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IS DEVELOPMENT AID A COMPLEMENT OR A SUBSTITUTE TO FOREIGN DIRECT INVESTMENT?

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Is Development Aid a Complement or a Substitute to Foreign Direct Investment?

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Abstract

Can foreign aid contribute to attracting private investment to developing countries? This paper applies an instrumental variable strategy developed by Galiani et al. (2014) to data from 35 countries that traversed the middle income country threshold between 1987-2013, attempting to capture the causal effect of aid on foreign direct investment. Based on evidence that achieving middle income country status (1) disqualifies a country from certain World Bank funds and (2) reduces the amount of aid given by other donors, crossing the income threshold is used as an instrument for aid inflows. The findings confirm the hypothesis that aid functions as a complement to FDI. Specifically, one per cent more aid will on average lead to 0.5 per cent more FDI three years later for the studied countries. This effect is found to run through the ability of aid to mitigate market failures that cause a shortage of investment in developing markets. Aid encourages FDI in countries less involved in international trade, and in times of political and economic risk. Taken together, the results suggest that aid can successfully catalyse new private investment, which in turn may contribute to sustained growth.

Keywords: Development aid, Foreign direct investment, Catalytic aid, Instrumental variable, Institutional factors.

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1 Introduction

Why are some countries poorer than others? Economic theory tells us that at the core of growth, is the ability of a nation to put productive physical and human capital to work. The topic of this paper, whether development aid can encourage foreign direct investment, hinges on the assumption that both capital accumulation and productivity matter in a developing country context. In addition to simply being an additional source of capital, foreign direct investment will theoretically (though not without controversy: Alfaro et al., 2010) induce competition, technology transfer, jobs and household consumption. However, in order for capital and labour to be productive and generate wealth, a number of other inputs are required. Workers need sufficient education and health. Firms depend on for example roads, ports, access to finance and electricity in order to thrive. In turn, investments in such things are contingent on a low-risk and peaceful environment. This is the traditional role of development aid: by infusing more resources into the recipient country, it loosens the constraints otherwise impeding public investments that could increase total productivity. Whether or not aid has successfully lead to such outcomes is however still up for academic debate (see for example Boone, 1996 and Clemens et al., 2012).

In theory, synergies between public and private development finance would occur, if aid is used in such a way that the recipient country attracts more private capital. By achieving the right conditions for investments to be productive, aid would pave the way for higher levels of capital accumulation, which in turn can raise the country out of poverty. This is sometimes denoted as *catalytic* aid, a concept that has become central to the donor community. Projected yearly capital needs in order to raise the world population out of poverty by 2030, as formulated in the United Nation Sustainable Development Goals, are set at about 4,000 billion USD (UNCTAD, 2014). Annual flows of development aid are estimated at about 155 billion dollars (OECD, 2016). If public aid flows alone are insufficient in order to reach these goals, can they be useful in mobilizing international private capital? This paper will specifically focus on foreign direct investment (FDI) as an alternative source of development finance. Thus, the question at hand becomes, is there a catalytic effect of aid on foreign direct investment?

Previous attempts at answering whether aid induces more FDI are rather limited, and have struggled to find a credible method for identifying the causal effect of aid. Some find that the relationship between aid and FDI is positive, and thus conclude that foreign aid works complementary to private foreign capital (Selaya & Sunesen, 2012), while others arrive at a negative net effect, suggesting that aid is a substitute for private investment (Harms & Lutz, 2006). This paper represents a first attempt at using a plausibly excludable instrumental variable to discern if there is a causal effect of aid on FDI. The

starting point is a working paper by Galiani et al. (2014)[1], in which they introduce a new instrumental variable to determine the causal effect of aid on growth. Their idea is to use as an instrument the variation in aid inflows that occurs when a country reaches an income level, which exceeds the eligibility threshold for certain World Bank funds. The World Bank International Development Association (IDA) are charged with supplying development finance on concessional or near-concessional terms. Facing financial constraints, the IDA has since 1987 set a restriction on their lending, targeting only those countries considered to be among the very poorest in the world. Once a country has reached a gross national income per capita of over 1,215 USD (2015) and have been able to maintain that level until the following round of re-financing negotiations, they are no longer eligible for IDA financing. They thus receive considerably less aid for reasons exogenous to the country. Given that crossing the threshold does not have any direct consequences on inward FDI, the effect of marginally more aid on FDI can be interpreted as causal.

The findings of this study confirm the hypothesis that aid functions as a complement to foreign investment. For a sample of 35 countries over the years 1987-2010, a positive causal effect of aid on FDI can be established. On average, a one percentage point increase in aid leads to about half a percentage point higher FDI inflows, or nine dollars more in real per capita terms. The robustness of these results are assessed in a number of test, none of which overturn the inference. Aid is found to be a mitigating factor in times of high macroeconomic and political instability, enabling investments despite a less favourable economic climate. Further, countries less active in global trade are found to benefit more from the complementarity of aid. Thus, the role of aid seem to be primarily as a counterweight in cases of classical market failures, where a country is by itself unable to attract enough investments to make up for its capital needs. Finally, countries that have crossed the threshold seem to have been receiving more investment relative to country size early on in the development process, than countries that are still below it, underlining the importance of early access to private capital markets.

The paper will proceed as follows: in Section 2, the theoretical underpinnings regarding aid and foreign investment are presented, followed by a review of previous literature. Section 3 describes the data sample and the empirical method applied, and features a discussion about threats to identification. The results of the study are accounted for in Section 4, and are followed up by a series of robustness checks in Section 5. Finally, Section 6 summarises and concludes the study.

[1]A new version of the working paper was released by NBER in April 2016. The 2016 version will sometimes be referred to, though this paper is based primarily on the 2014 version.

2 Theory

2.1 Foreign direct investment

Few things are as undisputed in neoclassical economics, as the theory that investments generate growth. In the Solow growth model, increased capital formation for a given level of domestic savings leads to a higher level of income per capita (see for example Acemoglu, 2009). Along this line of reasoning, foreign direct investment[2] is a key to development: developing countries constrained by low income and therefore low savings rates are in theory able to break out of poverty if they are able to attract enough foreign capital. The subsequent question then becomes, what can a country do to attract foreign investment?

Bloningen (2005) finds that investment decisions by multinational firms are mainly driven by the exchange rate, taxes, host country institutions, barriers to trade (generating "tariff-jumping" FDI), and other trade effects. Further, multinational corporations may be looking to establish export platforms with their investment, i.e. to place a production plant in one country to serve as export platform to other neighbouring countries. When focusing specifically on a developing country context, empirical studies often arrive at openness to trade, infrastructure, institutional quality and political instability as determining factors (Asiedu, 2002).

For the host country of a multinational firm, there are several theoretical benefits. The investments generate domestic jobs and income, which generate savings and subsequently growth. FDI is also thought to be a mechanism for knowledge transfer, as the company brings with it skills, technology and good business practise (for a summary, see OECD, 2002). The protocol from the United Nation Monterrey conference on development finance in 2002 states that "foreign direct investment... is specially important for its potential to transfer knowledge and technology, create jobs, boost overall productivity, enhance competitiveness and entrepreneurship, and ultimately eradicate poverty through economic growth and development." (United Nations, 2003). Having foreign companies enter the domestic market may also put pressure on domestic firms to increase efficiency and become more productive (Kosack & Turbin, 2006). Additionally, more FDI should open up for more trade between the host and home countries of the firm (OEDC, 2002). But how well do these theoretical benefits transfer to a developing country context?

One potential problem is that the domestic market may not be resilient to the level of competition posed by large multinational corporations. Instead of spurring the home

[2]The standard definition of FDI is that it consists of direct investment equity flows, such as equity capital, reinvestment of earnings and other capital, with an active ownership, i.e. at least ten per cent ownership by the home country parent company (World Development Indicators, 2016).

firms to increase productivity, fierce competition may quench them. Another worry is that the beneficial effects of FDI may not be realised, if the investing companies fail to incorporate the local labour force and markets in their production process. In their 2014 World Investment Report, The United Nations Conference on Trade and Development (UNCTAD) point out increased human and technological capacity as key to counteract such "weak absorptive capacity" of FDI (UNCTAD, 2014). In order for FDI to contribute to development, it needs to create value not just for the owners or for a small ruling elite, but must lead to general improvements in the living standard of the population. Obstacles to such general benefits would include corrupt governments, weak political and civil rights, conflicts and weak regulation of foreign companies. The ability to generate capital also varies with geographical characteristics and income level, from certain small island developing states, attracting a lot of investments, to landlocked developing countries without any natural resources, who are unable to draw in investment (UNCTAD, 2014). In the presence of such market failures, could aid function as a mitigating factor?

2.2 Impact of aid on FDI

In theory, the net effect of aid on FDI is ambiguous. On the one hand, it is possible to imagine several ways in which aid could contribute to private investments. Modern-time development aid often comes with reform requirements, urging countries to implement "good governance" (Stubbs et al., 2016). Such policy changes are meant to impose improved labour and tax regulation, rule of law, institutional quality etc, enabling (1) host countries to internalise the positive effects of FDI, and (2) increased attracting power for multinational firms to invest. Under the assumption that aid leads to a better policy and institutional environment, it increases the marginal productivity of capital, thus attracting foreign investments. Aid would then be a complement to foreign investment.

Opponents of the aid industry would argue that aid reduces incentives to be productive and efficient for domestic firms, that large windfall gains to the public sector lead to corruption and to a crowding out effect, as aid money invested replaces private capital that might have otherwise been put to productive use. An early proponent of this view was Milton Friedman, who reasoned that aid will only serve to replace domestic savings (Pronk, 2004), whereby aid and FDI would be substitutes in the international capital market. If aid is used for investments, it will serve to decrease the marginal product of capital, and therefore crowds out private investment. This sums up the two main hypotheses of how aid could influence FDI:

1. The complementarity hypothesis: aid has a complementary effect on FDI, indicating a positive relationship between the two capital flows. This is sometimes called a "crowding in"-effect.

2. The substitute hypothesis: aid functions as a substitute for private foreign capital, as public investments crowds out private ones. Thus, aid and FDI would exhibit a negative relation in data.

Recent discussions among donor institutions on how to raise development finance have emphasised the importance of using aid for leverage purposes, in order to optimize its impact (United Nations, 2003). Practical ways for aid agencies to encourage investment are through guarantees for private sector borrowing and through public-private partnerships. Development Finance Institutions that function as a bridge between public capital and the private sector are key players in balancing investment risk and development needs. The country knowledge amassed in aid agencies can also be used to reduce perceived risks by investors. Such usage of aid money includes improved information about the recipient state and introduction of a business climate (rules, practises and systems) that is familiar to the source country firms (Kimura and Todo, 2009). Aid projects proven to make a difference may be scaled up by soliciting private capital, allowing good projects to have a larger impact (UNCTAD, 2014).

2.3 Previous literature

Determining the effects of aid has been a headache for the economic literature for decades, and has mainly focused on the effect of aid on growth. One the one hand, critics including Boone (1996), Roodman (2007) and Easterly, Levine & Roodman (2004) have all argued against the merits of foreign aid, on grounds of it being superfluous if not outright damaging to developing economies. Others, such as Sachs (2006), argue that aid provides the means necessary to attain sustainable growth. The key issue spurring this debate is the difficulty in isolating causal effects of aid. As aid flows are determined by factors endogenous to the country, such as historical relationships between donor and recipient countries, conflicts and poverty, a straightforward estimation of the effect of aid on for example growth is likely biased. Specifically, the worries are reverse causation between aid and the variable of interest and simultaneous causation by other variable, as described by Clemens et al. (2012) in their critical review of the aid-growth literature thus far.

A number of papers have attempted to solve this problem through quasi-experimental methods, such as use of instrumental variables (IV). The idea is to isolate the effect of aid through an "instrument", another variable that predicts aid, but not the outcome of interest per se. In this way, it would remove from analysis the variation caused by all other factors that influence aid, which are simultaneously correlated with the variable of interest. IV methods have been criticised precisely because of their lack of an aggregated outcome perspective (see for example Deaton, 2009), since what is measured is

the "local average treatment effect", or the average treatment effect for those on whom the instrument is applicable. Instrumental variables for aid have historically consisted mostly of recipient-country characteristics such as population size or former colonial ties. As also discussed by Clemens et al. (2012), these variables are found to have limited explanatory power over aid, when not combined with population size. Instrumenting with population size only is not advisable, since economic theory suggests growth is directly dependent on it. A second popular instrumental variable is lagged observations of aid, which in theory are uncorrelated with the current-period error term. However, if we expect aid lagged one period to be a good predictor of growth, it is not clear why further lags of aid would not be correlated with contemporaneous growth (Clemens et al., 2012). A new strand of literature has attempted to reform the instruments, most notably Werker (2009), Nunn and Qian (2014) and Galiani et al. (2014). The common factor among these is the use of instruments arguably exogenous to the recipient country. Respectively, these are: oil price fluctuations, weather conditions in the US and a World Bank national income threshold for concessional funds. While these methods are still new and relatively untried, they represent a potential way around the main criticism of instrumental variables for aid. As this paper will later show, the IV first used by Galiani et al. (2014) is found to clearly influence the level of total aid a country receives, for reasons that will be argued are outside of the country's own hands. Since crossing this income threshold determines total disbursements of aid, and has been found to predict economic growth outcomes, it should also be a suitable IV for the topic of this paper.

Moving away from the aid and growth debate, the literature investigating the relationship between aid and foreign direct investment is less abundant, but equally divided. Most have focused on aggregated macro-level outcomes. Among them, Herzer & Grimm (2012) applies a panel cointegration approach, reaching a conclusion that supports the crowding out-hypothesis. Using instead a generalized method of moments (GMM) method, Karakaplan et al. (2005), find evidence of a positive relationship between foreign aid and FDI, but only in the presence of good macroeconomic policy and well-developed financial markets. Conversely, Harms & Lutz (2006) find almost the opposite: that aid does contribute to higher levels of private investments in developing countries, but only in those countries characterised by an unfavourable business environment. They conclude that aid can successfully promote investments in developing nations, and that the key to this is through the ability of aid funds to provide a more stable business climate. Thus, the institutional setting seems to matter for investors, in one way or another. Exploring the role of aid as a mitigating factor for risk perceived by multinational corporations, Asiedu et al. (2009) find that aid can encourage FDI, by compensating for the risk of expropriation. Using a slightly less aggregate approach, Selaya & Sunesen (2012) set out to empirically test the complementary and substitution hypotheses separately, by estimating separate effects for aid depending on the sectoral

usage it is intended for. The net effect of aid is found to be small but positive, meaning that the complementary effect dominates the substitution effect.

How is this collection of incongruous results to be understood? Most likely as a result of the methodological difficulties discussed above. The GMM estimators used by most of the aforementioned papers are less than convincing intuitively. Further methodological differences that may explain the lack of consensus include the country sample, which varies between papers, and whether or not the authors have chosen to study the contemporary effect of aid on FDI, or the lagged effect.

3 Methodology and Data

In an attempt to isolate the true effect of aid on foreign direct investment, this paper applies an instrumental variable approach first developed by Galiani et al. (2014). The instrumental variable is an indicator for whether a country has reached a level of GNI per capita of 1,215 USD (2015) or not. Reaching this threshold (1) disqualifies a country from World Bank International Development Association (IDA) funds, and (2) has been found to reduce the amount of aid given by other donors. The variation in aid at the crossing is thought to be exogenous to the country, and can thus be used to instrument for aid, conditional on country-specific conditions and time trends. The strategy will be described in detail below, after a review of the data set.

3.1 Data

The main part of the data for this study is sourced from the World Development Indicators, last updated in 2015. Foreign direct investment, the outcome variable, is measured as annual net inflows, the change in balance of payments resulting from the sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital (World Development Indicators, 2016). FDI in included in two denominators: as yearly shares of gross domestic product (GDP) and in per capita terms, to show that the model is robust to using either version. Aid is defined here as Official Development Assistance, which consists of disbursements of grants and loans on concessional terms, from all donors and for development purposes[3]. Data on aid from different donor groups and aggregated at recipient country level is from the Development Assistance Committee (DAC), the OECD cooperation forum for development aid. In order to put inflows in proportion to country size, aid is measured as annual shares of gross national income (GNI). See Figure 1 for a visual account of the median inflows of FDI and ODA to developing countries over years 1987-2013.

[3]For a detailed description of ODA, see `http://www.oecd.org/dac/dac-glossary.htm`

To control for country and market size, all main regressions include gross domestic product (GDP) per capita and population size. The variables are denoted in logarithmic form[4]. A number of additional covariates are added in later analysis: education, institutional factors and measures of macroeconomic stability. The only educational indicator available with reasonable coverage for the countries and years included is the primary school *gross enrolment ratio*. This is calculated as total enrolled students, as a share of the population in the appropriate age group (World Development indicators, 2016). Scores on political rights and civil liberties are taken from the Freedom House "Freedom in the World Comparative and Historical Data". Three measures regarding institutional quality are sourced from the Worldwide Governance Indicators (WGI): political stability, control of corruption and regulatory quality. The total WGI data set contains six dimensions, of which three are chosen that represent the aspects of governance most likely to directly influence attractiveness for FDI. Not including all six indicators is a decision supposed to balance the additional dimensions with the increased number of degrees of freedom in the regressions. Annual inflation rates and total trade as a share of GDP are measures regarding macroeconomic openness and stability that are taken from the World Development Indicators. Adding to these a measurement of the overall economic stability, the number of economic crises experienced by the country are included, as complied in a data set by Leaven et al. (2013). Summary statistics of all variables included can be found in Table 2, with closer descriptions and exact sources in Appendix Table 12.

The main sample used throughout this paper is a replication of the sample used in Galiani et al. (2014), for comparison purposes. The sample consist of the 35 countries who go from being eligible for IDA funds to not being eligible, during the years 1987-2010. The analysis is thus restricted to countries crossing the threshold from *below*, excluding instances of countries crossing from above the income limit. Galiani et al. (2014) motivate this choice by arguing that the effects on aid inflows of a country crossing from above, are not symmetric to the effects of crossing from below. There is no explicit policy within the IDA on how to deal with countries falling back below the threshold, which makes it hard to study these cases systematically. For a clear identification, this analysis follows suit and excludes crossings from above.

A list of the sample countries and their respective years of first crossing of the eligibility threshold from below can be found in Table 1. A number of observations do not correspond to the original sample by Galiani et al (2014), including data for Angola, Cameroon and Peru. Later observations of GNI per capita for Angola has been manually completed with data from WB and IMF, using the Atlas method described at the

[4]The downside of using the logarithm is that it necessitates treating disinvestments as zeroes, which may introduce a bias in estimation. Separate specifications when ODA and FDI are estimated in levels have been estimated with OLS and 2SLS, with and without a quadratic term for aid. Results are similar in magnitude to those in logarithms, but imprecise, with a modest negative coefficient on the squared term. The corresponding table can be obtained from the author upon request.

World Bank web page.[5] In cases where the WDI 2015 data results in years of crossings that differ from the Galiani-sample by more than two years, the crossings have been manually changed to those found by Galiani et al. (2014). Observed years of crossings that differ by a year or two are left as found. Overall, theses inconsistencies are likely due to updates in the WDI database.

Depending on data availability, the time series for each country vary, resulting in an unbalanced panel. The final sample consists of 247 country-period observations, which is the result of dropping missing values for total ODA and GDP. This is then reduced to 236 observations when missing values for the FDI outcome variable are dropped. To evaluate robustness of the results to adding more recently available data, and when motivated by need for a larger sample, the sample is later extended by years 2011-2013, which increases the number of observations to 281. In order to corroborate the replicated sample with the original results by Galiani et al. (2014), Appendix Table 13 presents a replication of their Table 5, "Baseline Results". It appears that most of the results are similar in magnitude and precision to those in the original table, and that results are robust to extending the sample with new data.

3.2 Empirical strategy

Estimating the effect of development aid on FDI in a panel data setting implies the following equation of interest:

$$FDI_{is} = \beta Aid_{is-1} + \Gamma X + \mu_i + \lambda_s + \varepsilon_{is} \tag{1}$$

In Equation (1), FDI in country i and time period s is a function of aid and a set of covariates, X, controlling for country fixed effects, μ_i, and time fixed effects, λ_s. Thus β would represent the average effect across countries and over time, of marginally increasing aid, controlling for time and country-specific variation. However, as previously mentioned, estimation of (1) with ordinary least squares (OLS) would likely be biased, due to reverse causality and joint determination. Factors common to both sender and receiving countries, such as language, culture or former colonial ties may be determining both aid and FDI, and not including these would bias the estimates. One jointly determining factor could be regional political interests of the sender country, creating incentives to both give aid and encourage private investments in the recipient country. Reverse causality would occur if foreign investments by a firm raise awareness in its home country of social and economic conditions in the host country, thereby attracting aid, which would cause an upward bias. On the other hand, if donors interpret increased FDI into a country as a sign they are not needed any more, the bias would be downward.

[5] See:https://datahelpdesk.worldbank.org/knowledgebase/articles/378832-what-is-the-world-bank-atlas-method (Accessed 2016-02-15)

Also important to note is that aid is notoriously fraught with measurement errors, in itself a form of bias. On beforehand, the direction of estimation bias thus can not be determined. Nevertheless, regular OLS estimates of Equation 1 are included in the main results, for comparison.

To address the endogeneity of aid, an instrumental variable strategy is applied. The instrumental variable is constructed as a dummy equal to one for country-time observations when GNI per capita exceeds the qualifying limit for IDA eligibility. The threshold has remained the same since 1987, adjusted yearly for inflation. Figure 1, right panel, plots the evolution of the operational threshold. Arguing that crossing the threshold level of GNI leads to decreasing ODA funds from both bilateral and multilateral donors other than the IDA, Galiani et al. (2014) find this to be a relevant instrumental variable for aid, in the context of economic growth effects. Evidence that aid levels do indeed fall after a country crosses the threshold will be presented in Section 4.1.

The IDA does not allocate funds on a yearly basis, but rather in three-year cycles. All data points are averaged over three year periods, denoted s, in order to correspond to the funding cycles, and to smooth data for yearly fluctuations. The first three-year period is thus 1987-1989, followed by non-overlapping sets of three years, resulting in eight periods total. Once a country crosses the threshold, the decision to withdraw funding will not take place until the next replenishment negotiation, and only after that does the reduction of aid occur. The instrument is thus thought to affect the level of aid with a one period lag. Important to note however, is that due to the financing protocol, a country that crosses the threshold level of GNI per capita will not with certainty lose its IDA funding. The organisation wants to see several consecutive years of staying above the threshold before it withdraws funds, which in practice means that some countries have been allowed continued funding after crossing the threshold, so as to not fall back below it immediately. A number of exceptions for certain types of countries also exists, which may further confound identification of the causal effect. These issues will be addressed in Section 5.6.

Further, aid is modelled here as affecting FDI with one period lag, for two main reasons. Recent insights in literature have shown that aid most likely affects the recipient country only after some time (e.g. Clemens et al., 2012). If one believes that what foreign investors react to are the conditions present in a country, rather than the inflow of aid funds as such, then one would consecutively believe that investments do not happen immediately after aid is increased. The second reason has to do with the potential response time of a multinational company, from realising the existence of an investment opportunity, to actually forming the investment decision and negotiating terms, to the time when the funds actually enter the country. In sum, the instrument is lagged two

periods in the analysis.

The first and second stage equations are specified as follows:

$$\widehat{Aid_{is-1}} = \alpha Crossing_{is-2} + \Gamma X + \mu_i + \lambda_s + \nu_{is} \tag{2}$$

$$FDI_{is} = \beta \widehat{Aid_{is-1}} + \Gamma X + \mu_i + \lambda_s + \varepsilon_{is} \tag{3}$$

In Equation (3), s denotes non-overlapping three year periods and i is a country indicator. μ_i and λ_s are country and time fixed effects, respectively. These are included based on the belief that the effect of aid on FDI varies across countries for any given year (Nigeria, for example, is an oil exporting country across the whole time frame, which ought to have consequences for FDI attraction power), and over time for any given country (such as global recessions). X is a vector of time-varying and country specific covariates, in the preferred model including GDP per capita lagged one period and population[6]. These are included as controls in the second stage, as there is reason to believe that multinational companies take into account the market size and growth potential when they make investment decisions. In the first stage, population and GDP per capita are thought to mean little for identification. That is, crossing the threshold, along with country and time effects, would already contain most of the variation in aid that is added by including GDP and population.

Hypothetically, GDP per capita has a positive effect on FDI, since higher consumer purchasing power implies better investment opportunities. It is introduced with a lag for the same reason that aid is lagged: to allow for investor response time. However, as the set-up in this model closely resembles a fuzzy regression discontinuity (RD) model, there is another reason for including GDP per capita as a control. In an RD model, the "forcing" variable, i.e. the variable that determines allocation into control or treatment group, is included in the specification in order to separate the causal effect of the discontinuous treatment variable, from the continuous underlying, or "running" variable (Angrist & Pischke, 2009). As treatment in this model is a function of income per capita reaching a certain level, controlling for a continuous measure of income per capita is motivated. Economic growth in itself may be affecting a country's received levels of aid, if the primary donor goal is poverty alleviation. In order to distinguish this continuous effect from the sharp decrease in aid that identification in this paper hinges on, income per capita is controlled for, first by including GDP per capita. The sensitivity of the model to functional form of the running variable and to the measure of income (GDP

[6]One strand of critique against earlier IVs for aid has been, as mentioned above, that instruments mainly own their power to population size (Clemens et al., 2012). In light of this, the main specification has been estimated without population as an included instrument, and found to be robust (see Section 5.2). Crossing the IDA threshold is thus in itself a good predictor of aid.

or GNI) will be evaluated in Section 5.2.

As for population, its inclusion relies on the assumption that the level of aid per capita matters for the outcome variable in question. In this line of reasoning, smaller countries on average receive more aid per capita, which would mean that population size matters for the ability of the country to use aid in ways that will eventually generate investments. One could also imagine that the market size matters for investment decisions.

$\widehat{Aid_{is-1}}$ is the instrumented aid variable, lagged one period to allow for investor response time. β is therefore the outcome of interest, the effect of which is ambiguous. To account for the possibility that the error terms ε_{is} are correlated within countries, standard errors are clustered at the country level. Equations 2 and 3 are estimated with two-stage least squares (2SLS) regression with fixed effects, constituting the main specification used in the results below. The main results include estimation by first difference for comparison.[7]

Instrumenting for aid in this way, the hope is to capture only the variation in aid flows, that is uncorrelated with the outcome variable and with the exogenous covariates. Specifically, the assumptions underlying identification of the causal effect in an instrumental variable setting can be stated as:

1. Instrument validity: $Cov(\widehat{Aid_{is-1}}, Crossing_{is-2}) \neq 0$
2. The exclusion restriction: $Cov(Crossing_{is-2}, \varepsilon_{is}) = 0$

Are these reasonable assumptions? Instrument validity will be evaluated empirically in the results section below. A related assumption is that of monotonicity: that the instrument affects aid *negatively* for all sample countries. This seems plausible due to the IDA rules, with the above mentioned caveat that the decrease can happen gradually over time. If we believe, as is reasonable in this model with country-level data, that aid affects FDI differently across countries, the second assumption actually contains two parts: random assignment of treatment conditional on covariates, and the assumption that the effect of crossing the threshold on FDI is channelled only through the effect on aid (Angrist & Pischke, 2009). In other words, FDI inflows can not be affected by crossing the threshold as such, nor can they be determined by omitted factors that coincide with the income level reaching the cut-off. The key identifying assumption for this strategy to hold is that crossing the threshold, conditional on country income and pop-

[7] According to Wooldridge (2002), choosing between the fixed effects and first difference estimators is a matter of efficiency, since both are consistent under assumptions of strict exogeneity. The fixed effects estimator will generally be more efficient if the idiosyncratic errors are serially uncorrelated, which can be tested by estimating the model and determining the covariance between the differenced error term and its lag. If this covariance turns out to be not significantly different than -0.5, the idiosyncratic error terms can be deemed not autocorrelated. Applied to the error terms from Equation 3, this method yields the conclusion that the fixed effects estimator is generally more efficient. Calculations can be obtained from the author upon request.

ulation size, is an as good as random event and does not directly affect FDI. In theory, one could imagine investors interpreting the re-classification of a country into the middle income bracket (graduating from IDA) as a signal of less risk. In practice, however, it seems plausible that multinational firms carefully evaluate the situation in the country before deciding to invest, and thus rather react to de facto changes in conditions that occur as a result of less aid. In sum, if it turns out that the instrument and the error term are not orthogonal, the 2SLS estimator would understate the relationship between aid and FDI. This issue will be dealt with further in Section 5.1.

Important to note is that this IV strategy measures the effect of of aid on FDI, following a large decrease in aid. Conclusions regarding increased aid in general, which are more interesting in the context of catalysing aid, thus have to rely on the assumption that the effect on FDI of an increase in aid would be the same for countries who receive an even, uninterrupted inflow of aid. If results are to be relevant for countries still in the low income group, this assumption has to hold. External validity will be assessed further in Section 5.7. As a final word of caution, note that the causal interpretation of the 2SLS estimates applies with certainty only to the countries included in the sample. As previously mentioned, IV regression estimates the so-called Local Average Treatment Effect, meaning it measures the treatment effect for those on whom the instrument applies. While no conclusions can be drawn regarding the total average effect, the results of this study do apply to all countries that have achieved middle income status in the last 30 years. It is not unimaginable that they would in the future extend to the countries currently in the low income bracket.

4 Results

In this section, the main results are first presented, followed by a discussion on the potential mechanisms underlying them.

4.1 Main Results

To address the first question at hand, whether aid disbursements do indeed decrease after a country has crossed the threshold set by the International Development Association, Equation 2 is estimated first for total aid, and then separately for four different groups of donors: the DAC countries, non-DAC donors, multilateral donors and finally, the International Development Association. Note that "multilateral donors" do not include the IDA. The results are presented in Table 3, where the upper panel is a replication of the first stage in Galiani et al. (2014) with missing values in columns (2)-(4) treated as zero. Total aid, column (1), includes no missing values. The results indicate a large negative effect on total aid from all donors, and on aid from DAC member donors. The

estimated effect for total ODA is that crossing the threshold leads to a 58 % fall in aid as a share of GNI (calculated as: $1 - e^{-0.860}$). The estimated reduction in DAC aid is 82 % (calculated as: $1 - e^{-1.71}$). As for the other donor groups, only multilateral aid other than IDA (MLA) decreases significantly. This is likely a result of data availability, as the DAC/OECD Credit Reporting System has a more complete coverage on member country data. The lower panel of Table 3 presents results when all missing values in columns (2)-(4) are dropped, as opposed to being treated as zero. Using this method, aid from all donor groups decreases at the cut-off. An illustration of the shifting donor composition of aid after a country crosses the threshold is presented in Figure 3, showing that IDA funds decrease substantially. The IDA does not, however, withdraw funds completely at the threshold. Overall, the effect of crossing the IDA threshold is a large decrease in the aid funds available to the recipient country. This in turns confirms the theory that other donors interpret traversing the cut-off GNI per capita as a signal to disburse less funds.

A placebo test replicating the one in Galiani et al. (2014) is conducted, to investigate whether the reduction in aid allocations at the cut-off is a coincidence. False threshold crossings of 50 % of the original threshold values are applied to the data. That is, the nominal threshold of 1,215 USD (2015) is halved to 607.5 USD, and Equation (2) is re-estimated with the placebo threshold, on all observations *before* the actual threshold crossing. Countries with a GNI per capita above the placebo threshold throughout the whole period are treated as not crossing. Table 14 in the Appendix presents the results: that the placebo threshold has no effect on aid from any donor group. None of the estimated coefficients are significantly different from zero. In the following analysis, *the first stage* refers to the results that are presented in the upper panel of Table 3, but with missing values for FDI dropped. This small sample change does not cause estimated effects to differ substantially from those in Table 3.

Before presenting the main results, it may be of interest to see the direct effect of crossing the threshold on FDI, the so-called reduced form:

$$FDI_{is} = \rho Crossing_{is-2} + \Gamma X + \mu_i + \lambda_s + \varepsilon_{is} \tag{4}$$

Equation 4 is estimated with OLS for the main sample. Appendix Table 15 presents the results, which show that indeed, foreign direct investment levels fall after a country crosses the threshold. Crossing the threshold leads to an average reduction in FDI two periods later by 50 % (calculated as: $1 - e^{-0.696}$). As previously discussed, the strategy in this paper depends on the assumption that becoming ineligible for IDA funds per se would not affect foreign investments, but that the observed fall in FDI is a consequence of less aid, which in turn happens because of the threshold crossing. Evidence thus far suggests that the instrument is in fact valid, whereby we can move on to the main

results.

In Table 4, columns (1) and (5) present results of the plain OLS estimates of the effect of aid on FDI, with controls for population and per capita income. The dependent variable is first FDI normalised by GDP and then FDI in per capita terms. The results of either specification show a positive correlation between aid and FDI. This basic relationship between FDI and lagged aid is evaluated graphically in Figure 2. With caution, the result can be interpreted to say that a one per cent increase in aid leads to an average increase in FDI of 0.24-0.26 per cent ($\pm$0.2 in a 95 % confidence interval). Where an effect of GDP per capita can be established, it affects the results in the presumed positive way. Population also follows the prediction, by not affecting FDI in any distinct way. Next, columns (2) and (6) present 2SLS estimates of Equation 3, for the respective measure of FDI. Both point in the same direction as the OLS results, but with larger point estimates: increasing aid inflows by one per cent leads to 0.88($\pm$0.7)-1.01($\pm$0.9) per cent average increases in FDI three years later. The first stages show acceptable F-statistics of about 14 (> 10), which again indicates that the instrument is valid (Stock & Watson, 2011). Columns (3) and (7) show that as predicted, results are more modest when estimated in first difference. When the same sample is extended by one time period, as in columns (4) and (8), the results hold up.

The difference in magnitude between the OLS and 2SLS estimates can be interpreted either as a result of bias in estimation, or as to say that the countries in the sample differ from developing countries in general. The truth is probably a combination of both. Estimation by OLS is assumed to produce inconsistent results due to omitted variable bias (as discussed in the methodology section), whereby one interpretation is that the IV estimates are consistent, while OLS is not. Given a credible instrumental variable, this can be tested by applying a Hausman test for endogeneity of Aid_{is-1} in the model (Wooldridge, 2002). The OLS estimate is compared to the 2SLS one, under the null hypothesis than both are consistent, but OLS is more efficient. The corresponding p-value of the test statistic is 0.0693, by which we can reject the null hypothesis at the 10 % level. Aid is thus found to be endogenous to the model, and estimation by OLS is inconsistent. The other plausible explanation (except a weak first stage, which has already been ruled out), is that the local average treatment effect is much larger than the average treatment effect. The large point estimates may be a local result, valid only for the countries in the sample. A discussion about the external validity of the results will follow in Section 6, where it is shown that the 2SLS results are closer in magnitude to the OLS results, when the sample is extended by 10 more countries.

The main analysis suggests that aid has a positive impact on FDI, but what does that mean in the context of these countries? At the time of crossing the threshold, the 35 countries have an average last-period ODA-to-GNI share of 8.1% and an average contemporary FDI-to-GDP share of 4.5%. A one percentage point increase in last-period

ODA equals an increase by 12.35%, which in turn leads to an increase in next period FDI by 10.8%, or equivalently by 0.49 percentage points at the sample mean.[8] The results thus point towards a catalytic effect of aid on FDI: increasing aid by one percentage point will on average increase FDI by half a percentage point, for a given level of population and per capita income. For FDI measured in per capita terms, increasing aid by one percentage point leads to an increase in FDI by 12.5 %, which is equivalent to 9 US dollars more per capita in real terms.

4.2 Potential mechanisms

How to interpret the above results? Previous literature has brought up on the role of institutional factors as determinants of foreign investment. One may also imagine country-specific but time varying factors such as education, macroeconomic policy and destabilising conflicts as possible explanations for fluctuations in FDI, above and beyond those captured by the instrumental variable. Because aid may affect FDI differently across the sample, we would want to know how the local average treatment effect differs for countries, based on differences in such factors.

To this end, heterogeneous treatment effects are estimated by splitting the sample in two by the median. Thus, the effect of aid on FDI in countries with a higher level of a certain trait can be compared to that in countries with a lower level. The mean of the covariate across all periods for each country is chosen to determine allocation to the low-level or the high-level group, and separate estimations are run for each group. In Table 5, the sample is split by the median of the Freedom House indicators[9], the Worldwide Governance Indicators (Kaufman et al., 2008), macroeconomic stability and trade as a share of GDP.

Columns (1)-(2) ("Freedom House") investigate the role of the institutional setting in which private companies are to invest. When the countries in this sample are ranked according to the average of their political rights and civil liberties indices, it turns out that aid has a strong catalytic effect in societies that can be characterised as more liberal and democratic. Note that the Freedom House indicators give high scores to illiberal and unfree societies, so the scale is "reversed". For countries designated with illiberal status, on the other hand, no effect can be established. Thus, aid can contribute to increased foreign investments in the presence of reasonably good quality and free institutions, but not when coupled with illiberal governments. Similar findings apply to three other measures of institutional quality, that are encompassed in the Worldwide

[8] Calculated as follows:
$\partial log(x) = 0.01/0.081 = 0.1235$
$\partial log(x)\beta_1 = \partial log(y) = 0.1235 \times 0.876 = 0.108$
$0.108 \times 0.045 = 0.0049$.

[9] Freedom House, "Country Ratings and Status, 1973-2016".

Governance Indicators: control of corruption, political stability and regulatory quality. In columns (2)-(3), the sample is divided based on the average over these three dimensions, for which low scores indicate low quality. Results again indicate that the effect of aid on FDI is enhanced in presence of good institutions. However, the point estimate remains positive for countries characterised by low scores. Thus, it seems that aid can work as a mitigating factor: that in times of conflicts, corrupt government and weak rule of law, aid inflows to the country can encourage investors to take the risk of entering the market, despite less-than-ideal conditions.

The same line of reasoning holds for the next category of countries too, namely those who have experienced above-median macroeconomic instability during the sample period. Measures of economic instability with adequate data availability are for the sake of this analysis only inflation and the number of economic crises experienced. Nevertheless, these should give a good enough indication of the economic conditions for operating in a given country and the risks facing potential investors. The sample is split based on the sum of them[10] in columns (5)-(6). As the point estimate is significant for the countries that have experienced more macroeconomic instability during the period, we can conclude that aid has mitigating effects also in the presence of an unstable economic climate. One theory is that aid flows cover up the government expenses that would otherwise have been neglected during recessions or hyperinflation spells, and therefore can contribute to the financial stability perceived by foreign companies. Another way of looking at it is that economic crises force countries to apply for structural budget support from donors, thus receiving more aid. The final sample division, presented in columns (7)-(8), reveals that the FDI-generating effect of aid previously found holds mostly for countries with a lower share of trade-to-GDP, i.e. among countries that are less open to the rest of the world. A plausible explanation for this finding is that countries who are more open to international trade simply are not dependent on the extra funds offered by donors to attract FDI, as they are sufficiently integrated into the global economy.

How are these results to be understood in light of the findings of Galiani et al. (2014), that aid induces growth? Since FDI contributes to economic growth, it is to be expected that investments increase as income increases. In Galiani et al. (2014), a positive relation is found between aid and domestic investments, and the authors conclude that an increased rate of physical investments is the main channel through which aid affects growth. Here, evidence has been presented that aid also prompts mobilisation of international private capital, and that a likely explanation for this is that it builds up complementary institutions and contributes to financial and political stability. Moreover, if capital accumulation is the main driver of economic growth, then the ability of development aid to make a country attractive to foreign investors seems like a path out

[10]That is, based on the average over time for each country, of the sum of inflation in per cent and the number of economic crises.

of poverty. More than just contributing to growth, it seems from the above results that aid actually contributes to nation-building and stability, two factors that in time may mean the countries are able to attract investments by themselves. If we explain the shortcomings of developing countries in attracting FDI by market failures, aid seems to be able to help countries overcome these.

5 Robustness Checks

Here follows a series of tests and discussions regarding the validity of the above results. First, we address the concern that the instrumental variable may not only affect FDI through its effect on aid. The design of the instrumental variable method and the specification of the sample are then questioned. Last of all, the question of whether the results are likely to extend to countries outside of the sample is raised.

5.1 Instrument exogeneity

As previously mentioned, some discussion is merited on whether the instrumental variable is excludable or not. One potential problem could be the fact that the instrument is based on national income reaching a certain level. This can be seen as an effect of a shock to the economy in the crossing period, in other words the random component of the error term. If for example crossing the IDA threshold in a given year is a result of an exogenous shock to the economy that year, this information would form part of both the instrumental variable in period s-2 and the mean of the error term. See for example Angrist and Pischke (2009) for an account of the problem with serially correlated standard errors in panel data.

As a first way around the potential endogeneity of the instrument, an alternative instrumental variable is constructed: $PredictedCrossing_{is-2}$. The method is based on Galiani et al. (2014), and is closely related to various matching techniques for constructing synthetic control groups, as developed by for example Abadie et al. (2010). Real GNI per capita for all countries that were ever on the DAC recipient list, other than the 35 countries in the sample, (130 countries total) form a pool of potential matches, from which predicted annual GNI per capita for the 35 countries is calculated.

First, log of real GNI per capita, $\ln y_{it}$, is regressed onto a set of country fixed effects for each of the 165 countries, generating mean predicted income, $\widehat{y_i}$, and residuals, e_{it}. Time periods in this regression is years, and all years 1987-2013 are included. Then the residuals are used to calculate similarities between the 35 sample countries and the 130 comparison countries, matching observations on the Euclidean distance metric (i.e. observations that are closer to each other are considered good matches). For each sam-

ple country (denoted i), a set of weights are constructed, one for each of the other 130 countries (denoted j). To calculate optimal weights, w_{ij}^*, the following distance formula is minimized with respect to w_j:

$$D_i = \| \mathbf{e_i} - \sum_j w_j \mathbf{e_j} \|,$$

where $\| \cdot \|$ denotes the Euclidean distance formula. $\mathbf{e_i}$ and $\mathbf{e_j}$ are vectors containing the residuals for each of the 27 years included. Subsequently, the set of optimal weights for each year and sample country are multiplied by the corresponding residual, to form predicted residuals: $\widehat{e_{it}} = \sum w_{ij}^* e_{jt}$. In the last step, predicted residuals are used to reconstruct predicted GNI per capita: $\widehat{y_{it}} = exp(\widehat{e_{it}} + \widehat{y_i})$, which in turn are used to construct predicted times of crossing the IDA threshold, $PredictedCrossing_{is-2}$. Since predicted GNI per capita is a composite measure of income from other, matched countries, this instrument is more likely to fulfil the assumption of strict exogeneity. For a number of countries, the predicted period of crossing differs by one period or more from the period determined by the actual data. These are: Albania, Azerbaijan, Bosnia and Herzegovina, China, Djibouti, Guyana, Indonesia, Kiribati, Peru, Samoa, Solomon Islands, Syria, Timor-Leste and Ukraine. Among these, some display a synthetic GNI per capita above the threshold level for all periods in the sample. For the sake of consistency, the instrumental variable $PredictedCrossing_{s-2}$ is set to one for all periods in these instances. In the rest of Section 6, this constructed IV will be used to double-check the consistency of the main estimates.

Moreover, the covariates used in the split sample analysis offer a direct way of investigating whether the exclusion restriction of the instrument holds. If the instrumental variable strategy is correctly specified, the effect of instrumented aid on FDI should not be confounded when covariates are added to the model. This is also what we find. In Table 6, different sets of control variables are added to the IV specification in Equation 3. Each specification is estimated with 2SLS, first with $Crossing_{s-2}$ as the instrumental variable, and then instrumenting for aid with $PredictedCrossing_{s-2}$. Columns (1) and (6) ("Main") show the model with the basic controls: real GDP per capita and population. As column (6) presents the main specification using the synthetic crossings, it is worth a closer look. When instrumenting for aid with the predicted GNI per capita-based crossings, the result is a larger point estimate. Increasing aid with one per cent would lead to increased FDI by 0.996 per cent. This supports the hypothesis of attenuation bias caused by correlation between the instrument and the error term, albeit a small one. Thus, the true marginal effect of aid on FDI would seem to be close to one-for-one.

The remaining columns then add in turn education, political and civil rights ("FH"), rule of law, corruption and stability ("WGI") and macroeconomic conditions ("Macro") as control variables. Of these, education and trade seem to predict FDI. Overall, however, the point estimate for aid remains stable, indicating that the instrument is not correlated with the error term through potential omitted variables. However, when adding the three selected measurements from the Worldwide Governance Indicators, the point estimate for instrumented aid loses precision.

In turn, the potential endogeneity of these covariates with respect to aid is evaluated by regressing them onto instrumented aid and the basic controls. Appendix Table 16 presents the result of this exercise, where in turn education, trade, civil liberties, political rights, political stability, regulatory quality, control of corruption, economic crises and inflation are estimated as a function of instrumented aid. Most of these are not affected by the instrument, meaning they are reasonably exogenous to the model in Equation 3. The exception is political stability, which seems to be endogenously determined within the model, something that would explain the inconsistent estimate above when the Worldwide Governance Indicators are added as controls. The conclusion can be drawn that all else equal, countries with a higher level of education and trade are likely to on average attract more FDI.

5.2 Robustness to main control variables

As mentioned in Section 3.2, there are some reasons to question the inclusion of population and GDP per capita as control variables in the main specification. This paragraph discusses model robustness to dropping all control variables, to dropping only the population control, and to the functional form and measurement of the income per capita variable. Results of estimating the main 2SLS specification with various controls can be found in Table 7, where column (1) is the main result for outcome variable FDI/GDP. Column (2) presents the estimates of the model without any covariates, including only time and country fixed effects. This confirms the hypothesis that the controls hold little information above and beyond that captured by the fixed effects.

Population is included in the model to account for market size and the scale effect of aid. However, it is not absolutely clear that population varies enough over time to capture effects beyond what is already covered by the country fixed effects. In order to evaluate the role of population as a control, the IV model has been estimated without the population variable. Column (3) of Table 7 holds the results, and two things are evident. First, controlling for population size increases power of the first stage regressions. The first stage F-statistic decreases from about 14 to around 11 when controlling only for GDP per capita. The second observation is that population does seem to account for

some of the variation in received FDI, as the point estimate increases slightly compared to column (1).

The main conclusion to be drawn from comparing different specifications of income per capita is that the model is robust to both functional form and income metric. Adding a squared term of log GDP per capita, the idea is to test whether the apparent discontinuous treatment effect of crossing the IDA eligibility threshold can actually be attributed to a non-linear effect of aid on FDI. Since the point estimate in column (4) holds up, the models seems not to be sensitive to the choice of running variable functional form. However, some evidence of a non-linear (positive but decreasingly so) relation between FDI and income per capita is detected, which implies a gradual decrease in FDI as the recipient country gets richer. The same conclusion holds when population is included, as in column (6). Finally, model robustness to using GNI per capita as the forcing variable instead of GDP per capita is tried and found satisfactory, the results of which can be found in column (5).

5.3 Measurement error in aid

One issue facing the validity of these results is that aid has been known to be measured with substantial error. Data on aid is collected mainly by the DAC Creditor Reporting System, which is voluntary for donors other than the DAC members to participate in. For this reason, aid data from non-DAC members is likely inconsistent. Reporting on aid from the DAC countries may also be inaccurate, depending on how closely commitments and disbursements of aid are monitored. Moreover, data on national income, GNI and GDP, are subject to measurement problems.[11] Thus, the independent variable used in this paper, ODA/GNI, is likely subject to measurement error, which would cause attenuation bias of the estimates.

Following Galiani et al. (2014), the effect of measurement error is evaluated by successively decreasing the estimation window, i.e. the number of included sample periods on either side of the period of threshold crossing. As we narrow the time frame included in the sample, the measurement error should become smaller in absolute terms, given that the measurement error of the error term is independently and identically distributed (i.i.d. errors, or in words, the assumption that the measurement error is evenly spread out over the entire sample). If aid is incorrectly measured across the whole sample, it will introduce noise in the data, confounding the effect on FDI. Using a shorter sample should in this sense mean getting less of the noise in estimations, whereby a more "true" effect can be estimated. Note however that the standard error will increase as the

[11] The World Development Indicators 2015 report highlights a number of large revisions made in 2013 by for example Nigeria (GDP revised up by 91 %) and Democratic Republic of Congo (GDP revised up by 62 %), drastically changing the estimated size of the economy (World Development Report 2015, p.78).

estimation window narrows, since the sample size is reduced. Because the fixed effect estimator would change for each subsample, as it subtracts the mean, the first difference estimator is applied. Log FDI per capita is the dependent variable, since it appears from Table 4 that FDI measured in per capita terms is more compatible with first differencing.

Table 8 reports the results of this experiment. The maximum number of periods before or after crossing, seven, is included in the first column, to then be reduced by one period for each following column. The OLS estimates in the upper panel of Table 8 shows that for each reduction of the number of periods around the crossing, the point estimate increases slightly. At very narrow time windows around the threshold, the estimated effect is at about the same level as the main fixed effects OLS estimate ($\beta = 0.25$), and significant. The 2SLS results follow largely the same pattern. Using the most narrow time frame, the point estimate increases to 1.49, implying that an increase in aid by one per cent would result in an increase in FDI of 1.5 per cent three years later. The first stage remains strong throughout the set of subsamples. While these results should be interpreted with caution due to the lower precision, they never the less indicate that the main results are underestimated due to measurement error.

5.4 Income measurement manipulation

According to the IDA eligibility rules, countries that attain a certain level of per-capita income can no longer access the World Bank concessional funds for the poorest. As has been established above, other donors cut back on foreign aid to a country following the same logic. Since these funds would reasonably make up important national resources, one can imagine a motive for low-income countries to retain their official national income figures below the current threshold. As previously discussed in Galiani et al. (2014), there are a number of counterarguments, such as that the World Bank Atlas GNI measurements are dependent on world inflation, and that data on GNI are collected from other sources than the national ones, which are the only ones governments could possibly control. If such behaviour existed among recipient country governments, i.e. if countries could self-select into treatment, it would severely bias the outcome of this study. Following Galiani et al. (2014), Figure 4 presents both visual accounts and a formal test for self-selection, based on the distribution of the income data. Manipulation of income data would show up as a "bunching" of observations just below the IDA threshold level of GNI, causing a jump in the distribution. In the left hand side of Figure 4, the distribution of the difference between current GNI per capita and the current IDA threshold is plotted, for all countries that were every eligible for IDA funds 1987-2010. The resulting difference is divided into 100 USD-bins, and is truncated at a maximum difference of 1000 USD. Visually, there is no bunching of observations just to the left of the point where income equals the threshold, i.e. at the crossing. Rather, the distribution looks continuous. In the right-hand panel of Figure 4, the kernel density

of the same difference measure is plotted, separately for observations below and above the threshold income level and using local linear regression[12]. Conversely to what would have been the case if countries had manipulated their income figures, the density plot is smooth at the point where GNI per capita equals the cut-off. A formal McCrary density test (McCrary, 2008) finds no evidence of manipulation of the running variable at the discontinuity.

5.5 Pre-crossing levels of FDI

Another potential problem with identification in this paper would arise if FDI turns out to be an important determining factor of GNI per capita at the IDA eligibility threshold, which would cause reverse causality between the dependent variable and the instrument. In theory, it could be that firms interpret the threshold crossing as a signal of better investment climate, as the country has reached a certain level of development, but this ought to be a gradual effect of increasing income rather than a sharp variability at the threshold. If FDI were a major determinant of GNI per capita crossing the cut-off, we would expect to see an upward trend in FDI in the periods just before crossing. To test for this, a version of an event study is carried out. An alternative specification of equation 1 is estimated, where aid is replaced by a period indicator variable, for the amount of time until, or since, the time of crossing. For each time period, the following relation is estimated:

$$FDI_{is} = \beta_d D_{dis} + \Gamma X + \mu_i + \lambda_s + \varepsilon_{is} \tag{5}$$

In Equation (5), D_{dis} represent the indicator variable for time distance $d = Currentperiod - Crossingperiod$. All time distances with a viable number of observations are included in the. Their coefficients, β_d, are plotted in Figure 5, along with 95 % confidence intervals. The solid line shows the average level of FDI in each time distance from crossing, given per capita level of income and population size. To control for the fact that global FDI increase over time[13], time fixed effects are included in the model. The fact that the level of FDI does not exhibit an upward trend right before the crossing works in favour of the identification strategy, as it means that FDI is unlikely to have been in itself the catalytic factor that pushed income above the threshold for the countries in the sample. Thus, it seems unlikely that the instrumental variable is endogenously determined within the model.

5.6 Robustness to sample specification

This part presents a series of re-estimations of the 2SLS model in Equation 3, for different subsets of the sample. The purpose is to evaluate the robustness of the identification

[12]This was done using the Stata user written command DCdensity by Justin McCrary.
[13]See Figure 1, left panel.

strategy to model specification and to the timing of the instrumental variable. All results in this section are estimated with $Crossing_{s-2}$ and $PredictedCrossing_{s-2}$, respectively, as instruments for aid, and are presented in Table 9.

First, a placebo test is conducted, in which the time of crossing for each country is moved back in time, first one and then two periods. All pre-treatment observations are included in this analysis. Throughout the paper, the instrument has been included in the empirical model with two period lags. Behind this lies the assumption that the chains of events that lead from crossing the threshold, to receiving less aid, to FDI being affected, need two periods to play out. Therefore, moving the instrument back in time should mean it causes little or no effect on FDI. The first two columns of Table 9 shows that this is assumption is correct. First, in column (1), $Crossing_{s-2}$ is moved back in time two periods, to the actual time of crossing the threshold. In column (2), it is moved back one period, contemporaneous to the lagged aid variable. No effect of aid on FDI can be determined in either case, which implies modelling the crossing with two lags is a good strategy.

Next, the sensitivity of the model to very recent middle income countries is evaluated. A side effect of the IV strategy applied in this paper is that the countries that cross the IDA threshold in any of the two last periods will never exhibit $Crossing_{s-2} = 1$, i.e. will never be in the treatment group. They are part of the sample to contribute to the overall variation, but it may still be interesting to know how the results are affected by dropping them. This is done in two steps in columns (3)-(4), by first excluding countries that cross in period 8 (2008-2010) and then those that cross in period 7 (2005-2007). Despite a greatly reduced sample size, the results using the actual crossings as instruments hold up, and increase in magnitude. Instrumenting with predicted crossings, the point estimates lose power, and in the case of column (4) turn inconsistent. Note that since a few countries in the sample have an income level above the threshold for the whole period, they will be excluded in these two samples. Another worry is that the model would be sensible to inconsistencies in the data regarding the time of reaching the cut-off GNI per capita. Some of the countries included in the sample cross the IDA threshold from below more than once. Column (5) present the results of excluding these countries from the sample. Both estimates hold up, but the one using actual crossing periods loses precision, implying that the predicted crossings variable is more robust to countries figuratively jumping back and forth across the threshold. In column (6), aid is instrumented with the last year of crossing instead of the first, resulting in stable point estimates. So far, we can thus conclude that the model is robust to various inconsistencies in the data, and that the effect of aid on FDI is likely underestimated when the sample includes a number of very recent IDA graduates.

In columns (7) and (8), we exclude observations for countries belonging to two deviant groups in the sample. This is done one at a time to maintain sample size. First, the sample contains three countries that have at some point been subject to the small island economy exception, which grants them continued eligibility despite having crossed the threshold.[14] Since this exception means that aid most likely did not decrease after the country crossed the IDA threshold, these countries pose a threat to identification. Column (5) shows that when these are excluded, the point estimate using the actual crossings does indeed increase. Finally, the sample also includes a few countries that never received any IDA funds, despite having had a GNI per capita below the threshold during the period studied.[15] In a similar reasoning, these countries would bias estimates downward, if the fact that they have never been on the IDA recipient list means that the instrument does not have the same effect on aid to these countries. If bilateral donors are thought to react to the announcement that a country has graduated from the IDA program, the absence of such an event would cause identification to fail for this group of countries. Indeed, the point estimates in column (8) are large and significant at the 5 %-level, though the first stage becomes slightly weaker.

Additionally, one might be concerned that the results are driven by any one specific country. A quick way to test for this is to exclude one country at a time from the sample, and estimate the main model on the remaining countries. In Figure 6, the 35 resulting point estimates are plotted. The dashed line represents the main 2SLS estimate with all 35 countries. Distinguishable from the main result is Nigeria, as the point estimate is increased to above 1 when the country is excluded. Among the strongest drivers of the results, India and Bolivia are most prominent. However, the main take away from this analysis is that the results are robust to excluding any one country from the sample.

5.7 External validity

For the 35 countries included in the main sample, it seems that aid does have a catalytic effect on FDI. But is this result valid, when put in a wider context? To address concerns about external validity, the sample is extended by adding ten more countries that cross the threshold during the period 1987-2013, in two steps. First, one set of five countries that reach the cut-off before 2010 in the currently available World Development Indicators data are added. Then, we add a second set of five countries that become ineligible after 2010 (i.e. after the sample used by Galiani et al. (2014) was collected). In total, they add about 80 country-period observations to the sample. One issue with adding these is that the IV strategy looses relevance, as a larger amount of observations in this sample will never exhibit $Crossing_{s-2} = 1$. Table 10 report the results of estimating the

[14] Defined as countries "with less than 1.5 million people, significant vulnerability due to size and geography, and very limited credit-worthiness and financing options". In this sample they are: Kiribati, Samoa and Papua New Guinea (World Bank, 2016).

[15] These are Peru, Ukraine, Turkmenistan and Syria.

main specification with 2SLS, first adding the countries crossing before or in 2010, and then adding onto that the countries crossing after 2010. Despite the countries added that cross the threshold after 2010, the first stage remains strong. Columns (1) and (3) show that when the five first countries are added, the point estimates remain close to the main results. When all ten extra countries are added, the effect of ODA on FDI is smaller and less precise. Since most of the added countries reach the cut-off in very recent years, these weakly positive results are an indicator that aid may well in time have a positive effect on FDI for these countries too.

One worry is that the countries in the sample stand out in some way compared to countries at similar levels of development, which makes them more attractive for investors. If this is the case, the results so far may not have very high relevance for other countries faced with a similar situation. In their paper, Galiani et al. (2014) find that countries below the threshold do not differ substantially in their growth pattern, compared to the 35 studied countries. Across the the distribution of country-year income, $lnGDPpc_{it-1}$, the growth pattern remains largely the same between the two groups. For the purpose of this paper, it is of interest to see whether the country that cross and those who who do not cross differ in terms of the amount of investments received from abroad. A sample is created containing all country-year observations that fall below the IDA threshold. This results in an unbalanced panel of 79 distinct countries, including the 35 from the original sample. Regular OLS is applied, regressing the logarithm of FDI/GDP (and then FDI per capita) on a dummy equal to one if the observation is from the set of countries that cross the threshold, zero otherwise. Thus, the outcome of interest measures the difference in FDI received between countries that reach the threshold level of income per capita, and those who do not. To break down the level of analysis across the income distribution, the treatment dummy is interacted with four other indicator variables, one for each quartile of the income distribution. For example, the first quartile dummy equals one for country-year observations with $lnGDPpc_{it-1} < p(25)$.

Table 11 contains three different specifications: in columns (1) and (4) no controls are added; in columns (2) and (5) we control for last period level of real per capita GDP, and in columns (3) and (6) the dummy variable for crossing country is interacted by dummies for income quartiles. Overall, average inflows of FDI differ between the two groups. However, when controlling for GDP per capita, the difference becomes smaller and less precise. Countries with approximately the same income level thus differ some in terms of new inward FDI flows, depending on whether they have crossed the IDA threshold up until 2010 or not. When dividing the groups into quartiles by last-year income per capita, the first quartile stands out. It seems that for country-year observations in the bottom of the income distribution, i.e. country-year observations early on in the development process, the countries that did eventually cross the threshold received sub-

stantially more FDI. Galiani et al. (2014) also find that growth is substantially higher for countries that eventually cross the threshold in the first income quartile. Together, these results can be interpreted to say that aid and FDI in the early stages of a country's development are keys to continued growth.

6 Conclusions

The main contribution of this paper is to provide plausibly causal positive estimates of the effect of aid on foreign direct investment for the sample of 35 countries that have reached middle income status in years 1987-2010. It further contributes to the understanding of why it is that aid encourages investments. The method is based on the work of Galiani et al. (2014), in which the authors reach the conclusion that foreign aid has contributed to economic growth. This paper is in part a replication of the main results of their work, recreating results that indicate a positive effect of aid on economic growth. Understanding the two outcomes as a whole opens up for the interpretation, although not explicitly dealt with here, that foreign investment can be a contributing factor to economic growth. Increased inflows of development aid (1) adds to a higher domestic investment level, and (2) induces foreign investors to increase their activity in a country. This would further speed up the accumulation of physical capital, allowing the country to grow at a pace faster than would be possible through domestic savings alone. On the other hand, one could imagine the reverse relation: that increased growth is what makes a country more attractive to investors. However, the findings regarding external validity, that the group of countries studied here have been more successful overall in attracting FDI than countries still receiving IDA funds, speaks for the former line of reasoning: that foreign investment is part of the explanation for economic growth.

Turning to possible explanations of the main result in this paper, that aid induces FDI, some mechanisms are found that could enable productive usage of capital. These include human capital in form of education, political stability and civil rights, control of corruption and openness to trade. Receiving assistance in form of aid is found to increase chances of attracting FDI in countries where these conditions are not sufficiently fulfilled. In this way, the results support the findings of both Harms & Lutz (2006) and Asiedu et al. (2009), that institutions and investment risk matter. They also corroborate the conclusion of Selaya and Sunesen (2012), that the complementary effects of aid outweigh potential crowding-out effects. Thus it would seem that the primary role of aid in this context, is in contributing funds that can function as a buffer in times of high uncertainty, as caused by conflicts, high inflation spells and economic crises. Aid is also found to attract FDI to countries that are less open to trade. Taken together, these represent examples of market failures, where developing market economies are unable to draw in foreign capital despite investment opportunities.

Due to data availability limits, this study has been unable to explain more in detail both the exact mechanisms through which aid catalyses FDI, and the exact ways in which FDI affects the host countries. Ideally, there would be readily available data on for example the number of special export zones in recipient countries, tax reductions given to foreign companies, and on sender country export credits. Given the growing awareness of the need for good quality development statistics, this is a possibility for future research. Likewise, through projects such as AidData[16], detailed data on sectoral classifications of aid will likely improve the conditions for studying which kind of aid projects are effective in improving the investments climate. Furthermore, this paper has only been able to establish short-term effects over a few years, for a small sample of countries. Monitoring the progress of the larger sample of 45 countries that have crossed the IDA eligibility threshold to this date will eventually provide a better understanding of the long-term results.

So why are some countries poorer than others? Throughout this paper, it has been argued that foreign direct investment is an important piece of the puzzle, allowing countries to accelerate their pace of growth beyond the constraint set by their domestic savings rate. The empirical evidence further strongly suggests that development aid plays a key role in inducing foreign investments, and does so especially in countries that by themselves struggle to attract investors. While the academic debate on the merits of aid churns on, this paper can conclude that based on the above findings, development aid must be doing something right, in that it increases the recipient countries' level of capital accumulation. While this result can only be interpreted as causal for relatively new middle income countries, one could argue that it is precisely for these countries that it matters the most. Prior research suggests that both aid and investments lead to growth, and the evidence in this paper combined with Galiani et al. (2014) would suggest that aid leads to foreign investment and to economic growth. Thus, if the complementary factors built up by aid are sustained, the path for middle income countries to self-dependence as integral parts of the global financial system seems clear.

[16] AidData is a project for increased availability of project-level aid statistics. See: http://aiddata.org/

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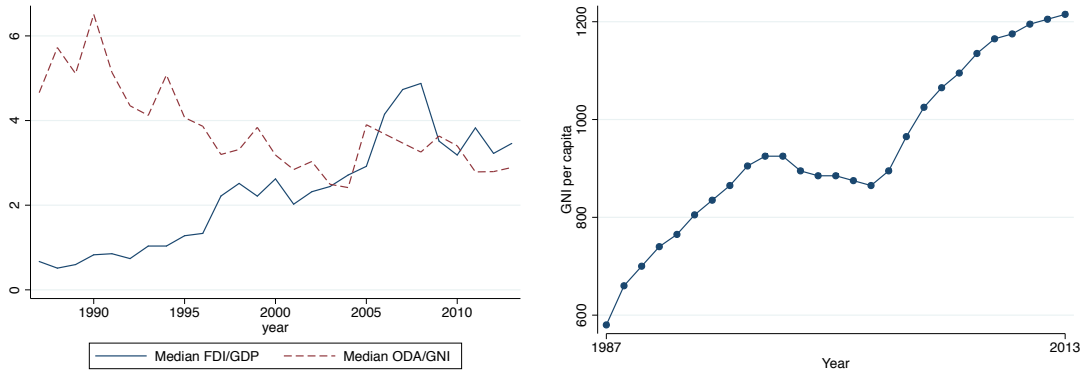
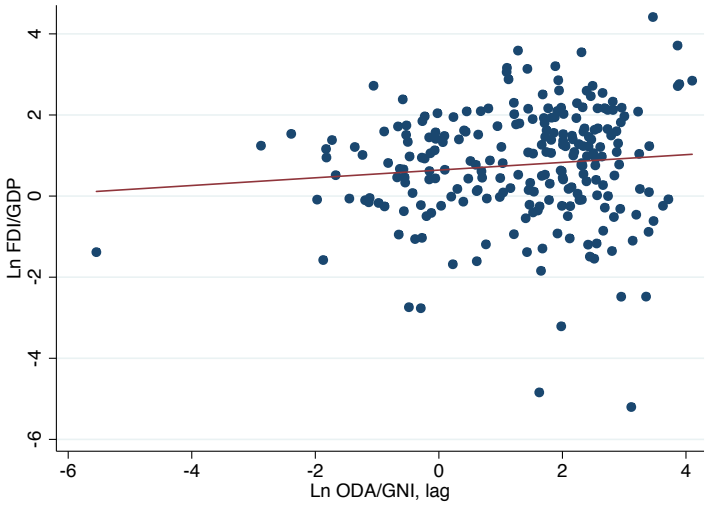
Figures and Tables

Figure 1: Aid, FDI and the IDA operational threshold, years 1987-2013



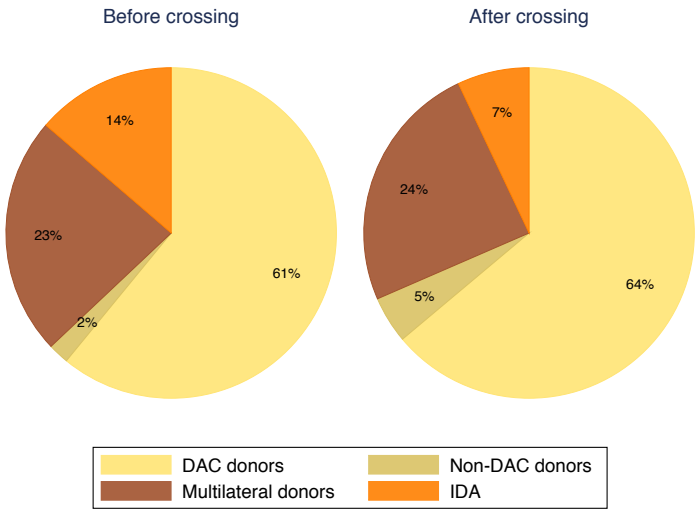
Notes: Left panel plots median ODA/GNI and FDI/GDP over time, for all 165 countries ever on the recipient list for aid from the Development Assistance Committee of the OECD. Right panel plots the operational threshold of the International Development Association in nominal USD. Threshold is thus adjusted annually for inflation.

Figure 2: Basic correlation between lagged aid and FDI.



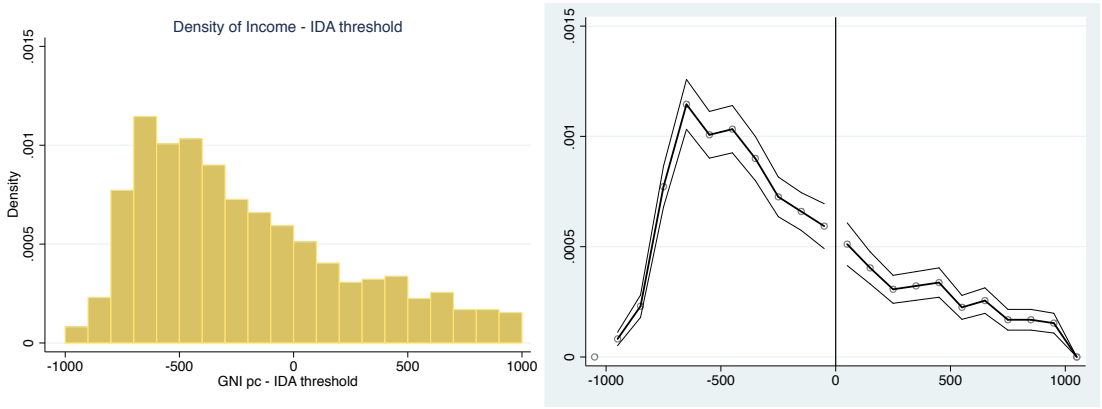
Notes: Scatter plot showing the basic correlation between ln FDI and lagged ln ODA, for all country-period observations in the main sample, total n=236, years 1987-2010. The fitted line shows the basic OLS estimate of the relationship, $\beta = 0.239$.

Figure 3: Composition of total aid by donor group



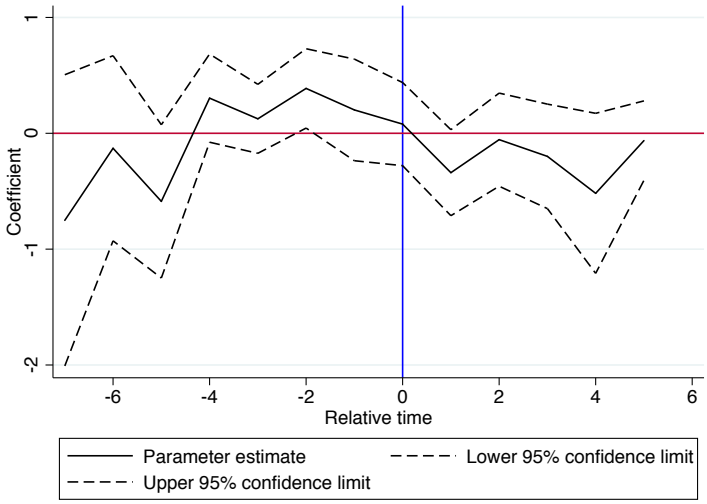
Notes: Each percentage share calculated as aid by donor divided by total aid, for each country-period observation in the main sample. No. of countries = 35, years = 1987-2013.

Figure 4: McCrary test for discontinuous density function



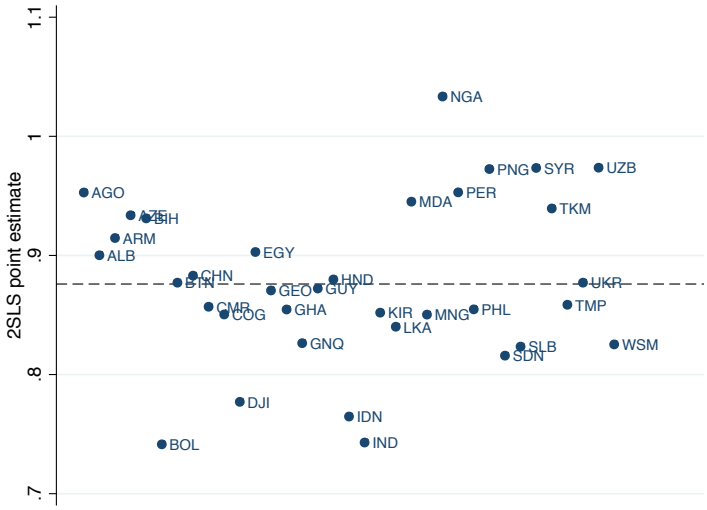
Notes: Number of country-year observations=1956, number of countries=96, period=1987-2010. Sample consists of all countries eligible for IDA funds at some point during the period. Left plot shows distribution of distances between GNI pc and IDA threshold, in bins of 100 and restricted to an upper limit of 1000. Right hand side shows kernel density plots of the distance between income and threshold for observations above and below the threshold, respectively. The bandwidth is set to 100 and the kernel is Epanechnikov. Formal McCrary test fails to reject the null hypothesis of no discontinuity at breaking point ($income - threshold = 0$), with log distance in height of -0.15 and standard error 0.30 (p-value -0.5).

Figure 5: Conditional average FDI in each time period relative to crossing



Notes: Estimated average ln(FDI/GDP), controlling for time and country fixed effects, log GDP per capita and population. The scale of the x-axis is time relative to the period of crossing the threshold, with negative values for periods before the crossing. Solid line plots the coefficients on dummy variables for each time period, before and after the time of crossing for each country. Dashed lines indicate the span of a 95 % confidence interval for each coefficient. Years 1987-2013, 267 observations for 35 countries.

Figure 6: Point estimates of instrumented aid, when dropping one country at a time



Notes: 2SLS estimates of Equation 3 with $Crossing_{s-2}$ as IV, when dropping one country at a time from the sample. Dependent variable is FDI/GDP. The country specified by each country code above is dropped. Number of observations=228-233, number of countries=34. All coefficients significant at 5 %-level. Dashed line represents the overall point estimate when number of countries=35 (0.876).

Table 1: IDA threshold crossings from below, 1987-2013

Country	Year of crossing	Country	Year of crossing
Albania	1999	Lesotho**	2011
Angola	2005	Mauritania**	2011
Armenia	2003	Moldova	2007
Azerbaijan	2005	Mongolia	2006
Bhutan	2003	Nicaragua*	1999
Bolivia	1997	Nigeria	2009
Bosnia and Herzegovina	1997	Pakistan**	2012
Cameroon	2008	Papua New Guinea	2009
China	2000	Peru	1990
Congo, Rep.	2006	Philippines	1994
Cote d'Ivoire*	2009	Samoa	1995
Djibouti	2007	Solomon Islands	1997
Egypt, Arab Rep.	1995	Sri Lanka	2003
Equatorial Guinea	1997	Sudan	2010
Georgia	2003	Syrian Arab Republic	1998
Ghana	2008	Timor-Leste	2006
Guyana	1999	Turkmenistan	2003
Honduras	2000	Ukraine	2003
India	2010	Uzbekistan	2010
Indonesia	1994	Vietnam*	2010
Kiribati	1988	Yemen, Rep*	2009
Kyrgyz Republic**	2013	Zambia*	2008
Lao PDR**	2012		

* = Country not in data by Galiani et al. (2014) but crossing before or in 2010 in current data.
** = Country crossing after 2010. Year of crossing = year of *first* crossing from below. Based on World Development Indicators, last updated 2015.

Table 2: Summary statistics

Variable	Count	Mean	Sd	p25	p50	p75
FDI/GDP	243	4.535	7.667	0.907	2.373	5.120
FDI pc, 2010 USD	244	75.445	206.393	4.681	15.831	57.961
Ln(FDI/GDP)	236	0.767	1.385	-0.061	0.940	1.660
Ln FDI pc	238	2.834	1.864	1.677	2.820	4.120
Lag of (ODA/GNI)	247	8.116	9.573	1.101	5.296	11.292
Lag of (DAC/GNI)	247	5.250	6.680	0.683	3.317	6.720
Lag of (NonDAC/GNI)	247	0.175	0.525	0.000	0.003	0.113
Lag of (MLA/GNI)	247	1.879	2.901	0.153	0.847	2.277
Lag of (IDA/GNI)	247	0.664	1.282	0.000	0.163	0.857
Ln ODA/GNI, lag	247	1.296	1.510	0.096	1.667	2.424
Ln(DAC/GNI), lag	247	0.658	3.141	-0.236	1.199	1.905
Ln(NonDAC/GNI), lag	247	-1.346	1.830	-2.526	0.000	0.000
Ln(MLA/GNI), lag	247	-0.371	1.634	-1.626	-0.051	0.823
Ln(IDA/GNI), lag	247	-0.597	1.387	-1.040	0.000	0.000
Crossing in s-2	247	0.227	0.420	0.000	0.000	0.000
Ln GDP pc 2000 USD, lag	247	6.602	0.556	6.252	6.637	6.961
Ln Population	247	15.992	2.218	14.798	15.901	17.109
Primary school enrolment rate	224	98.652	18.226	93.468	101.658	109.315
Civil liberties, 1=high 7=low	247	4.358	1.601	3.000	4.000	6.000
Political rights, 1=high 7=low	247	4.323	1.982	2.667	4.000	6.000
Political stability	171	2.807	0.787	2.375	2.794	3.239
Regulatory quality	172	2.058	0.585	1.636	2.160	2.468
Control of corruption	172	1.389	0.472	1.032	1.391	1.701
Inflation	244	94.963	536.667	4.864	8.711	18.623
Economic crises	247	0.202	0.403	0.000	0.000	0.000
Trade as % of GDP	243	86.579	53.291	52.927	77.051	107.679

Notes: Mean, standard deviation, and the 25th, 50th and 75th percentiles for all country-period observations, using all non-missing observations for total ODA and GDP per capita. Missing values for other donor types are replaced by one before taking the natural logarithm, thus treated as zero. A quick review of the sample reveals this to be a correct strategy overall. Missing values and disinvestments in FDI/GDP dropped, resulting in the uneven number of observations. 247 = sample size in Galiani et al., 236 = sample size in main results of this paper.

Table 3: First stage: Effect on aid of crossing the IDA threshold

	All observations				
	(1)	(2)	(3)	(4)	(5)
	ODA	DAC	NonDAC	MLA	IDA
Crossing in s-2	-0.860***	-1.710**	0.338	-0.356*	0.045
	(0.222)	(0.813)	(0.467)	(0.179)	(0.296)
Ln GDP pc, lag	-1.239***	-0.553	-0.060	-1.226***	-0.373*
	(0.351)	(0.690)	(0.307)	(0.215)	(0.198)
Ln Population	-3.979***	-8.302*	4.573*	-2.213**	-0.402
	(1.101)	(4.615)	(2.332)	(0.931)	(0.869)
No. of obs.	247	247	247	247	247
No. of countries	35	35	35	35	35
	Only non-missing observations in each donor category				
	ODA	DAC	NonDAC	MLA	IDA
Crossing in s-2	-0.860***	-1.777**	-0.451	-0.366*	-0.535**
	(0.222)	(0.865)	(0.458)	(0.187)	(0.247)
Ln GDPpc, lag	-1.239***	-0.674	-1.175***	-1.332***	-1.748***
	(0.351)	(0.760)	(0.342)	(0.288)	(0.364)
Ln Population	-3.979***	-9.274*	-1.709	-2.905***	-2.246
	(1.101)	(4.862)	(2.489)	(0.949)	(1.664)
No. of obs.	247	240	132	239	164
No. of countries	35	35	30	35	30

Notes: Dependent variable is $\ln ODA/GNI_{s-1}$ from donor type specified in each column. ODA=total official development assistance. DAC=bilateral ODA from DAC members. NonDAC=bilateral ODA from non-members of DAC. MLA=other multilateral aid. IDA=multilateral aid from the IDA/World Bank. Missing values for donor types other than total ODA are treated as zero in the upper panel, excluded in the lower panel. No missing values for total ODA in this sample. GDP in constant 2000 USD. Robust standard errors clustered at country level in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 4: Main results

	Ln FDI/GDP				Ln FDI per capita			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	2SLS	First Diff.	1987-2013	OLS	2SLS	First Diff.	1987-2013
Ln ODA/GNI, lag	0.239**	0.876**	0.534	0.734*	0.255**	0.964**	0.846*	0.792**
	(0.102)	(0.376)	(0.480)	(0.377)	(0.100)	(0.405)	(0.421)	(0.390)
Ln GDP pc, lag	-0.136	0.735	0.155	0.469	0.795***	1.751***	1.143	1.448***
	(0.258)	(0.512)	(0.784)	(0.500)	(0.236)	(0.564)	(0.755)	(0.530)
Ln Population	-0.391	1.333	1.808	0.872	-1.223	0.849	1.905	0.377
	(1.322)	(1.974)	(3.366)	(1.587)	(1.271)	(1.940)	(3.484)	(1.482)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IV		Yes	Yes	Yes		Yes	Yes	Yes
First difference			Yes				Yes	
No. of obs.	236	236	195	267	238	238	201	269
No. of countries	35	35	35	35	35	35	35	35
First stage F-stat.		14.06	9.81	12.23		14.38	14.40	12.42
Mean ln FDI	0.77	0.77	0.77	0.84	2.83	2.83	2.83	3.07

Notes: IV is $Crossing_{s-2}$, country crossing the threshold two periods earlier. Dependent variable is the log of period mean FDI/GDP in columns (1)-(4), log of FDI per capita in columns (5)-(8). Standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 5: Split sample analysis by the median of explanatory variables

	Freedom House		Worldwide Governance Ind.		Macroec. stability		Trade	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High	Low	High	Low	High	Low	High	Low
Ln ODA/GNI, lag	0.194	1.386**	1.947*	0.540	0.764**	0.972	0.533	0.767*
	(0.396)	(0.594)	(1.058)	(0.439)	(0.355)	(1.409)	(0.595)	(0.372)
Ln GDP pc, lag	-0.439	2.908*	4.067	0.189	1.012	0.585	0.135	1.638
	(0.442)	(1.459)	(2.427)	(0.528)	(1.196)	(1.337)	(0.558)	(1.336)
Ln Population	0.721	3.708	9.622*	-1.107	1.581	-1.522	0.055	3.334
	(2.161)	(2.965)	(4.793)	(2.335)	(2.413)	(2.233)	(2.663)	(3.113)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First stage F-stat.	9.88	5.24	3.37	9.17	17.43	2.03	5.52	10.87
No. of obs.	124	143	137	130	142	125	143	124
No. of countries	16	19	18	17	18	17	20	15
Years of data	1987-2013		1996-2013		1987-2013		1987-2013	
Median dep. var.	4.00		2.12		1.00		79.18	

Notes: 2SLS estimates of samples split by median of the mean over all periods for each country, for each variable specified in the column heads. IV is $Crossing_{s-2}$ in the upper panel. Dependent variable is the log of FDI/GDP. Country and time fixed effects are included in all models, and no of observations and countries are the same in the upper and lower panels, specified at the bottom of the table. Standard errors clustered at country level in parentheses. Freedom House includes political rights and civil liberties. Worldwide Governance Indicators include control of corruption, political stability and regulatory quality, available from 1996. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 6: Adding control variables

	$IV = Crossing_{s-2}$					$IV = PredictedCrossing_{s-2}$				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Main	Education	FH	WGI	Macro	Main	Education	FH	WGI	Macro
Ln ODA/GNI, lag	0.876**	0.819**	0.869**	0.515	0.823**	0.996**	0.804**	1.022*	1.198	1.101**
	(0.376)	(0.317)	(0.386)	(0.578)	(0.354)	(0.477)	(0.378)	(0.509)	(1.285)	(0.505)
Ln GDP pc, lag	0.735	0.744	0.700	-0.126	0.887*	0.899	0.720	0.908	0.676	1.258*
	(0.512)	(0.525)	(0.517)	(0.717)	(0.516)	(0.682)	(0.672)	(0.700)	(1.623)	(0.735)
Ln Population	1.333	0.007	1.502	-1.171	2.537	1.658	-0.041	1.924	-0.961	3.118*
	(1.974)	(2.293)	(2.111)	(1.436)	(1.552)	(2.055)	(2.407)	(2.262)	(1.701)	(1.842)
Primary school enrolment rate		0.031**					0.031**			
		(0.013)					(0.013)			
Civil liberties, 1=high 7=low			-0.169					-0.187		
			(0.247)					(0.246)		
Political rights, 1=high 7=low			0.041					0.059		
			(0.142)					(0.141)		
Political stability				0.224					0.335	
				(0.186)					(0.236)	
Regulatory quality				-0.134					-0.347	
				(0.687)					(0.732)	
Control of corruption				0.166					-0.030	
				(0.705)					(0.857)	
Inflation					-0.000					-0.000
					(0.000)					(0.001)
Economic crisis					-0.072					-0.092
					(0.221)					(0.242)
Trade as share of GDP					0.010***					0.010***
					(0.003)					(0.003)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	236	214	236	198	232	236	214	236	198	232
No. of countries	35	33	35	35	35	35	33	35	35	35
First stage F-stat	14.06	17.11	13.88	6.91	16.70	7.46	8.61	6.17	2.33	8.56

Notes: 2SLS estimates, instrumental variable specified at the top of each section. Dependent variable is the log of period mean FDI/GDP. FH= Freedom House. WGI= Worldwide Governance Indicators, available from 1996. Macro = Trade/GDP, economic crises and inflation. Standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 7: Robustness to specification of main control variables

	(1) Main	(2) No controls	(3) GDP	(4) GDP squared	(5) GNI+Pop.	(6) GDP squared+Pop.
Ln ODA/GNI, lag	0.876**	0.738**	0.953**	0.778*	0.749*	0.721**
	(0.376)	(0.321)	(0.466)	(0.442)	(0.382)	(0.354)
Ln GDP pc, lag	0.735		0.859	7.474**		7.506**
	(0.512)		(0.634)	(3.356)		(3.160)
Ln Population	1.333				1.424	0.939
	(1.974)				(2.413)	(1.871)
Ln GDP pc squared, lag				-0.510**		-0.519**
				(0.245)		(0.228)
Ln GNI pc, lag					-0.006	
					(0.417)	
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	236	236	236	236	233	236
No. of groups	35	35	35	35	35	35
First stage F-stat	14.06	14.98	10.76	10.17	8.64	13.08

Notes: All columns are 2SLS estimates, where IV is $Crossing_{s-2}$. Dependent variable is the log period mean FDI/GDP. Ln GDP pc squared, lag is $log(GDPpc_{s-1})^2$. Standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 8: Reducing the number of included time periods around the period of crossing

	OLS					
	(1)	(2)	(3)	(4)	(5)	(6)
Max. no. of periods around crossing	7	6	5	4	3	2
Ln ODA/GNI, lag	0.135	0.135	0.150	0.163	0.203	0.246*
	(0.094)	(0.094)	(0.095)	(0.103)	(0.121)	(0.133)
Ln GDP pc, lag	0.202	0.202	0.189	0.136	0.363	0.569
	(0.366)	(0.366)	(0.368)	(0.375)	(0.342)	(0.387)
Ln Population	-0.173	-0.172	0.136	0.054	-0.756	-1.100
	(2.295)	(2.296)	(2.264)	(2.207)	(2.420)	(1.853)
	2SLS					
Max. no. of periods around crossing	7	6	5	4	3	2
Ln ODA/GNI, lag	0.816*	0.824*	0.806	0.701	1.132*	1.485**
	(0.446)	(0.453)	(0.477)	(0.447)	(0.577)	(0.683)
Ln GDPpc, lag	1.271*	1.282*	1.198	0.964	1.610*	1.867**
	(0.710)	(0.718)	(0.750)	(0.727)	(0.797)	(0.906)
Ln Population	2.356	2.388	2.594	2.145	2.754	4.155
	(3.066)	(3.088)	(3.103)	(3.006)	(3.609)	(3.575)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	229	228	218	202	176	139
No. of countries	35	35	35	35	35	34
First stage F-stat.	14.36	13.96	12.92	12.93	12.08	12.50
Mean ln FDI	3.07	3.13	3.15	3.20	3.24	3.38

Notes: All estimates are in first differences. Upper panel is estimated with OLS, lower panel are 2SLS estimates, where IV is $Crossing_{s-2}$. Dependent variable is the first difference of log period mean FDI per capita. Standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 9: Robustness checks of results to instrument timing and sample selection

	$IV = Crossing_{s-2}$							
	(1) Cross in period s	(2) Cross in $s-1$	(3) Drop s=8	(4) Drop s=7	(5) One Cross	(6) Last Cross	(7) SIDS	(8) NoIDA
Ln ODA/GNI, lag	-0.070	0.345	1.120**	1.811**	0.614*	0.619*	0.898**	1.165**
	(0.815)	(0.704)	(0.544)	(0.854)	(0.361)	(0.322)	(0.409)	(0.475)
Ln GDP pc, lag	-0.565	0.126	0.772	1.316	0.947	0.383	0.693	1.247*
	(1.292)	(1.208)	(0.618)	(0.873)	(0.939)	(0.427)	(0.567)	(0.681)
Ln Population	-1.698	0.229	2.732	5.393	1.087	0.636	1.897	2.606
	(4.052)	(3.763)	(2.871)	(3.535)	(2.777)	(1.785)	(2.069)	(2.189)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	190	190	184	142	201	236	218	211
No. of countries	34	34	28	21	30	35	32	31
First stage F-stat.	3.85	3.94	10.52	9.12	16.01	18.28	12.74	9.02
	$IV = PredictedCrossing_{s-2}$							
	Cross in period s	Cross in $s-1$	Drop s=8	Drop s=7	One Cross	Last Cross	SIDS	NoIDA
Ln ODA/GNI, lag	-0.207	0.271	0.821	3.364	0.833**	0.778**	0.978*	1.076**
	(0.977)	(0.997)	(0.609)	(3.811)	(0.379)	(0.354)	(0.555)	(0.471)
Ln GDP pc, lag	-0.792	0.002	0.387	2.163	0.691	0.601	0.804	1.120
	(1.508)	(1.673)	(0.692)	(3.189)	(0.564)	(0.526)	(0.807)	(0.727)
Ln Population	-2.333	-0.117	1.851	13.152	1.809	1.069	2.113	2.350
	(4.644)	(4.754)	(3.320)	(14.384)	(1.950)	(1.814)	(2.235)	(2.084)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	190	190	152	124	222	236	218	211
No. of countries	34	34	22	18	33	35	32	31
First stage F-stat.	2.95	1.91	4.30	0.72	9.39	10.21	5.73	8.54

Notes: 2SLS estimates, instrumental variable is $Crossing_{s-2}$ in the upper panel, $Predictedcrossing_{s-2}$ in the lower panel. Dependent variable is the log of period mean FDI/GDP. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 10: Extended sample of countries

	Ln FDI/GDP		Ln FDI per capita	
	(1) 40Countries, years 1987-2010	(2) 45Countries, years 1987-2013	(3) 40Countries, years 1987-2010	(4) 45Countries, years 1987-2013
Ln ODA/GNI, lag	0.734**	0.347	0.865**	0.411
	(0.350)	(0.327)	(0.386)	(0.354)
Ln GDP pc, lag	0.497	-0.045	1.557***	0.948*
	(0.466)	(0.436)	(0.521)	(0.474)
Ln Population	0.675	0.312	0.369	-0.193
	(1.758)	(1.324)	(1.765)	(1.299)
Time FE	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes
No. of obs.	270	347	272	349
No. of countries	40	45	40	45
First stage F-stat.	13.16	12.83	13.53	13.01
Mean ln FDI	0.80	0.87	2.83	2.98

Notes: 2SLS estimates, IV is $Crossing_{s-2}$. Dependent variable is ln FDI/GDP in columns 1-2, ln FDI per capita in columns 3-4. 40 countries includes five more crossing before or in 2010. 45 countries add five more that cross after 2010. Robust standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 11: External validity

	Ln FDI/GDP			Ln FDI per capita		
	(1)	(2)	(3)	(4)	(5)	(6)
Crossing 1987-2010	0.763**	0.464		1.365***	0.592*	
	(0.299)	(0.312)		(0.326)	(0.324)	
Q1 GDP pc x Cross			1.028			1.200*
			(0.634)			(0.628)
Q2 GDP pc x Cross			0.232			0.264
			(0.483)			(0.498)
Q3 GDP pc x Cross			0.199			0.295
			(0.434)			(0.434)
Q4 GDP pc x Cross			0.370			0.461
			(0.455)			(0.484)
Real GDP pc, lag		0.467	0.571		1.210***	1.341***
		(0.350)	(0.474)		(0.371)	(0.503)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1192	1192	1192	1192	1192	1192
No. of countries	75	75	75	75	75	75

Notes: OLS estimates on country-year observations. Dependent variable is the log of FDI/GDP in columns 1-3, FDI per capita in columns 4-6. Robust standard errors clustered at country level in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Appendix: Additional Tables

Table 12: Detailed description of variables and sources

Variable	Source	Description
FDI	WDI	Foreign direct investment, net inflows (BoP, current US$).
ODA	OECD/DAC	Net official development assistance received (current US$).
GDP per capita	WDI	Gross domestic product per capita (constant 2000 US$).
GNI per capita	WDI	Gross national income per capita, Atlas method (current US$).
Population	WDI	Total population.
Education	WDI	Primary school enrolment rate: total number enrolled, as share of population in the appropriate age group.
Civil liberties	FH	Includes freedoms of expression, assembly, association, education, and religion. Scale is 1 (free) to 7 (Not free).
Political rights	FH	Free and fair elections, functioning opposition and minority representation. Scale is 1 (free) to 7 (Not free).
Political stability	WGI	Likelihood of political instability and/or politically motivated violence. High estimate = low likelihood.
Control of corruption	WGI	Extent of usage of political power for private gain. High estimate = strong control.
Regulatory quality	WGI	Ability of government to permit and promote private sector development. High estimate = strong.
Inflation	WDI	Inflation as the annual percentage ratio of GDP in current local prices to GDP in constant local prices.
Economic crisis	Laeven et al. (2013)	Total yearly count of banking crisis, currency crisis and sovereign debt crisis (authors aggregation).
Trade, % GDP	WDI	Sum of exports and imports of goods and services, as share of gross domestic product.

Notes: WDI = World Development Indicators, 2016 update. OECD/DAC= DAC2a dataset, Query Wizard for International Development Statistics. FH = Freedom House. WGI = Worldwide Governance Indicators.

Table 13: Growth regressions. Replication of Table 5 in Galiani et al. (2014).

	OLS		2SLS: IV is $Crossing_{s-2}$					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln ODA/GNI, lag	0.012**	0.010	0.028**	0.024**	0.014	0.045**	0.021	0.072**
	(0.005)	(0.007)	(0.010)	(0.010)	(0.012)	(0.018)	(0.024)	(0.033)
Ln GDP pc, lag	-0.060**	-0.159***	-0.037	-0.045*	-0.041	-0.101**	-0.140**	-0.012
	(0.029)	(0.031)	(0.028)	(0.022)	(0.028)	(0.047)	(0.054)	(0.068)
Ln Population	-0.029	-0.024	0.026	0.002	-0.048	0.128	0.025	0.156
	(0.070)	(0.114)	(0.083)	(0.055)	(0.074)	(0.168)	(0.176)	(0.202)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes		Yes	Yes	Yes			
IV = Predicted Crossings					Yes			Yes
First difference		Yes				Yes	Yes	Yes
Instrument in first diff.							Yes	
No. of obs.	247	212	247	281	219	212	212	189
No. of countries	35	35	35	35	30	35	35	30
First stage F-stat			15.11	14.42	10.26	10.64	16.11	5.89

Notes: Dependent variable is mean period GDP per capita (y) growth, defined as $\ln y_t - \ln y_{t-1}$. Observations are country-period, 1987-2010, except for column 4, which is 1987-2013. IV predicted=the synthetic crossings generated by predicted income. IV-FD models generally with instrument not in first difference. Cross FD=IV first differenced. Standard errors clustered at country level in parentheses. F-stat is Kleibergen-Paap Wald. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 14: (Replication) Placebo test: Effect on aid of crossing 50 % of the IDA threshold

	(1)	(2)	(3)	(4)	(5)
	ODA	DAC	NonDAC	MLA	IDA
False crossing in s-2	0.1063	0.3123	-1.0231	0.8192	0.4710
	(0.6741)	(0.9117)	(1.4946)	(0.5367)	(0.2990)
Ln GDP pc, lag	-2.8362***	-2.6125***	-1.0226	-2.3640***	-0.6667
	(0.5276)	(0.8188)	(0.8358)	(0.5663)	(0.5912)
Ln Population	-8.2236***	-8.8675***	-0.1189	-5.1160**	0.4787
	(1.8692)	(2.6262)	(4.7213)	(2.0499)	(2.2810)
No. of obs.	130	130	130	130	130
No. of countries	32	32	32	32	32
p-value coef=0	0.88	0.73	0.50	0.14	0.13

Notes: Replication of Galiani et al. (2014), Table 4. Dependent variable is $\ln ODA/GNI_{s-1}$ from donor type specified in each column. Missing values for donor types other than total ODA are not included. ODA=total official development assistance. DAC=bilateral ODA from DAC members. NonDAC=bilateral ODA from non-members of DAC. MLA=other multilateral aid. IDA=multilateral aid from the IDA/WB. No missing values for total ODA in this sample. GDP in constant 2000 USD. Robust standard errors clustered at country level in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 15: Reduced form results

	Ln FDI/GDP	Ln FDI pc
	(1)	(2)
Crossing in s-2	-0.696**	-0.785***
	(0.257)	(0.273)
Ln GDP pc, lag	-0.317*	0.612***
	(0.183)	(0.191)
Ln Population	-1.483	-2.444*
	(1.360)	(1.336)
Time FE	Yes	Yes
CountryFE	Yes	Yes
No. of obs.	236	238
No. of countries	35	35
Mean ln FDI	0.84	3.07

Notes: Dependent variable specified at top of each column. Years 1987-2010. Robust standard errors clustered at country level in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.

Table 16: Regressing control variables on instrumented aid

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Education	Trade	Civil Liberties	Political Rights	Political Stability	Regulatory Quality	Control of corruption	Crises	Inflation
Ln ODA/GNI, lag	2.205	13.272	-0.081	-0.290	0.513**	0.279	-0.034	-0.083	28.276
	(3.091)	(8.792)	(0.243)	(0.430)	(0.238)	(0.225)	(0.157)	(0.101)	(94.907)
Ln GDP pc, lag	-3.122	-3.197	-0.187	-0.422	0.684**	0.489*	-0.036	-0.118	332.707
	(9.122)	(11.267)	(0.353)	(0.664)	(0.269)	(0.261)	(0.196)	(0.152)	(301.122)
Ln Population	17.233	51.161	1.222	0.372	0.325	-0.299	-0.636	-0.124	2091.024*
	(25.660)	(38.094)	(1.318)	(2.119)	(1.469)	(0.813)	(0.474)	(0.599)	(1226.367)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	224	243	247	247	171	172	172	247	244
No. of countries	33	35	35	35	35	35	35	35	35
First stage F-stat.	16.90	16.51	15.11	15.11	7.50	7.59	7.59	15.11	16.25
Variable Mean	98.65	86.58	4.36	4.32	2.80	2.06	1.39	0.20	94.96

Notes: 2SLS estimates, instrumental variable is $Crossing_{s-2}$. Dependent variables are specified for each column. Sample sizes are set by all non-missing observations. Standard errors clustered at country level in parentheses. $*p < 0.10, **p < 0.05, ***p < 0.01$.