*	-0.033	-0.028*	-0.032
	[0.021]	[0.061]	[0.013]	[0.028]	[0.015]	[0.123]
Infant Mortality	0.000	0.008*	0.007	-0.007	0.031***	-0.002
	[0.013]	[0.004]	[0.005]	[0.018]	[0.004]	[0.019]
Female Schooling	-0.051	-0.295*	0.051	-0.241	-0.032	-0.078
	[0.161]	[0.173]	[0.039]	[0.254]	[0.109]	[0.228]
Health Expenditures	0.025	-0.083	-0.008	-0.063	-0.060	0.016
	[0.075]	[0.070]	[0.037]	[0.089]	[0.055]	[0.091]
Institution Measure	0.024	0.063	-0.032	0.067	-0.08055	-0.081
	[0.131]	[0.123]	[0.037]	[0.123]	[0.067]	[0.067]
Observations	135	120	135	120	135	120
Country FE	YES	YES	YES	YES	YES	YES
Quintile x Period Dummies	YES	YES	YES	YES	YES	YES
F-statistics p Value	0.000	0.000	0.000	0.000	0.000	0.000
Adjusted R-squared	0.640	0.857	0.707	0.844	0.788	0.566
Kleibergen-Paap Test *p* Value	0.093	0.048	0.083	0.071	0.007	0.073
Hansen Test p Value	0.129	0.161	0.195	0.397	0.149	0.995
Joint significance of all ODA variables	0.001	0.110	0.069	0.256	0.036	0.108
Joint significance of ODA & ODA x q2	0.691	0.268	0.789	0.261	0.846	0.878
Joint significance of ODA & ODA x q3	0.084	0.334	0.292	0.833	0.962	0.535

Joint significance of ODA & ODA x q4	0.928	0.306	0.674	0.845	0.338	0.466
Joint significance of ODA & ODA x q5	0.015	0.077	0.028	0.116	0.015	0.834
Instrumentation equation partial R-squared						
ODA	0.140	0.166	0.161	0.211	0.209	0.160
ODA x q2	0.171	0.417	0.679	0.872	0.176	0.181
ODA x q3	0.171	0.417	0.813	0.883	0.176	0.358
ODA x q4	0.171	0.417	0.492	0.883	0.176	0.265
ODA x q5	0.171	0.417	0.492	0.888	0.176	0.368

Notes: Robust standard errors in brackets ***p<0.01, ** p<0.05, * p<0.1.
Regressions 5.1 – 5.2 instruments: the sum of aggregate aid of France and Germany weighted by the colonial tie and its interaction with the quintile dummy variables q2-q5, and the sum of real per capita GDP of France and Germany weighted by the colonial tie interacted with the quintile dummy variables q2-q5.
Regressions 5.3 instruments: the sum of aggregate aid of the U.K. and France weighted by the colonial tie and its interaction with the quintile dummy variables q2-q5. The sum of real per capita GDP of the U.K. and France weighted by the colonial tie, and its interactions with the quintile dummy variables q2-q5.
Regression 5.4 instruments: aggregate aid of the U.K. weighted by geographical distance and its interaction with the quintile dummy variables q2-q5; the sum of real per capita GDP of France and the U.K. weighted by the colonial tie, and its interactions with the quintile dummy variables q2-q5.
Regressions 5.5 instruments: the sum of aggregate aid of France and Germany weighted by the colonial tie and its interaction with the quintile dummy variables q2-q5, and the sum of real per capita GDP of France and Germany weighted by the colonial tie interacted with the quintile dummy variables q2-q5.
Regressions 5.6 instruments: aggregate aid of the U.S. weighted by geographical distance and its interaction with the quintile dummy variable q5; and the sum of real per capita GDP of France and the U.K. weighted by the colonial tie interacted with the quintile dummy variables q2-q5.

Results in Table 5 are consistent regardless of political institution measures. Focusing on the joint significance of coefficients on aid and its interactions, we find that the effect of aggregate aid we observe in Table 4 appears to be driven by the impact of aid in countries with good institutional quality. In the subsamples of countries with above-average institutional quality, our results in Table 5, for example, show that the effect of aggregate aid is statistically significant for the fifth asset quintile. In subsamples of countries with below-average institutional qualities, none of the coefficients on aid and aid interacted with individual quintiles are statistically different from zero, except for regression 5.2, where the joint coefficient test is significant for the fifth quintile. These results suggest that in countries with good institutional quality, aid is more effective. In countries with poor institutional quality, aid appears much less effective. To the extent that aid is more effective in lowering the adolescent fertility rate in countries with above-average political indicator values, our results are consistent with previous studies that argue aggregate aid promotes economic growth in recipient countries with good policies.

4. Conclusions

This paper focuses on aid effectiveness in lowering the adolescent fertility rate across asset quintiles in developing countries. We use data on adolescent fertility rates across five household asset quintiles in each country from 42 countries to assess the potential heterogeneous impact of aid on the teenage birth rate. Our results show that aggregate aid has an overall negative and significant effect on the adolescent fertility rate, consistent with findings in Zhuang et al. (2020).

Moreover, the impact of aid is different across asset quintiles. We find that aggregate ODA lowers the fertility rate for girls of the richest (the fifth) asset quintile, while it does not affect the fertility rate for girls of the poorest quintile. Using health ODA instead of aggregate ODA provides qualitatively similar results. We also divide countries into subsamples based on aid recipients' institutional quality measured by corruption, democratic accountability, and bureaucracy quality. Subsample results show that aid is ineffective in lowering adolescent fertility rates in countries with below-average institutional quality. In contrast, countries with above-average institutional quality tend to experience significantly beneficial effects from aid, although such beneficial impacts might be captured by wealthy instead of economically disadvantaged families. Our subsample results based on institutional quality are consistent with previous studies suggesting that policy regimes and institutional quality are essential for promoting economic growth in aid recipient countries.

The findings from our paper regarding the effects of ODA on adolescent fertility rates across asset quintiles highlight some exciting topics to explore in future studies. For example, one important future research topic is investigating why ODA effects are different across asset quintiles. Some papers, such as Layton (2008) and Bjørnskov (2010), find that aid benefits are skimmed by political elites rather than going to the poor. Such findings might be attributed to aid inflows biasing democratic decision-making and causing more rent-seeking behavior even in developing countries with better institutional quality (Bjørnskov, 2010; Knack, 2001, 2004; Heckelman and Knack, 2008). As a result, a more effective system of checks and balances in recipient countries is necessary. In addition, increasing efforts to monitor aid flows from donor countries and agencies are called for so that foreign aid can achieve its designated goals.

References

Azarnert, L. V. (2008) "Foreign Aid, Fertility and Human Capital Accumulation" *Economica* **75**, 766-781.

Barro, R., and Lee, J.W. (2013) "A New Data Set of Educational Attainment in the World, 1950-2010" *Journal of Development Economics* **104**, 184-198.

Bjornskov, C. (2010) "Do Elites Benefit from Democracy and Foreign Aid in Developing Countries?" *Journal of Development* **10**, 179-194.

Bongaarts, J. (2008) "Fertility Transitions in Developing Countries: Progress or Stagnation?" *Studies in Family Planning* **39**, 105-110.

Burnside, C., and Dollar, D. (2000) "Aid, Policies, and Growth" *American Economic Review* **90**, 847-867.

Burnside, C., and Dollar, D. (2004) "Aid, Policies and Growth: Revisiting the Evidence" World Bank Policy Research Paper O-2834.

Cameron, A., and Miller, D. (2015) "A Practitioner's Guide to Cluster-Robust Inference." *Journal of Human Resources* **50**, 317-372.

Chauvet, L., Gubert, F., and Mesple-Somps, S. (2013) "Aid, Remittances, Medical Brain Drain and Child Mortality: Evidence Using Inter and Intra-Country Data" *Journal of Development Studies* **49**, 801-818.

Collier, P., and Dollar, D. (2001) "Can the World Cut Poverty in Half? How Policy Reform and Effective Aid Can Meet the International Development Goals?" *World Development* **29**, 1787-1802.

Creatsas, G., and Elsheikh, A. (2009) "Adolescent Pregnancy and its Consequences" *Obstetrics and Gynecology* **7**, 167-172.

Dalgaard, C., and Hansen, H. (2001) "On Aid, Growth and Good Policies" *Journal of Development Studies* **37**, 17-35.

Dreher, A., and Langlotz, S. (2017) "Aid and Growth: New Evidence Using and Excludable Instrument" Discussion Paper Series, University of Heidelberg. https://doi.org/10.11588/heidok.00023147

Galiani, S., Knack, S., Xu, L., and Zou, B. (2017) "The Effect of Aid on Growth: evidence from a Quasi-experiment" *Journal of Economic Growth* **22**, 1-33.

Galor, O., and Weil, D. (2000) "Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and beyond" *American Economic Review* **90**, 806-828.

Gwatkin, D. R., Rutsein, S., Johnson, K., Eldwan, S., Wagstaff, A., and Amouzou, A. (2007) "Socio-Economic Differences in Health, Nutrition, and Population within Developing Countries, an Overview" Produced by the World Bank in collaboration with the Government of the Netherlands and Swedish International Development Cooperation Agency, Washington. D.C.

Hansen, H., and Tarp, F. (2001) "Aid and Growth Regressions" *Journal of Development Economics* **64**, 547-570.

Heckelman, J., and Knack, S. (2008) "Foreign Aid and Market-Liberalizing Reform" *Economica* **75**, 524–548

Hudson, J., and Mosley, P. (2001) "Aid, Policies and Growth: In Search of the Holy Grail" *Journal of International Development* **13**, 1023-1038.

Kingston, D., Heaman, M., Fell, D., and Chalmers, B. (2012) "Comparison of Adolescent, Young Adult, and Adult Women's Maternity Experiences and Practices" *Pediatrics* **129**, e1228-e1237.

Knack, S. (2001) "Aid Dependence and the Quality of Governance: Cross-country Empirical Tests" *Southern Economic Journal* **68**, 310-329.

Knack, S. (2004) "Does Foreign Aid Promote Democracy?" *International Studies Quarterly* **48**, 251–266.

Layton, T. (2008) "The Effects of Foreign Aid on Income Inequality" *Sigma: Journal of Political and International Studies* **26**, Article 4.

Mosley, P., Hudson, J., and Verschoor, A. (2004) "Aid, Poverty Reduction and the "New Conditionality" *Economic Journal* **114**, 217-244.

Neanidis, K. (2012) "Humanitarian Aid, Fertility, and Economic Growth" *Economica* **79**, 27-61.

Patton, G, Coffey, C., Sawyer, S. Viner, R., Haller, D., Bose, K., Vos, T., Ferguson, J., and Mathers, C. (2009) "Global Patterns of Mortality in Young People: a Systematic Analysis of Population Health Data" *Lancet* **374**, 881-892.

Rajan, R., and Subramanian, A. (2008) "Aid and Growth: What does the Cross-Country Evidence Really Show?" *Review of Economics and Statistics* **90**, 643-665.

Santelli, J., Song, X., Garbers, S., Sharma, V., and Viner, R. (2017) "Global Trends in Adolescent Fertility, 1990-2012, in Relation to National Wealth, Income Inequalities, and Educational Expenditures" *Journal of Adolescent Health* **60**, 161-168.

Shea, J. (1997) "Instrument Relevance in Multivariate Linear Models: A Simple Measure" *Review of Economics and Statistics* **79**, 348–352.

Simson, R. (2012) “Following the Money: Examining the Evidence on ‘Pro-poor’ Budgeting” London: Overseas Development Institute. https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/7709.pdf

Staiger, D., and Stock, J. H. (1997) “Instrumental Variables Regression with Weak Instruments” *Econometrica* **65**, 557 – 586.

Tavares, J. (2003) “Does foreign aid corrupt?” *Economics Letters* **79**, 99-106.

Viner, R., Ozer, E., Denny, S., Marmot, M. Resnick, M. Fatusi, A., and Currie, C. (2012) “Adolescence and the Social Determinants of Health” *Lancet* **379**, 1641-1652.

Wall-Wieler, E., Lee, J., Nickel, N., and Roos, L. (2019) “The Multigenerational Effects of Adolescent Motherhood on School Readiness: A Population-based Retrospective Cohort Study” *PLOS ONE* **14**, e0211284. https://doi.org/10.1371/journal.pone.0211284

Wang, M., and Zhuang, H. (2019) “How does Foreign Aid Affect Total Fertility Rate? Panel Data Evidence” *International Economic Journal* **33**, 605-619.

WHO (2016) “Global Health Estimates 2015: Deaths by Cause, Age, Sex, by Country and by Region, 2000–2015” Geneva: WHO.

Zhuang, H., Wang, M., and Daniels, J. (2020) “Foreign Aid and Adolescent Fertility Rate: Cross-Country Evidence” *Journal of Globalization and Development* **11**, 20180051. https://doi.org/10.1515/jgd-2018-0051

Appendix

Table A1. First Stage Results of Aggregate ODA

VARIABLES	(1) ODA	(2) ODA x q2	(3) ODA x q3	(4) ODA x q4	(5) ODA x q5	(6) Health ODA	(7) Health ODA x q2	(8) Health ODA x q3	(9) Health ODA x q4	(10) Health ODA x q5
Total aid budget of UK x Religion	-22.35***	-5.655*	-6.099*	-5.655*	-29.74***					
	(5.507)	(3.278)	(3.262)	(3.278)	(9.315)					
q2 x Total aid budget of UK x Religion	0.0267	0.486*	0.0216	0.00281	1.419***					
	(0.224)	(0.279)	(0.0787)	(0.0772)	(0.302)					
q3 x Total aid budget of UK x Religion	0.221	-0.139	10.25*	-0.139	27.00***					
	(4.244)	(1.504)	(5.379)	(1.504)	(5.973)					
q4 x Total aid budget of UK x Religion	0.0267	0.00281	0.0216	0.486*	1.419***					
	(0.224)	(0.0772)	(0.0787)	(0.279)	(0.302)					
q5 x Total aid budget of UK x Religion	-0.000559	0.00104	0.00217	0.00104	0.485***					
	(0.0191)	(0.00746)	(0.00768)	(0.00746)	(0.0373)					
Real GDP p.c. of France and UK x Colonial Tie	-0.00456	-0.00337	-0.00346	-0.00337	0.0125					
	(0.0145)	(0.00677)	(0.00673)	(0.00677)	(0.0144)					
q2 x Real GDP p.c. of France and UK x Colonial Tie	0.000310	0.0152*	0.00007	-0.00008	-0.0156					
	(0.00626)	(0.00837)	(0.00227)	(0.00228)	(0.00978)					
q3 x Real GDP p.c. of France and UK x Colonial Tie	0.000120	-0.000189	0.0151*	-0.00019	-0.0173*					
	(0.00627)	(0.00226)	(0.00839)	(0.00226)	(0.00970)					
q4 x Real GDP p.c. of France and UK x Colonial Tie	0.000310	-0.00008	0.00007	0.0152*	-0.0156					
	(0.00626)	(0.00228)	(0.00227)	(0.00837)	(0.00978)					
Total aid budget of Japan x Religion						-20.54***	-6.589	-7.456	-6.589	-5.596
						(4.008)	(4.704)	(4.840)	(4.704)	(6.278)

q2 x Total aid budget of Japan x Religion						0.0577	0.982**	0.0413	0.00116	-0.120
						(0.176)	(0.456)	(0.138)	(0.137)	(0.249)
q3 x Total aid budget of Japan x Religion						0.571	-0.372	20.82**	-0.372	-2.797
						(3.449)	(2.731)	(9.115)	(2.731)	(4.920)
q4 x Total aid budget of Japan x Religion						0.0577	0.00116	0.0413	0.982**	-0.120
						(0.176)	(0.137)	(0.138)	(0.456)	(0.249)
q5 x Total aid budget of Japan x Religion						0.00330	0.00161	0.00408	0.00161	0.105***
						(0.00959)	(0.0112)	(0.0113)	(0.0112)	(0.0350)
Real GDP p.c. of France and Germany x Colonial Tie						-0.0223*	-0.0102	-0.0104	-0.0102	0.00607
						(0.0118)	(0.00742)	(0.00747)	(0.00742)	(0.00853)
q2 x Real GDP p.c. of France and Germany x Colonial Tie						0.000376	0.0335**	0.000159	-0.000178	-0.0183**
						(0.00595)	(0.0149)	(0.00422)	(0.00426)	(0.00846)
q3 x Real GDP p.c. of France and Germany x Colonial Tie						0.000007	-0.000405	0.0334**	-0.000405	-0.0185**
						(0.00591)	(0.00425)	(0.0148)	(0.00425)	(0.00836)
q4 x Real GDP p.c. of France and Germany x Colonial Tie						0.000376	-0.000178	0.000159	0.0335**	-0.0183**
						(0.00595)	(0.00426)	(0.00422)	(0.0149)	(0.00846)
Ln(GDP per capita)	-0.940***	-0.200*	-0.198*	-0.200*	-0.300	-0.732***	-0.162	-0.154	-0.162	-0.139
	(0.209)	(0.105)	(0.105)	(0.105)	(0.249)	(0.213)	(0.154)	(0.154)	(0.154)	(0.168)
Rural Population	-0.0626***	-0.0120*	-0.0121*	-0.0120*	-0.0114	-0.0696***	-0.0130	-0.0130	-0.0130	-0.0148
	(0.0125)	(0.00723)	(0.00727)	(0.00723)	(0.0175)	(0.0126)	(0.00850)	(0.00863)	(0.00850)	(0.00998)
Infant Mortality	0.0195***	0.00307	0.00309	0.00307	0.000944	0.0249***	0.00366	0.00370	0.00366	0.00613
	(0.00690)	(0.00407)	(0.00410)	(0.00407)	(0.0102)	(0.00482)	(0.00481)	(0.00484)	(0.00481)	(0.00607)
Female Schooling	0.0276	0.00559	0.00513	0.00559	0.0167	-0.147***	-0.0290	-0.0297	-0.0290	-0.0284
	(0.0537)	(0.0316)	(0.0319)	(0.0316)	(0.0725)	(0.0453)	(0.0355)	(0.0363)	(0.0355)	(0.0367)
Health Expenditures	0.00748	-0.000812	-0.000392	-0.000812	-0.0245	0.276***	0.0520	0.0531	0.0520	0.0564
	(0.0524)	(0.0392)	(0.0393)	(0.0392)	(0.0748)	(0.0475)	(0.0577)	(0.0577)	(0.0577)	(0.0646)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quintile x Period Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Observations	310	310	310	310	310	300	300	300	300	300
F-stat	179.82	128.1	136.5	128.1	15.41	266.2	18.37	18.578	18.37	12.055

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A2. First Stage Results of Aggregate ODA Based On Institutional Quality

Panel A. Corruption Index

			Above Average					Below Average		
VARIABLES	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total aid budget of France and Germany x Colonial Tie	-7.054***	-1.420	-1.420	-1.420	-1.398	-2.788***	-0.413	-0.413	-0.413	-1.242
	(0.429)	(1.497)	(1.497)	(1.497)	(3.747)	(0.940)	(0.748)	(0.748)	(0.748)	(3.481)
q2 x Total aid budget of France and Germany x Colonial Tie	-1.227	-19.03***	0.0844	0.0844	1.362	-0.603	-1.061	-0.136	-0.136	0.0259
	(0.992)	(3.509)	(1.072)	(1.072)	(4.596)	(0.592)	(0.673)	(0.194)	(0.194)	(0.581)
q3 x Total aid budget of France and Germany x Colonial Tie	-1.227	0.0844	-19.03***	0.0844	1.362	-0.603	-0.136	-1.061	-0.136	0.0259
	(0.992)	(1.072)	(3.509)	(1.072)	(4.596)	(0.592)	(0.194)	(0.673)	(0.194)	(0.581)
q4 x Total aid budget of France and Germany x Colonial Tie	-1.227	0.0844	0.0844	-19.03***	1.362	-0.603	-0.136	-0.136	-1.061	0.0259
	(0.992)	(1.072)	(1.072)	(3.509)	(4.596)	(0.592)	(0.194)	(0.194)	(0.673)	(0.581)
q5 x Total aid budget of France and Germany x Colonial Tie	0.000	-0.000	-0.000	-0.000	-14.91***	-0.776	-0.181	-0.181	-0.181	-0.777
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	(0.636)	(0.188)	(0.188)	(0.188)	(0.735)
q2 x Real GDP p.c. of France and Germany x Colonial Tie	0.388	6.024***	-0.0266	-0.0266	-0.365	0.186	0.359*	0.0418	0.0418	0.0398
	(0.313)	(1.112)	(0.339)	(0.339)	(1.451)	(0.182)	(0.203)	(0.0591)	(0.0591)	(0.180)
q3 x Real GDP p.c. of France and Germany x Colonial Tie	0.388	-0.0266	6.024***	-0.0266	-0.365	0.186	0.0418	0.359*	0.0418	0.0398
	(0.313)	(0.339)	(1.112)	(0.339)	(1.451)	(0.182)	(0.0591)	(0.203)	(0.0591)	(0.180)
q4 x Real GDP p.c. of France and Germany x Colonial Tie	0.388	-0.0266	-0.0266	6.024***	-0.365	0.186	0.0418	0.0418	0.359*	0.0398
	(0.313)	(0.339)	(0.339)	(1.112)	(1.451)	(0.182)	(0.0591)	(0.0591)	(0.203)	(0.180)

q5 x Real GDP p.c. of France and Germany x Colonial Tie	-0.000	0.000	0.000	0.000	4.853***	0.240	0.0560	0.0560	0.0560	0.367
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	(0.195)	(0.0579)	(0.0579)	(0.0579)	(0.225)
Ln(GDP per capita)	2.393***	0.420	0.420	0.420	0.567	-1.108***	-0.356	-0.356	-0.356	-0.467
	(0.339)	(1.064)	(1.064)	(1.064)	(2.686)	(0.413)	(0.371)	(0.371)	(0.371)	(1.374)
Rural Population	-0.0457***	-0.0161	-0.0161	-0.0161	0.00130	-0.191***	-0.0345	-0.0345	-0.0345	-0.0269
	(0.00873)	(0.0234)	(0.0234)	(0.0234)	(0.0897)	(0.0169)	(0.0239)	(0.0239)	(0.0239)	(0.0898)
Infant Mortality	0.00450	0.00374	0.00374	0.00374	-0.00335	0.00807	-0.00113	-0.00113	-0.00113	0.000727
	(0.00825)	(0.0175)	(0.0175)	(0.0175)	(0.0586)	(0.00696)	(0.00542)	(0.00542)	(0.00542)	(0.0312)
Female Schooling	-0.545***	-0.144	-0.144	-0.144	-0.0569	-0.514***	-0.0984	-0.0984	-0.0984	-0.0940
	(0.0618)	(0.205)	(0.205)	(0.205)	(0.709)	(0.0652)	(0.0997)	(0.0997)	(0.0997)	(0.340)
Health Expenditures	0.124***	0.0236	0.0236	0.0236	0.0267	-0.113*	-0.0399	-0.0399	-0.0399	-0.0159
	(0.0361)	(0.135)	(0.135)	(0.135)	(0.394)	(0.0654)	(0.0595)	(0.0595)	(0.0595)	(0.263)
Institution Measure	0.0166	-0.00620	-0.00620	-0.00620	0.0176	0.185**	0.00602	0.00602	0.00602	0.0609
	(0.0689)	(0.159)	(0.159)	(0.159)	(0.509)	(0.0891)	(0.0740)	(0.0740)	(0.0740)	(0.342)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quintile x Period Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	135	135	135	135	135	120	120	120	120	120
F-stat	168.21	42.17	42.17	43.79	12.56	158.5	126.7	126.7	126.7	299.4

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Panel B. Democratic Accountability

			Above Average					Below Average		
VARIABLES	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total aid budget of France and the UK x Colonial Tie	-0.479***	-0.106	-0.118	-0.114	-0.103					
	(0.0492)	(0.242)	(0.239)	(0.244)	(0.642)					
q2 x Total aid budget of France and the UK x Colonial Tie	-0.169	-2.051*	-0.0166	-0.0169	-0.0286					
	(0.118)	(1.051)	(0.388)	(0.386)	(0.568)					
q3 x Total aid budget of France and the UK x Colonial Tie	-0.170	0.0672	-2.296**	0.0373	0.0251					
	(0.117)	(0.393)	(1.030)	(0.383)	(0.564)					
q4 x Total aid budget of France and the UK x Colonial Tie	-0.170	0.0517	0.0373	-2.278**	0.0235					
	(0.116)	(0.386)	(0.381)	(1.002)	(0.560)					
q5 x Total aid budget of France and the UK x Colonial Tie	-0.157*	0.0501	0.0367	0.0350	-2.267**					
	(0.0940)	(0.382)	(0.378)	(0.375)	(1.083)					
Real GDP p.c. of France and the UK x Colonial Tie	-0.177***	-0.0333	-0.0350	-0.0346	-0.101	-0.697	-0.0441	-0.279	-0.279	-0.122
	(0.00862)	(0.0517)	(0.0528)	(0.0530)	(0.112)	(0.487)	(0.982)	(0.684)	(0.684)	(0.959)
q2 x Real GDP p.c. of France and the UK x Colonial Tie	0.0524	0.648**	0.00103	0.00125	0.0671	-0.000157	0.0185	0.000996	0.000996	0.0138**
	(0.0367)	(0.319)	(0.118)	(0.117)	(0.175)	(0.00136)	(0.0122)	(0.00390)	(0.00390)	(0.00681)
q3 x Real GDP p.c. of France and the UK x Colonial Tie	0.0527	-0.0219	0.710**	-0.0117	0.0543	-0.000384	0.00483	0.0117	-0.00068	0.00731
	(0.0363)	(0.121)	(0.316)	(0.118)	(0.175)	(0.00160)	(0.00473)	(0.0116)	(0.00414)	(0.00882)

q4 x Real GDP p.c. of France and the UK x Colonial Tie	0.0527	-0.0160	-0.0116	0.703**	0.0549	-0.00038	0.00483	-0.00068	0.0117	0.00731
	(0.0363)	(0.118)	(0.116)	(0.304)	(0.173)	(0.00160)	(0.00473)	(0.00414)	(0.0116)	(0.00882)
q5 x Real GDP p.c. of France and the UK x Colonial Tie	0.0486	-0.0155	-0.0114	-0.0109	0.824**	0.000	0.002	-0.000	-0.000	0.051***
	(0.0294)	(0.117)	(0.115)	(0.114)	(0.329)	[0.002]	[0.004]	[0.004]	[0.004]	[0.014]
Total aid budget of the U.K. x Geographical Dist.						-0.000***	-0.000	-0.000	-0.000	0.000
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
q2 x Total aid budget of the U.K. x Geographical Dist.						-0.000	0.000	-0.000	-0.000	-0.000*
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
q3 x Total aid budget of the U.K. x Geographical Dist.						-0.000	0.000*	-0.000*	-0.000	-0.000
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
q4 x Total aid budget of the U.K. x Geographical Dist.						-0.000	0.000*	-0.000	-0.000*	-0.000
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
q5 x Total aid budget of the U.K. x Geographical Dist.						-0.000	-0.000	0.000	0.000	0.000***
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Ln(GDP per capita)	2.219***	0.384	0.404	0.385	0.311	0.132	0.0294	0.0678	0.0678	-0.423
	(0.147)	(0.920)	(0.862)	(0.884)	(1.805)	(0.285)	(0.837)	(0.602)	(0.602)	(1.184)
Rural Population	-0.066***	-0.0127	-0.0162	-0.0166	-0.0211	0.0458***	0.00614	0.0132	0.0132	0.00546
	(0.00419)	(0.0222)	(0.0207)	(0.0212)	(0.0460)	(0.0170)	(0.0357)	(0.0308)	(0.0308)	(0.0539)
Infant Mortality	0.0235***	0.000501	0.00193	0.00196	0.00297	-0.00640	-0.00132	-0.00027	-0.00027	-0.0101
	(0.00332)	(0.0165)	(0.0160)	(0.0161)	(0.0434)	(0.00462)	(0.0169)	(0.0181)	(0.0181)	(0.0316)
Female Schooling	-0.539***	-0.119	-0.137	-0.138	-0.163	0.327*	0.0372	0.105	0.105	0.0513
	(0.0512)	(0.255)	(0.245)	(0.249)	(0.581)	(0.172)	(0.363)	(0.387)	(0.387)	(0.535)
Health Expenditures	0.0607***	-0.0172	-0.0128	-0.0134	-0.0141	-0.248***	-0.0558	-0.0426	-0.0426	-0.0553
	(0.0217)	(0.107)	(0.115)	(0.117)	(0.295)	(0.0178)	(0.0632)	(0.0739)	(0.0739)	(0.0889)
Institution Measure	-0.0536***	-0.0250	-0.0195	-0.0196	-0.0191	-0.0278	-0.00457	-0.00066	-0.00066	-0.0705
	(0.0123)	(0.0924)	(0.120)	(0.120)	(0.290)	(0.0422)	(0.105)	(0.105)	(0.105)	(0.187)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Quintile x Period Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	135	135	135	135	135	120	120	120	120	120
F-stat	156.55	22.11	44.60	44.18	39.40	115.25	139.6	163.5	163.5	105.5

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Panel C. Bureaucracy Quality

	Above Average					Below Average				
VARIABLES	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5	ODA	ODA x q2	ODA x q3	ODA x q4	ODA x q5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total aid budget of France and Germany x Colonial Tie	-6.915***	-1.208	-1.208	-1.208	-0.689					
	(1.019)	(0.944)	(0.944)	(0.944)	(1.616)					
q2 x Total aid budget of France and Germany x Colonial Tie	-4.502	-1.878*	-0.814	-0.814	0.0797					
	(3.045)	(1.129)	(0.726)	(0.726)	(1.217)					
q3 x Total aid budget of France and Germany x Colonial Tie	-4.502	-0.814	-1.878*	-0.814	0.0797					
	(3.045)	(0.726)	(1.129)	(0.726)	(1.217)					
q4 x Total aid budget of France and Germany x Colonial Tie	-4.502	-0.814	-0.814	-1.878*	0.0797					
	(3.045)	(0.726)	(0.726)	(1.129)	(1.217)					
q5 x Total aid budget of France and Germany x Colonial Tie	-4.151	-0.726	-0.726	-0.726	-1.042					
	(3.122)	(0.736)	(0.736)	(0.736)	(1.523)					
q2 x Real GDP p.c. of France and Germany x Colonial Tie	1.416	0.615*	0.256	0.256	0.0227					
	(0.959)	(0.351)	(0.228)	(0.228)	(0.384)					
q3 x Real GDP p.c. of France and Germany x Colonial Tie	1.416	0.256	0.615*	0.256	0.0227					
	(0.959)	(0.228)	(0.351)	(0.228)	(0.384)					
q4 x Real GDP p.c. of France and Germany x Colonial Tie	1.416	0.256	0.256	0.615*	0.0227					
	(0.959)	(0.228)	(0.228)	(0.351)	(0.384)					
q5 x Real GDP p.c. of France and Germany x Colonial Tie	1.307	0.228	0.228	0.228	0.450					
	(0.983)	(0.231)	(0.231)	(0.231)	(0.475)					

Total aid budget of the U.S. x Geographical Dist.						-0.000***	-0.000	-0.000	-0.000	-0.000
						[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
q5 x Total aid budget of the U.S. x Geographical Dist.						0.000	-0.026	-0.026*	-0.026*	0.094**
						[0.006]	[0.016]	[0.015]	[0.015]	[0.041]
q2 x Real GDP p.c. of France and the U.K. x Colonial Tie						0.000	0.000	-0.000	-0.000	0.027**
						[0.001]	[0.007]	[0.003]	[0.003]	[0.012]
q3 x Real GDP p.c. of France and the U.K. x Colonial Tie						0.000	0.007	-0.015	-0.000	0.043***
						[0.001]	[0.006]	[0.011]	[0.004]	[0.013]
q4 x Real GDP p.c. of France and the U.K. x Colonial Tie						0.000	0.007	-0.000	-0.015	0.043***
						[0.001]	[0.006]	[0.004]	[0.011]	[0.013]
q5 x Real GDP p.c. of France and the U.K. x Colonial Tie						-0.000	0.009	0.004	0.004	0.093***
						[0.002]	[0.006]	[0.003]	[0.003]	[0.012]
Ln(GDP per capita)	1.097*	0.120	0.120	0.120	-0.141	-7.290***	-1.518	-1.528	-1.528	-1.276
	(0.594)	(0.448)	(0.448)	(0.448)	(0.850)	(0.968)	(4.040)	(3.709)	(3.709)	(7.029)
Rural Population	-0.179***	-0.0347	-0.0347	-0.0347	-0.0287	-0.238***	-0.0488	-0.0486	-0.0486	-0.0430
	(0.0136)	(0.0209)	(0.0209)	(0.0209)	(0.0505)	(0.0209)	(0.0989)	(0.0973)	(0.0973)	(0.196)
Infant Mortality	0.0282	0.000429	0.000429	0.000429	-0.0234	-0.0999***	-0.0207	-0.0206	-0.0206	-0.0176
	(0.0324)	(0.0113)	(0.0113)	(0.0113)	(0.0248)	(0.0173)	(0.0763)	(0.0704)	(0.0704)	(0.148)
Female Schooling	-0.937***	-0.214	-0.214	-0.214	-0.412	-0.261***	-0.0515	-0.0545	-0.0545	-0.0770
	(0.255)	(0.163)	(0.163)	(0.163)	(0.322)	(0.0311)	(0.182)	(0.183)	(0.183)	(0.547)
Health Expenditures	-0.423***	-0.0862	-0.0862	-0.0862	-0.0618	-0.164***	-0.0340	-0.0351	-0.0351	-0.0313
	(0.0472)	(0.0616)	(0.0616)	(0.0616)	(0.173)	(0.0316)	(0.136)	(0.125)	(0.125)	(0.422)
Institution Measure	-0.432***	-0.0776	-0.0776	-0.0776	0.0219	-0.623***	-0.129	-0.129	-0.129	-0.109
	(0.109)	(0.0632)	(0.0632)	(0.0632)	(0.186)	(0.0746)	(0.328)	(0.297)	(0.297)	(0.543)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quintile x Period Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	135	135	135	135	135	120	120	120	120	120
F-stat	46.71	73.29	73.29	73.29	47.73	55.80	173.9	111.8	111.8	18.24

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1