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Abstract

History tells us that sustained economic growth, necessary to alleviate poverty in sub-Saharan Africa, requires growth in the fundamentals, such as infrastructure and human capital, but also structural transformation, i.e., a reallocation of labor from low-productivity to high-productivity sectors. I study whether foreign aid is a factor that helps or hinders structural transformation. I use a dataset on aid projects with precise coordinates from all major donors and match it to panel data with extensive information on labor market activities for a large representative sample of individuals in Uganda. I find consistent evidence that foreign aid reverses the process of structural transformation. More specifically, the local short-term effect of foreign aid is that people in areas with ongoing aid projects work more in agriculture and less in non-agricultural sectors. There are no significant effects on wages or household expenditures for people in the agricultural sector, but the effects on people in non-agricultural sectors are negative.

Keywords: foreign aid, structural transformation, Africa, AidData, LSMS
JEL classification: F35, O14, O55

1. Introduction

Structural transformation, the reallocation of labor from low-productivity to high-productivity sectors, is a process that all countries that today are rich and industrialized have gone through. The sectoral share of agriculture falls over time, both in terms of the gross domestic product and in terms of employment, while the share of the service sector increases. The share of the industrial sector grows and then shrinks (Duarte and Restuccia 2010, Herrendorf et al. 2014). While this is a core stylized fact of economic development, this process has during recent decades occasionally moved backwards on the African continent. Labor moved not from low-productivity to high-productivity sectors but the opposite during the period 1990-2010, and though there was a reversal of this trend

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in the later part of the period, some obstacles are clearly slowing the pace of the much needed structural transformation process (McMillan et al. 2014). This has led to concerns about whether countries on the continent can actually sustain high economic growth (Rodrik, 2016). During the same period, African countries were recipients of large amounts of foreign aid and their economies constantly subject to donor involvement. Are these phenomena related? The question asked in this paper is whether foreign aid helps or hinders the process of structural transformation.

There is some agreement in the literature on the determinants of aid allocation, e.g., that it is largely determined by strategic donor interests. The impact of aid on economic growth is more debated, even if some see an emerging consensus that the effect is positive (Arndt et al. 2015a). The consequences of foreign aid for structural transformation on the national level is still open to debate. Effects found on modern manufacturing or exporting sectors range from negative in the short term (Rajan and Subramanian 2011), to positive both in the short term (Selaya and Thiele 2010) and the long term (Arndt et al. 2015b). When the effects on the national level are negative, a Dutch disease type of argument is often evoked. The core of this argument is that an inflow of foreign aid can lead to an exchange rate appreciation, an added burden on manufacturers struggling to be internationally competitive.

The analysis in this paper is made using data on the sub-national level, and Uganda is well suited for an analysis of the within-country effects of aid on sectoral labor allocation. Uganda is a large poor country in sub-Saharan Africa for which there is both georeferenced data on aid projects and household-level panel data with information about labor allocation by sectors. I match aid projects to individuals at the lowest administrative level possible, the parish. This allows me to examine the short-term impact of foreign aid on the process of structural transformation, which at the individual level is measured using hours worked in different economic sectors.

The empirical exercise shows that foreign aid projects have a moderate but robust statistically significant short-term effect on the local economic structure. In areas with ongoing aid projects, non-agricultural sectors are depressed while activity in the traditional agricultural sector is encouraged. There are negative effects on wages and household expenditures, driven by negative outcomes for people active in industry and services. The implication is that aid projects, in the way that they are now being implemented, may create obstacles for countries that want to escape poverty by undergoing structural transformation. Donors need to consider how they affect not only growth fundamentals, such as human capital and infrastructure, but also the sectoral allocation of labor.

I review the related literature in the fields of structural transformation and aid-effectiveness, as well as the smaller strand of the literature that concerns the overlap of these fields, in more detail in the next section. After that, in Section 3, I discuss the data and empirical strategy used in the empirical analysis. The results of the analysis are presented and discussed in Section 4. Section 5 concludes the paper.

2. Related literature

2.1 Aid-effectiveness

The *foreign aid paradox* states that in developing countries that have got the fundamentals right, the conditions for investments are already good and investments will already be taking place.[1] In developing countries where the conditions for investment are not good, however, aid money will be unproductive and a waste of resources. In light if this paradox, it may not be a surprise that so many studies fail to find that aid leads to growth.[2]

Using an instrument based on the income-threshold for certain forms of World Bank-aid, Galiani et al. (2017) document that aid can have a positive effect on growth. Given the instrument, this is the local average treatment effect (LATE) of aid received by poor countries because they are poor, and not necessarily the effect of aid in general. Still, the finding is important as it casts doubts on the position that foreign aid cannot have a positive impact. Using a different type of instrument, Rajan and Subramanian (2008) find no effect of aid on growth, irrespective of policy environment, geography, or type of aid. Their instrument is based on the supply of aid and the character of donor-recipient relationships. As such, their zero-finding is the LATE of aid given for these reasons. Evidently, well-crafted analyses can reach different conclusions, and also meta-studies are hard pressed to find an agreement. For instance, where Doucouliagos and Paldam (2009) reveal a negative effect of aid, Mekasha and Tarp (2013) make a few not overly dramatic methodological adjustments and find a positive effect.[3] The case for aid is weakened by negative impacts found on other aspects of development. For instance, Djankov et al. (2008) find a negative effect on democratic institutions, Svensson (2000) that it leads to more corruption, and Rajan and Subramanian (2011) that it leads to Dutch disease and therefore hurts exporting sectors.[4]

An emerging strand of the literature considers the effects of aid on the sub-national level. A recent study of the effect of World Bank aid on sub-national development is Dreher and Lohmann

[1] For reviews of the theory and empirics on the impact of foreign aid, see Temple (2010), Qian (2015), and Addison et al. (2017). The paradox, and the main theoretical arguments why aid still could matter in light of it, are discussed in Temple (2010).

[2] Caselli and Feyrer (2007) find that the marginal product of capital is similar across countries. With this as a starting point, they argue that developing countries do not have low capital-labor ratios because of poorly functioning credit-markets, but rather due to a lack of complementary factors, such as human capital and TFP. This suggests two things. First, aid to regular investments in physical capital should crowd out private capital and not affect economic growth. Second, if aid instead contributes to the build-up of complementary factors, where additional funds may yield high social returns but not as high private returns, this will increase the marginal product of capital temporarily, more investments will be made, and there will be more economic growth.

[3] Comparisons are complicated by the fact that even findings published in highly ranked journals have been found to not be robust to changes in specification and sample (Roodman 2007).

[4] A number of studies have disaggregated aid into aid from different classes of donors or aid to different sectors of the economy. To mention a few, Easterly (2003) finds that multilateral aid is more effective than bilateral aid, Clemens et al. (2012) find a positive role for "early-impact" aid, which is types of aid whose impact should be seen within the time frame considered, Dreher et al. (2008) find that more aid to education leads to higher primary school enrolment, and Jones and Tarp (2016) find that aid, especially if targeted to the public sector or the government, does not on average have a negative effect on institutional quality.

(2015). Using regional nighttime light growth as the indicator of development, they find a positive correlation, but no causal effect of aid. Some studies use a mix of treatment and effect at different administrative levels. Hodler and Raschky (2014) combine a treatment at the national level with characteristics at the regional level to study outcomes at the regional level. They find that more aid at the national level is associated with an increase in nighttime light in regions where the leader was born.

Aid allocation within countries is determined by factors similar to the donor-recipient relations uncovered at the national level. In Africa, the birth region of political leaders matter for aid allocation while objective measures of need do not, both for aid from China (Dreher et al. 2014) and from the World Bank and the African Development Bank (Öhler and Nunnenkamp 2014). In India, local needs and political patronage hardly affect World Bank aid allocation across districts (Nunnenkamp et al. 2017).

2.2 Structural transformation

The process of structural transformation involves a declining share of agriculture in GDP, combined with an increasing share of services, and a hump-shaped share of manufacturing.[5] The core of many formal models on structural transformation, such as Kongsamut et al. (2001), Ngai and Pissarides (2007), and Matsuyama (2009), is focused on mechanisms that can explain why structural transformation is occurring in the first place. In Kongsamut et al. (2001), structural transformation is driven by the demand side and explained by income effects and non-homothetic preferences, an argument made similarly in Laitner (2000). Supply side factors are central in Ngai and Pissarides (2007), where the process is driven by relative price changes due to differences in TFP growth rates across sectors, and in Acemoglu and Guerrieri (2008), who focus on capital deepening and sectoral differences in capital intensity. Herrendorf et al. (2013) use data from the U.S. to empirically investigate the importance of the two main theoretical factors argued to lead to structural transformation, income changes and relative price changes, and find that there are merits to both. Duarte and Restuccia (2010) find that productivity growth differences (implying relative price changes) between sectors can explain the patterns of structural transformation across countries. McMillan et al. (2014) find that structural transformation is positively affected by exchange rate undervaluation, consistent with the Dutch disease logic.

2.3 Structural transformation in Africa

In Africa, economic growth after 1990 has been held back the movement of labor from high-productivity to low-productivity sectors, even if there is a modest contribution to growth from

[5] These stylized facts are documented in, e.g., Duarte and Restuccia (2010) and Herrendorf et al. (2014). See Herrendorf et al. (2014) for an overview of theory and stylized facts about structural transformation, but also, e.g., Ray (2010), and more recently, McMillan et al. (2016). Some authors prefer the term structural change to the term structural transformation.

structural transformation after the year 2000 (McMillan et al. 2014). McMillan and Harttgen (2014) find that about half of the economic growth in Africa during the period between 2000 and 2010 is due to structural transformation, with labor moving out of agriculture. Structural transformation in sub-Saharan Africa in the long term is studied by de Vries et al. (2015), who document an overall growth of the manufacturing sector during the high economic growth period 1960-1975, and a growth of services during 1990s. In terms of employment, the manufacturing sectors in the countries studied by de Vries et al. (2015) have the same share in 2010 as they did in 1990, but about ten percent of the work force has shifted from agriculture to services.[6]

2.4 Structural transformation and economic growth

Structural transformation and economic growth are related but should not be confused. As argued in McMillan et al. (2016), both improvements in the fundamentals, such as human capital and infrastructure, and structural transformation, where scarce resources move from low- to high-productivity sectors, are needed.[7] To increase the share of manufacturing could also have positive dynamic growth effects since there is evidence of unconditional convergence in manufacturing (Rodrik 2013). A low share of manufacturing in poor countries, and insufficient labor reallocation into manufacturing, prevents many poor countries from benefiting from this convergence. That is, with manufacturing comes a great potential benefit to poor countries in terms of productivity growth in that sector, and productivity growth at the aggregate level would be greater if more labor had been allocated to manufacturing to begin with (Rodrik 2013). Another feature of manufacturing that has made it central to the process of structural transformation and economic growth is its' capacity to employ large quantities of workers with moderate skills that cannot be absorbed in the agricultural sector (McMillan and Headey 2014).

2.5 Foreign aid and structural transformation

The evidence on the effects of foreign aid on structural transformation on the national level is mixed.[8] That the effects of aid on manufacturing is more positive in the long term (Arndt et al. 2015b) could be because real exchange rate overvaluations fade away once supply has had time to catch up with the increase in demand. Then, by affecting production prices, the Dutch disease

[6] Gelb et al. (2014) note that there are highly productive firms in sub-Saharan Africa, and asks why their productivity has not diffused more, across sectors or across firms within sectors. They consider three main explanations. First, a poor business climate with poor infrastructure and excessive regulation crowds out the manufacturing sector. Second, the economies are less attractive for investments due to small markets and low state capacity, which are related to geography and colonial history. The third reason is the high prevalence of ethnically based businesses, often led by minorities.

[7] It has been argued that the large agricultural productivity gap, i.e., the difference in value added between agriculture and non-agriculture, observed especially in developing countries is due to measurement issues. Gollin et al. (2014) find that this is not the case, and suggest that the gap is caused by sectoral misallocation of labor. The implication is that closing the gap by reallocating labor would greatly increase aggregate productivity.

[8] For a discussion, see Temple (2010).

effect on the tradable and non-tradable sectors are counteracted (Selaya and Thiele 2010). That studies, such as Rajan and Subramanian (2011) and Selaya and Thiele (2010) find different effects also in the short term could be because of differences in data, definition of key outcome variables, and empirical methods. A reason for why the real exchange rate may not appreciate, and for why there may be no Dutch disease type of effect even in the short run, is, according to Selaya and Thiele (2010), the idle labor capacity in developing countries.[9]

3. Data and estimation strategy

3.1 Data

I combine data on aid projects in Uganda from AidData (Tierney et al. 2011, AidData 2016a) with panel data on individuals from the Uganda National Panel Survey (UNPS; World Bank, 2017).[10] The data from AidData (2016a) covers aid projects by 56 donors between 1978 and 2014, and includes 565 geocoded aid projects across 2426 locations in Uganda.[11] Project details include aid commitment, aid disbursement, starting date, end date, donor, and aid sector. Projects that are geocoded have point coordinates that are coded with different levels of precisions. I follow a common practice in the literature that uses georeferenced aid data and use project locations that have AidData precision codes 1 or 2.[12] I use these coordinates to assign aid projects to Ugandan parishes and to the individuals living there.[13] A single aid project can be implemented in several different locations, each with point coordinates supplied in the dataset, but the data on the aid amount is not as disaggregated. When there is data on aid amounts, it is only the total for the project as a whole over the full period the project runs.

As in Dreher and Lohmann (2015), the aid indicators here capture the amount of aid per capita. The following procedure is followed, and since there will be measurement error in each of these steps, the estimates I obtain when I use these indicators as explanatory variables will suffer from

[9] It is often argued that whether aid leads to real exchange appreciation depends on the supply side response of the targeted country. A recent example of this is Addison and Baliamoune-Lutz (2017), who find Dutch disease effects of aid on the real exchange rate in Morocco but not in Tunisia, and argue that it reflects differences in the domestic policy response and in supply side factors such as infrastructure.

[10] Recent studies that also combine these datasets include Odokonyero et al. (2015), who use a difference-in-difference type of method to establish that aid has positive effects on health outcomes, and Berlin et al. (2017), who use a matching procedure and find inconclusive overall effects on gender-related outcomes and attitudes. Civell et al. (2017) use data from AidData and combine it with a dataset related to the UNPS, the Uganda National Household survey (UNHS). In a two-stage approach they first investigate the effect of foreign aid on nighttime luminosity at the district level, and then the effect the latter has on household expenditures, also at the district level.

[11] For an overview of the aid history of Uganda, and an analysis showing positive effects of aid on tax revenues between 1970 and 2014, see Bwire et al. (2017).

[12] A precision code 1 means that the AidData coordinates "correspond to an exact location or populated place," and a precision code 2 means that the "coordinates correspond to a location that is known to be within 25km of the coordinates or a division smaller than ADM2" (AidData 2016b: 3).

[13] Administrative boundaries are not constant over time. In the present paper, maps on administrative boundaries from RCMRD (2017) are used throughout.

attenuation bias and can therefore be seen as conservative. Aid commitments are used since one of the estimations methods I use rests on the inclusion of an indicator for aid projects that are yet to be implemented at the time of the UNPS surveys, and since data on actual disbursement is missing for aid projects that were not completed at the time the AidData was compiled. The total aid amount, in constant USD, for each project is divided into equal amounts for each project location and year.[14] To calculate the population in each parish, which in Uganda is the fourth administrative level, maps on administrative boundaries from RCMRD (2017) and on population from Gridded Population of the World (CIESIN 2016) are used.[15] Similar to Hodler and Raschky (2014), the indicators are created as the natural logarithm of one plus the amount of aid per capita.[16] The main aid indicators are thus continuous measures, designed to capture the intensity by which the population in a certain area is treated by the presence of a foreign aid project. Continuous indicators, rather than dummy variables indicating the presence or not of an aid project nearby, are reasonable in this context since the effect on the local economy ought to be stronger if there are more or larger aid projects in the area.

Data on labor market outcomes is drawn from the Uganda National Panel Survey (UNPS), which is part of the World Bank's Living Standards Measurement Study (LSMS) project.[17] The first three waves of the UNPS, the 2009/2010 wave, the 2010/2011 wave, and the 2011/2012 wave, are used, since these allow for tracking of individuals and households over time, and provide longitude and latitude of the households.[18]

The same maps on administrative boundaries that are used to assign aid projects to different administrative units are used to assign individuals within households to different parishes depending on the coordinates of the household. The longitude and latitude of households supplied with the UNPS do not reveal the exact location of the households due to a modest random scrambling of the coordinates. The random offset of the coordinates is in the range of zero to two kilometers in urban areas and zero to five kilometers in rural areas, with an additional zero to ten kilometer offset

[14] Data on aid commitment in projects with precision codes 1 or 2 that had not already been implemented fully in 2009 and could therefore be used in the present analysis is available for 109 projects covering 599 different project locations.

[15] In the maps from RCMRD (2017), Uganda has 58 districts (ADM1), 162 counties (ADM2), 967 sub-counties (ADM3), and 5,342 parishes (ADM4). Uganda covers 241,038 km^2, so on average a parish covers 45 km^2. The Ugandan population in 2009 was about 33 million, which means that the average parish population was about 6,200 individuals. I use the method in Dreher and Lohmann (2015) to calculate the parish population, including the linear interpolation for missing years.

[16] For each parish, the aid indicators come from first taking the sum of the assigned aid amounts for each parish that particular year, then dividing that number by the parish population the previous year. The analysis is made on the natural logarithm of one plus this per capita amount.

[17] More specifically, it is part of LSMS-ISA. The UNPS is representative at the urban/rural and regional level. The World Bank/LSMS-ISA team collaborates with the Uganda Bureau of Statistics in the actual management and implementation of the UNPS.

[18] Since some people move, one cannot use coordinates from one wave as if they were also the coordinates of the household in an earlier or later wave. That means that one cannot assign coordinates from later or earlier waves to the households in the earlier 2005/2006 UNHS (Uganda National Household Survey) or the later 2013/2014 UNPS survey.

for one percent of the rural households.[19] Figure 1 shows the spatial distribution of all household locations in the three survey waves as well as the full set of geocoded aid projects.

[Figure 1 about here]

The fact that administrative units, such as parishes, are nested within higher administrative units means that one can include spatial fixed effects and time trends at different administrative levels. It is also straight-forward to compare results with spatial fixed effects at different administrative levels with each other. Since individuals are matched to aid projects at the parish level, one can test whether the results hold if one includes parish fixed effects, i.e., fixed effects at what I use as the treatment level. That would not be possible if one had created buffer zones around each household, and used aid projects within these buffers as the aid indicators. Buffer zones will overlap each other and intersect political units at different administrative levels, such as districts, counties, or parishes. Spatial fixed effects at these administrative levels will then not capture all time-invariant characteristics at the treatment level. Moreover, it is standard to cluster standard errors at the treatment level. This is easy to do since the parish is the assigned treatment level. If one used buffers around each household, standard errors should also be clustered at the household level, and in short panels this is not optimal. Most important, though, is that one's economic activity is more tightly linked to events taking place in the administrative unit where one lives, than to events taking place in buffer zones created *ad hoc*.[20]

The respondents in the UNPS are asked about the labor market activities of all the members of their households. For each individual (household member), there are details on the main income generating activity, which could be either a job or a business, during the week before the survey. Based on the responses to these questions, I construct a set of indicators of different aspects of the labor market and the local economic structure. These indicators, measured at the individual level, are then used in the analysis to gain insights into whether foreign aid leads to structural transformation.

The main indicator of sector of activity is *Work on Hh farm*, the number of hours worked on the household farm or with household livestock. To complement this indicator, the character of the main income generating activity will be assessed using details on occupation in terms of main tasks or duties, and economic sector of activity in terms of the main goods or services produced at the

[19] When this means measurement error in the dependent variables it leads to less precise estimates, but not to inconsistency in the estimates. When it means measurement error in the explanatory variables, the estimates will suffer from attenuation bias, and can therefore be seen as conservative.

[20] Both administrative units and buffer zones will vary in terms of size of the population and population density. These factors must therefore be held constant in the regressions irrespectively of whether the treatment is defined to be on the administrative unit level or on the buffer zone level. Administrative units will vary in physical size in a way that buffer zones will not, but one can control for that by including physical area as a control variable in the regressions, or use area fixed effects.

place of work. Respondents are asked to describe the tasks or duties and the industry with their own words, and the activity is then assigned the appropriate ISCO (International Standard Classification of Occupations)-code and ISIC (International Standard Industrial Classification)-code. Following, e.g., Duarte and Restuccia (2010) and McMillan and Harttgen (2014), the ISIC-codes are used to distinguish between hours worked in the agricultural, industrial, or service sectors. The ISCO-codes are used to distinguish between hours worked in agricultural, industrial, or service occupations.[21] For summary statistics and a detailed description of all key variables, see Tables A.1 and A.2 in *Appendix A*.

The sample consists of all household members represented in any of the three survey waves, that are ten years old or more, that in the surveys are coded as usual members of the household, i.e., they have stayed with the household for at least six of the last twelve months, and that are not included in the household roster because they are servants to the household.

3.2 Estimation strategy

Aid projects are not randomly allocated. In a naïve bivariate regression with aid projects as the independent variable and some labor market outcome as the dependent variable, the estimate would suffer from an omitted variables bias.

One of the methods I use to deal with this problem shares important characteristics with the difference-in-difference method. This method retains variation both between and within parishes and is similar to the one used recently in economics and political science in the context of foreign aid (Isaksson and Kotsadam 2018, 2017) and mining (Kotsadam and Tolonen 2016, Knutsen et al. 2016). To ensure that the underlying assumptions, which is those of the difference-in-difference method, are reasonable I hold constant a number of factors that I believe to be good candidates for both explaining where aid projects are allocated and for being correlated with the labor market outcomes that I am interested in. The following characteristics of the location where the individuals live are provided by UNPS and are calculated using the exact location of the households: urban/rural area status, percent agriculture within one kilometer, distances to market, to headquarters of district of residence, to nearest land border crossing, to nearest major road, and to nearest population center, elevation and slope, annual mean of temperature and precipitation, and mean temperature and precipitation of the wettest quarter. I supplement these with indicators I calculate at the level of the parish: population density and nighttime light emission in the year 2000, physical size, and size of the population during the previous year. Individual-level characteristics always included are gender, age and age-squared, ethnic group dummies, but also ethnic group-by-gender-dummies, and a gender-by-urban dummy. Since the time period studied here is short, I assume that the role of other, *unobserved*, determinants of the within-country allocation of aid projects is approximately constant. Then, under the common trends assumption, the omitted variables problem is solved by

[21] As these are dependent variables, measurement error here will lead to less precise, yet still consistent, estimates.

including measures both for aid projects that are currently being implemented and for aid projects yet to be implemented. Conditional on the included control variables, the *difference* between the estimates of the ongoing and future aid projects will not be affected by unobservable time-invariant characteristics that determine whether areas will ever be targeted by foreign aid. Individuals in areas without aid projects, in the past, the present, and the future, serve as the control group. I estimate the following equation:

$$\begin{aligned} Y_{ipt} &= \beta_1 \cdot Ongoing\ aid/capita_{pt} + \beta_2 \cdot Future\ aid/capita_{pt} + \alpha_d + \delta_t \\ &\quad + \eta_d \cdot t + \gamma \cdot X_{it} + \lambda \cdot X_p + \varepsilon_{ipt} \end{aligned} \qquad \text{(Equation 1)}$$

Y_{ipt} is the labor market outcome measure for individual i, in parish p, at time t. *Ongoing* and *Future aid/capita* are the parish per capita amountss of aid in aid projects currently being implemented and projects yet to be implemented. *Ongoing* aid projects are projects that had a start date no later than the year of the survey and had an end date not prior to the year of survey. *Future* aid projects are projects that started no earlier than the year after the survey.[22] α_d are district fixed effects (parishes are nested within districts), η_d represents linear district time trends that together with the year-by-month fixed effects (δ_t) capture seasonal and within-country trends and aggregate shocks, X_{it} is a vector of individual-by-time-level controls, and X_{pt} is a vector of parish level controls. The time-invariant and time-varying covariates make the common trends assumption credible, but will also reduce noise and give more precise estimates.[23] Details on what is included in these vectors is discussed above, but can also be found in the notes to the first regression table, Table 1. Standard errors (ε_{ipt}) are clustered at the parish level.

The estimates of β_1 or β_2 cannot be given a causal interpretation in isolation since they are both likely to be biased due to omitted variables. However, their difference, $\beta_1 - \beta_2$, is a difference-in-difference type of measure, and it is this difference that is in focus when the results are presented in Section 4. If positive, it says that conditional on the underlying probability that the parish attracts aid, which is captured by the measure for yet to be implemented aid projects and other the control variables, aid projects currently being implemented in the parish have a positive effect on the labor market outcome studied.

The UNPS data has a panel structure, but most of the variation in aid project exposure during the short sample period, 2009-2012, is spatial rather than temporal. Still, that each parish is observed in several time periods presents us with the possibility to remove all time-invariant unobserved heterogeneity at the parish level. In a parish fixed effects specification, only the year-to-year

[22] The aid amount used for *Future aid/capita* is the amount in yet to be implemented projects averaged over the period from the year after the survey until 2018, which is the latest end year of any future aid projects in the AidData dataset.

[23] How the inflow of foreign aid and the sectoral shares of agriculture, industry, and services evolve on the national level over the sample period is shown in Figures B.1 and B.2 in *Appendix B*. Shocks or trends in these will be absorbed by the control variables.

change at the parish level is retained and the identifying variation no longer comes from the level, but from the change in foreign aid. I exploit the temporal variation in aid in ongoing projects by estimating the following parish fixed effects-specification:

$$\begin{aligned} Y_{ipt} &= \beta_1 \cdot Ongoing\ aid/capita_{pt} + \alpha_p + \delta_t \\ &\quad + \eta_d \cdot t + \gamma \cdot X_{it} + \varepsilon_{ipt} \end{aligned} \qquad \text{(Equation 2)}$$

The key difference compared to *Equation 1* is that parish fixed effects (α_p) are included, so that β_1 is estimated using the within-parish variation in aid only.[24] The interpretation of a positive estimate of β_1 obtained using *Equation 2* is that if there is more aid coming into the local area this year than the year before, the probability of observing the specific labor market outcome is higher.

In a lagged dependent model, the lag of the dependent variable will capture the influence of many of the underlying determinants, thus making the assumption of a causal effect of aid more plausible. The equation for the lagged dependent model:

$$\begin{aligned} Y_{ipt} &= \beta_1 \cdot Ongoing\ aid/capita_{pt} + \chi \cdot Y_{ip(t-1)} + \alpha_p + \delta_t \\ &\quad + \eta_d \cdot t + \gamma \cdot X_{it} + \varepsilon_{ipt} \end{aligned} \qquad \text{(Equation 3)}$$

When the lag of the dependent variable is included, the model becomes dynamic. χ is expected to be positive and suffer from Nickell bias. Note that the parish fixed effects are still included.

I also estimate an individual fixed effects model by estimating the following equation:

$$\begin{aligned} Y_{ipt} &= \beta_1 \cdot Ongoing\ aid/capita_{pt} + \alpha_i + \delta_t \\ &\quad + \eta_d \cdot t + \gamma \cdot X_{it} + \varepsilon_{ipt} \end{aligned} \qquad \text{(Equation 4)}$$

When the individual fixed effects (α_i) are included they render the parish fixed effects (α_p) redundant. For the standard errors to still be clustered at the parish level when *Equation 4* is estimated, the sample needs to be restricted to individuals that always live inside same parish.

4. Results

4.1 Main results

If foreign aid projects promote local structural transformation, people near aid projects will gradually come to work less on the household farm or with household livestock and work more in off-farm activities. The evidence presented in Tables 1 and 2 shows that the exact opposite is taking place.

[24] The estimate of β_1 will suffer from attenuation bias. The data on aid commitment is not disaggregated by project location and year. The yearly data is created by attributing equal shares of the total project amount to each project location and year that is recorded for each project. While I believe that this is a reasonable approximation, there will be a lot of noise, especially as the identification comes only from the temporal variation within each parish.

While the positive estimate for *Ongoing aid/capita* in the first column in Table 1 suggests that people work more on the household farm in areas where more aid money is currently coming in, we know it will suffer from an omitted variables bias, i.e., capture factors that determine the location of aid projects. We therefore relate it to the estimate for *Future aid/capita* in the same column. The latter is significantly negative, indicating that aid projects target areas where people tend to work *less*, not more, in the traditional agricultural sector to begin with. The significant F-test of the difference between these two estimates, which is the *difference-in-difference type of measure*, confirms that there is a positive effect on farm and livestock activity.[25]

Aid per capita is measured at the level of the parish. With the inclusion of parish fixed effects in the specification in the next column, the identifying variation comes only from yearly changes within parishes over the four consecutive years covered in the UNPS sample.[26] Again, an inflow of aid money is found to encourage household farm and livestock activities. The qualitative result is the same when I add the lag of the dependent variable, in the third column, and individual fixed effects, in the fourth column. Comparing the results in the last three columns, the strongest magnitude is found in the lagged dependent model, but even here the effect is moderate. One standard deviation increase in *Ongoing aid/capita* leads only to a 0.07 standard deviations increase in *Work on Hh farm*, i.e, the number of hours worked on the household farm or with household livestock.

There would be less reason for concern if the positive effect on hours worked on the household farm did not coincide with fewer hours worked elseswhere, but the number of hours worked *outside* the farm actually do fall in areas with ongoing aid projects, see Table 2. Total hours worked is not affected. The short term effect of ongoing aid projects is therefore one of reversed structural transformation. People living in areas more exposed to foreign aid activity tend to work fewer hours off-farm and concentrate more on traditional agricultural activities.

[Table 1 about here]

[Table 2 about here]

The analysis here uses aggregated aid at the local level, regardless of identity of the donors or of what sector the aid project targets. In *Appendix D*, I show that the results are not driven by aid projects from any single group of donors or to any single aid sector alone, and are therefore unlikely to capture that aid alleviates any particular binding constraint.

[25] Econometrically, it would be a problem if aid projects specifically targeted areas with a *trend* from non-agricultural to agricultural production, or vice versa. As I show in *Appendix C* that is not the case here.

[26] The parish is the level at which aid projects are matched to individuals. The parish is the fourth administrative level (after district, counties, and sub-counties). Since respondents in the sample used here come from over 500 parishes, a high number of area fixed effects are estimated. Any time-invariant characteristic of the parishes that could be driving both the local industrial structure and the allocation of aid projects are removed. Time-variant heterogeneity is dealt with by the inclusion of year-by-month fixed effects and linear district time trends.

4.2 Robustness

Before turning to alternative indicators of sectoral activity that can help to uncover the underlying mechanisms and reveal what other activities those that flow into agriculture are abandoning, Table 3 is devoted to investigating the robustness of the positive short-term effect of aid on hours worked on the farm uncovered above. First, the set of control variables can be expanded considerably without affecting the results. Several of these additional control variables, presented in the notes to the table, are likely to be endogenous, wherefore they do not belong in the baseline regressions.

In Uganda, the administrative level below the district is the county. In the baseline estimation, district fixed effects and linear district time trends are included. There may important unobserved heterogeneity in levels and trends between counties within each district, and this may bias the *DD*-results. The results in the third line show that this is not the case since estimates are quite similar when I replace the district-level indicators with their county-level counterparts. This interpretation is further backed up by results I obtain when I first omit all individuals living in *counties* that score zero on both aid indicators (ongoing and future aid per capita) and where there also have been no other aid projects for at least five years, and then, in the next specification, omit individuals in *counties* where at least one aid project has been completed during the last five years.

In the baseline, the sample consists of individuals that by the UNPS are coded as usual members of the household. The reason is that when the treatment is defined at the parish level, individuals cannot be considered to be effectively treated if they have lived elsewhere for most of the year. In the sixth line, the sample is expanded to include household members that are either servants or have not stayed with the household for at least six of the last twelve months. This does not affect the result.

Rural-urban migration is limited in Africa despite apparent potential gains for migrants.[27] How beneficial migration out of rural areas is depends on the character or the area people migrate to. Migration out of agriculture leads to faster poverty reduction if people move into secondary towns or the rural nonfarm economy rather than into large cities (Christiaensen and Todo 2014). Foreign aid could affect migration patterns, and structural transformation is sometimes even confused with internal rural-urban migration. The inflow of aid to an area may either attract people or force them to reallocate to other areas. Suppose that people move to a location where there was an ongoing aid project in order to find work. That does not mean that the aid project has no effect on the local economic structure, but it would affect how one interprets the impact on the people that lived there before. The results from the individual level fixed effects specification presented in Table 1 suggest that migration is not a fundamental underlying force. An alternative way to test whether migration is a channel is to omit all persons that have migrated to their current location to either look for work or for other economic reasons. Excluding all economic migrants does not change the

[27] For evidence on this migration, and a discussion on potential factors that could explain low migration, see de Brauw et al. (2014).

result in any meaningful way.

Not all individuals in the sample have a main income generating activity. Some are probably too old to work, but a majority of those that do not work are attending school. There is also some missing data on occupation or sector, or on number of hours worked, but that is on a reasonable level.[28] In the surveys, there are more general questions about economic activity that does not refer to the main job or business. They include having any paid job, running any business, doing any unpaid work in family businesses, or doing any paid or unpaid work on the household farm, but less than one percent of those for which there is no data on the character of their main job or business have some economic activity according to any of these measures. The sample does not contain individuals that are too young to be a part of the (latent) work force. A majority of the 10-17 year olds in the sample are reported to have a main job or business, classified as an agriculture occupation (55%), an industry occupation (2%) or a service occupation (2%).[29] Hence, the young cannot be excluded from the sample on basis of an argument that they are too young to work and therefore not part of the workforce. For completeness, I omit all individuals younger than 18 years old in a separate specification. The demographic profile of the sample means that a considerable share of it is dropped. The qualitative results are not affected.

In line nine, I use only one round of the UNPS. Note that while I here use only the first of the three UNPS rounds, the outcome in the lagged dependent specification in Table 1 is measured in the last two rounds. The robustness of these results means that the baseline result is not an artefact of some unusual or atypical event or action that for some unrelated reason also affected the people included in the sample between the survey rounds.

One should always consider the risk for selection bias caused by under- or oversampling of certain groups. In the remained of Table 3, I omit individuals living in parishes that are small or large in terms of either physical size, population, or population density, in order to show that the results are not excessively influenced by them. Finally, the mean and median number of individuals per parish in our baseline sample is about 100, but some parishes are represented by few individuals. This does not drive the results, since these hold also when parishes with few individuals in the sample are omitted. My conclusion from the evidence presented above is that the positive short-term effect of aid on traditional agricultural activities is genuine and robust.

[Table 3 about here]

[28] In *Appendix E*, I investigate the effect on school attendance or having zero reported hours of work. There is no effect on the probability of zero hours worked, and only a small and not consistently significant positive effect on probability of school attendance.

[29] Also in the lower part of this age spectrum (10-13 years of age), working is still very common. 53% have an agriculture occupation, 1% an industry occupation, and 1% a service occupation.

4.3 Sector and occupation

In this sub-section, I focus on more specific indicators of occupation and economic sector. The main income generating activities are coded as belonging to one of the three broad economic sectors using the ISIC-codes (goods or services produced), and to three broad classes of occupations using the ISCO-codes (tasks or duties performed). A majority in the sample, or 55 or 56 percent in terms of occupation or industry, are active in agriculture. The industrial sector is considerably smaller and employs four or eight percent, while activity in the service sector is somewhat more common with a share of ten or 13 percent, depending on definition. The dependent variables used in Tables 4 and 5 still capture the number of hours worked, but now by economic sector or occupation. The effects that foreign aid have on labor allocation across economic sectors and classes of occupations are quite similar. More hours are worked in the agricultural sector and agricultural occupations, while less hours are worked in the non-agricultural sector and non-agricultural occupations. The effects on industry or services are generally not robustly statistically significant when these are studied in isolation. For aid to help poor agriculturally dependent countries to walk in the footsteps of more developed countries, people near aid projects should become more likely to work in the industrial or service sectors and have industrial or service occupations. People should be less likely to have agricultural occupations and work in the agricultural sector. The exact opposite is happening here.

Judging by the estimates in the third column in both Tables 4 and 5, people living in areas with ongoing aid projects do not seem different in terms of non-agricultural activity when compared to people living in areas that do not receive aid. However, as both the difference-in-difference type of measure ("*Difference: Ongoing - Future*") and the lagged dependent estimates in the fourth column reveal, this apparent similarity masks that aid projects are more likely to target areas where non-agricultural activity is more common to begin with. The similarity of individuals in areas with and without ongoing aid projects is the result of aid projects discouraging non-agricultural activities. Aid not only halts the process of structural transformation, but reverses it.

[Table 4 about here]

[Table 5 about here]

In *Appendix E*, I discuss alternative and complementary indicators that reflect the character of the main income generating activity, in terms of skill-level and place of work. I show that foreign aid has a negative impact on the skills required to perform the task that people do in their current main income generating activity, and that it encourages a movement of people out of work in off-farm self-employment or the operation of private firms. There is no effect on unemployment.

4.4 Wages and household expenditures

That foreign aid is associated with labor being reallocated from non-agricultural sectors into the agricultural sector is clear from the evidence presented above. Following Rodrik (2013), one could refer to this as perverse structural transformation. If it reflects that aid supports agriculture, and that more people therefore willingly work in the agricultural sector, one should be less concerned about this development than if it reflects that people shun other sectors because aid discourages non-agricultural activities. In this subsection, evidence on the short-term effects of aid on wages and welfare at the sub-national level is presented. If aid supports agriculture, there should be a positive relationship between the inflow of aid and wages and welfare on average. If aid creates conditions that are less favorable for industry and services, these relationships should instead be negative. What the data shows is that both wages and household expenditures are negatively affected for people on average, and that these averages are driven by negative effects on people in non-agricultural sectors. There are no significant effects, neither positive nor negative, on people in the agricultural sector.[30]

The focus in Table 6 is on the short-term effects of foreign aid on wages, which are available only for employees. The overall wage level is depressed when aid flows into the area, but the effect is modest. The estimate in the second column can be translated into a standardized beta-coefficient of -0.08. That is, a one standard deviation increase in ongoing aid per capita is associated with a decrease in the average wage of less than a tenth of a standard deviation. The effect is not large, but it is also clearly not positive. The effect is statistically significant for workers in the non-agricultural sectors, but not in the agricultural sector.

To evaluate the short-term effects of foreign aid on welfare, I look at household expenditures per household member. Foreign aid has a negative and significant short-term effect on this metric, see Table 7. Again, the effect is on the moderate side. Expressed as a standardized beta-coefficient, the results in the second columns is a low -0.03. Separating households by what sector the household head is active in, I find effects similar to those uncovered for wages above. There is no effect on household expenditures for households where the head is active in the agricultural sector, but for households where the head is active in the industrial or service sectors, expenditures are clearly lower.

[Table 6 about here]

[Table 7 about here]

[30] The samples that can be used here are much smaller than the baseline sample, especially when I separately employees and households by sector of activity. To use the lagged dependent specification would mean an additional loss of one-third of these samples. I therefore opt for the parish fixed effects model rather than the lagged dependent model.

Wages and household expenditures are highest in the service sector and lowest in the agricultural sector. Market real wages and household expenditures carry information about how productive people are in their current occupation. The reallocation of labor from non-agricultural sectors/occupations to agricultural sector/occupation in areas with ongoing aid projects is therefore an indication of a negative local short-term effect on average productivity. I investigate this further in *Appendix F*.

4.5 Discussion

Two broad trends can be observed. First, in areas where aid projects are implemented, people tend to work more in agriculture and less in other sectors. Second, wages and household expenditures fall in the non-agricultural sectors.

In principle, aid could support agriculture through, e.g., programs for fertilizer introduction, funding of extension services, or investments in human capital formation or infrastructure. With improved conditions for agriculture, one could expect a movement of people into that sector. That aid has a negative impact on wages and household expenditures says that this explanation is at odds with the data and that we need to look elsewhere.

For the revealed pattern to be explained by Dutch disease type of mechanisms (Corden and Neary 1982), one should observe an overall increase in the wage level, an expansion of the (internationally or domestically) non-tradable sector, and a contraction of (internationally or domestically) tradable sectors. Here average wages fall, and there no expansion of the service sector. Neither the first nor the second trend can thus be explained by mechanism of this type.

Uganda should have a comparative advantage in certain agricultural goods and a comparative disadvantage in industrial production (manufacturing). The literature that examines the links between trade liberalization, or openness, and structural transformation may provide insights. A typical finding in this literature is that more openness is associated with positive or no effects on structural transformation, not negative effects. For instance, Dodzin and Vamvakidis (2004) find that increased openness leads to a higher share of industrial value added, while Wacziarg and Wallack (2004) find that there is no robust effect on inter-sectoral labor shifts after liberalization episodes. If foreign aid somehow integrated targeted areas more with the world market, the economic structure should come to reflect the pattern of comparative advantage. More specifically, it should affect relative prices and encourage activities in the tradable sector in which the country has a comparative advantage, and discourage activities in the tradable sector without comparative advantage. While these two shifts are in line with what is observed here, specialization and trade should generate positive, not negative, effects on wages and welfare.

Classical explanations of long term structural transformation focus on either the demand side (income effects) or the supply side (relative price effects). The first of these says that as incomes rise due to productivity growth in all sectors, non-homothetic preferences lead to a relative increase

in demand for goods from non-agricultural sectors and relative fall in demand for goods from the agricultural sector. By the same logic, reversed structural transformation requires a negative shock to overall productivity followed by falling local incomes. Still, the effects should be on relative demand and not on absolute demand. There is no reason to expect an absolute increase in demand for agricultural goods when the income level falls. The data does not show any negative effects on wages or welfare in the agricultural sector, so there is no consistent fall in incomes in all sectors in areas receiving aid. The effect on the averages comes entirely from falling wages and expenditures in non-agricultural sectors. In the relative price-explanation for structural transformation, sectoral TFP growth rate differences lead to changes in relative prices. Over time, labor shifts to the sector with slower TFP-growth (a higher relative price). In line with this reasoning, faster TFP growth in non-agricultural sectors would predict the first main trend, but there should not be falling wages and welfare for people active in those sectors. Falling TFP in agriculture could also explain the first trend, but that would not lead to falling wages in other sectors.

More data is needed to pinpoint the exact mechanism, and it is worth to consider that when implementing aid projects on the ground, donors affect both local supply and local demand. A possible mechanism deserving further investigation is whether there is crowding out of local suppliers of non-agricultural goods and services. Some projects directly aim to supply more or better roads, school buildings, health centers, etc. Projects with other aims can still end up affecting supply in the same direction. For instance, in order to improve access to electricity, local roads may need to improved first. Also in areas where production is small-scale and labor-intensive, and products and services are of relatively poor quality, some necessary construction and maintenance of roads and buildings is often already taking place. Where donors engage non-local producers in the implementation process they may therefore crowd out demand for goods and services from local suppliers. If so, communities may both benefit from access to better roads, schools, and health centers, and experience a short-term negative shock to local producers of non-agricultural goods and services. Lower demand implies lower profitability in local non-agricultural sectors and some firms may down-size or close. As a response to lower labor demand and a lower relative compensation, workers should seek employment elsewhere. Additionally, as aid projects are implemented, local demand for agricultural products can increase. Donors are more likely to bring in physical capital and technical expertise that crowd out local non-agricultural supply than food or other agricultural products consumed by the people directly active in the projects. If there is an increase in demand for products from the agricultural sector, profitability in the sector can increase initially. New farms may open up and production in already existing farms expand. There could be more hours worked in the sector. Labor attracted to the sector will work on increasingly marginal land, and lower marginal yields imply that the net effect on wages or household expenditures in the agricultural sector is not necessarily positive.

In sum, crowding out of supply in industry and services combined with a relative increase in demand in agriculture could explain not only the observed pattern of labor reallocation and hours

worked, but also the effects on wages and welfare.

5. Concluding remarks

The process of structural transformation refers to the reallocation of labor from low-productivity to high-productivity sectors. The question asked here is if the inflow of foreign aid money speeds up or reverses this process. In the first part of the paper, I review the related literature on aid-effectiveness and structural transformation. The effects found on the national level range from negative in the short term, to positive in the short and long term. There are no previous systematic studies on the effects of foreign aid on structural transformation on the sub-national level.

The data used in the empirical exercise links georeferenced aid projects to individual-level panel data with information about labor allocation by sectors in Uganda. Since the matching is done on the lowest administrative level possible, only aid projects with high precision in the point coordinates are used. The empirical results are obtained using a difference-in-difference type of estimator and more traditional models with fixed effects and lagged dependent variables.

A number of conclusions can be drawn from the evidence presented. First, aid projects appear to be located in areas that are relatively more developed to begin with. Second, areas where aid projects are being implemented appear to become, on several metrics, less developed. Third, there is robust evidence that the local short-term effect of foreign aid is that people work more in unskilled agricultural activities and fewer hours outside the farm. Fourth, aid has a negative effect on wages and household expenditures. Overall, aid has a negative short-term effect on the local economic structure by depressing modern sectors and encouraging the traditional agricultural sector. Whether this effect lingers on once the aid projects are finished is a topic for future research.

A stylized fact of development is that the share of agriculture goes down as countries leave poverty and grow richer. In recent decades, though, this process of structural transformation has sometimes been going backwards in Africa. That foreign aid leads to an increase in farm activity should not come as surprise, given the strong donor focus on smallholder agriculture. Collier and Dercon (2014) argue that this focus is based on the wrong model of economic growth, and that for poverty in Africa to be reduced the number of farmers should go down, not up. The evidence presented in this paper supports the idea that the inflow of foreign aid is partly to blame for the lack of progress in terms of structural transformation. To firmly put this process back on track, donors need to focus more on the development of high-productivity activities and more seriously consider the extent to which their activities on the ground crowd out struggling enterprises in sectors with better dynamic properties.

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Appendix

A. Variable descriptions and summary statistics

[Table A.1 about here]

[Table A.2 about here]

B. Trends in foreign aid and sectoral shares in Uganda

[Figure B.1 about here]

[Figure B.2 about here]

C. Pre-trends

The results from *DD*-specifications suggest that aid projects tend to target areas where people work more in non-agriculture and less in agriculture, but when the projects are being implemented, people move out of non-agriculture and into agriculture. Hence, aid contributes to the reversal of the structural transformation process. This interpretation rests on the assumption that aid projects are not specifically targeting parishes that already have a *trend* from non-agricultural to agricultural production. In order to test whether this is the case, I estimate the following specification:

$$\begin{aligned} \Delta Ongoing\ aid/capita_{t+1,t} &= \beta_1 \cdot \Delta Y_{t,t-1} + \alpha_d + \delta_t \\ &\quad + \eta_d \cdot t + \lambda \cdot X_{t-1} + \varepsilon_{pt} \end{aligned} \qquad \text{(Equation C.1)}$$

The unit of observations is the parish, and all variables used are calculated as the weighted mean for each parish. $\Delta Y_{t,t-1}$ represents changes the labor market indicator from year $t-1$ to year t, and the dependent variable captures changes in *Ongoing aid/capita* from year t to year $t+1$. The vector X contains parish level controls including the parish mean of the individual level controls. All control variables represent year $t-1$, except for the district time trends and year-by-month fixed effects which represent year t. Table C.1 collects the results. The estimates show that *less*, not more, aid goes to parishes with a trend from non-agricultural to agricultural production (in terms of parish average in hours worked by sector), but they are not statistically significant. Changes in the labor market indicators from $t-1$ to t cannot explain changes in aid from t to $t+1$.

[Table C.1 about here]

D. Disaggregated aid

Any disaggregation of aid into aid from different donors makes the identification of a causal effect in the difference-in-difference type of estimation less likely, since one must then assume that aid from different donors have different determinants, and since the control group no longer will consist of people in areas where there has been, are, or will be no aid projects (from other donors). The parish fixed fixed effects estimations rely on yearly within-parish variation in aid and is not subject to these particular concerns. I prefer the parish fixed effects model to the lagged dependent model in this context also since when aid is disaggregated into aid from different donors, fewer parishes will have positive amounts of aid per capita and to retain the sample size becomes more important here. For these reasons, the parish fixed effects results are presented along with *DD*-results.

First, I separate aid projects into aid from three different donor classes; *Western bilateral* donors, *Multilateral* donors, and *Mixed*, i.e., projects that are joint between *Western bilateral* and *Multilateral* donors. China has too few projects to be included as a separate class. The results for projects from *Western bilateral* donors and from joint aid projects are similar to what is found for aid in general, while there is no effect (on this metric) of multilateral projects.

[Table D.1 about here]

Next, total aid is disaggregated into aid with different purposes, or to different aid sectors. The econometric issues discussed above are relevant here as well. Aid to infrastructure and aid to agriculture are the only aid types for which the effects are consistently statistically significant in both the *DD* and *Parish FE* estimations. Aid to human capital has similar effects, but the difference is not significant in the *DD* estimation. Evidently, the effect of aggregated aid on agricultural activity, discussed in the main text, is not just capturing an effect from aid to agriculture as such.

The results from the disaggregated analyses show that the main results are not due to the effect of aid from any single class of donors or to any particular sector alone. It is therefore unlikely that they capture that aid projects alleviates any particular binding constraint. Note that what could not explain the results in this subsection is that aid projects from different donors or to different sectors are of different size, since the indicators reflect the per capita amount of aid.

[Table D.2 about here]

E. Skill-level, place of work, unemployment, and school attendance

In Table 4, the ISCO-code of the main income generating activity is used to construct indicators of three types of occupations. The ISCO-code is a classification of the tasks and duties performed,

and consequently a reflection of the skills required in these occupations. Following Dorosh and Thurlow (2014), I use the ISCO-code to classify occupations as unskilled or skilled, see Table A.2 for details.[31] From this complementary perspective on the character of people's occupations, the estimates in Table E.1, though not always statistically significant, suggest that foreign aid has a negative impact on the skills required to perform the task that people do. More specifically, there is a positive effect on the number of hours worked in unskilled occupations, and a negative effect on hours worked in skilled occupations. The local economy becomes less advanced, at least in the short term.

[Table E.1 about here]

Standard categories used in the structural transformation literature are in Table E.2 complemented with indicators informative on related aspects of the economic structure. In the process to become a more developed economy, people should move out of traditional forms of employment on the household farm and into more modern forms of employment or work places. In Table E.2, the evidence shows that foreign aid reverses this development process by encouraging a movement of people out of work in off-farm self-employment or managing a business. There is no effect on off-farm *employment*, nor on hours worked in the government or in other private households.

[Table E.2 about here]

True unemployment is very rare in this sample, and there is no indication that aid affects the probability of being unemployed, see Table E.3. Likewise, there is no effect on the probability of reporting zero hours worked. There is a weak and marginally significant negative effect of aid on the probability of attending school, but only in the *LD*-specification. The effects on school attendance, unemployment, and zero hours worked (all dummy indicators) are not large enough to explain why more hours are worked in agriculture in areas with ongoing aid projects.

[Table E.3 about here]

[31] In interpreting the results, it is worth noting that "elementary occupations," which about six percent of the individuals in the sample have, are included in the group of industrial occupations. The difference between an agricultural occupation and an unskilled occupation is that the latter include individuals that have an elementary occupation. Similarly, the skilled occupations are those whose main tasks or duties also mean that they are coded as having either a service occupation or an industrial occupation, net of those with an elementary occupation.

F. Productivity

[Table F.1 about here]

People earn more if they are employed in the industrial sector than if they are employed in the agricultural sector, and even more if they are employed in the service sector, see Table F.1. This suggests that the main results reflect how an inflow of aid is associated with people shifting into less productive occupations, at least in the short term.

Under the assumption that market compensation for a person with a certain occupation is a signal of how productive a person with that occupation is, I can use observed wages (for employed workers) and household expenditures (for households where the head has a certain occupation) in areas without completed or ongoing aid projects to construct two measures of productivity. There are nine occupational classes (based on ISCO-codes): 1. Legislators, senior officials, managers and administrators, 2. Professionals (graduates), 3. Associate professionals (diploma and certificate holders), 4. Clerks, 5. Service workers, shop and market sales workers, 6. Agricultural or fishery workers, 7. Craft and related workers, 8. Plant, machine operators and assemblers, and 9. Elementary occupations. For each occupational class, I extract the weighted average wage and household expenditures. I then assign each individual or household head a specific value depending on their occupation.

The wage-based and the expenditure-based versions of the indicators of productivity of occupation are used as dependent variables in Table F.2. To the extent that the assumption that market compensation carry information about how productive people are in their current occupation, the results indicate that ongoing aid projects are associated with people shifting into less productive occupations.

[Table F.2 about here]

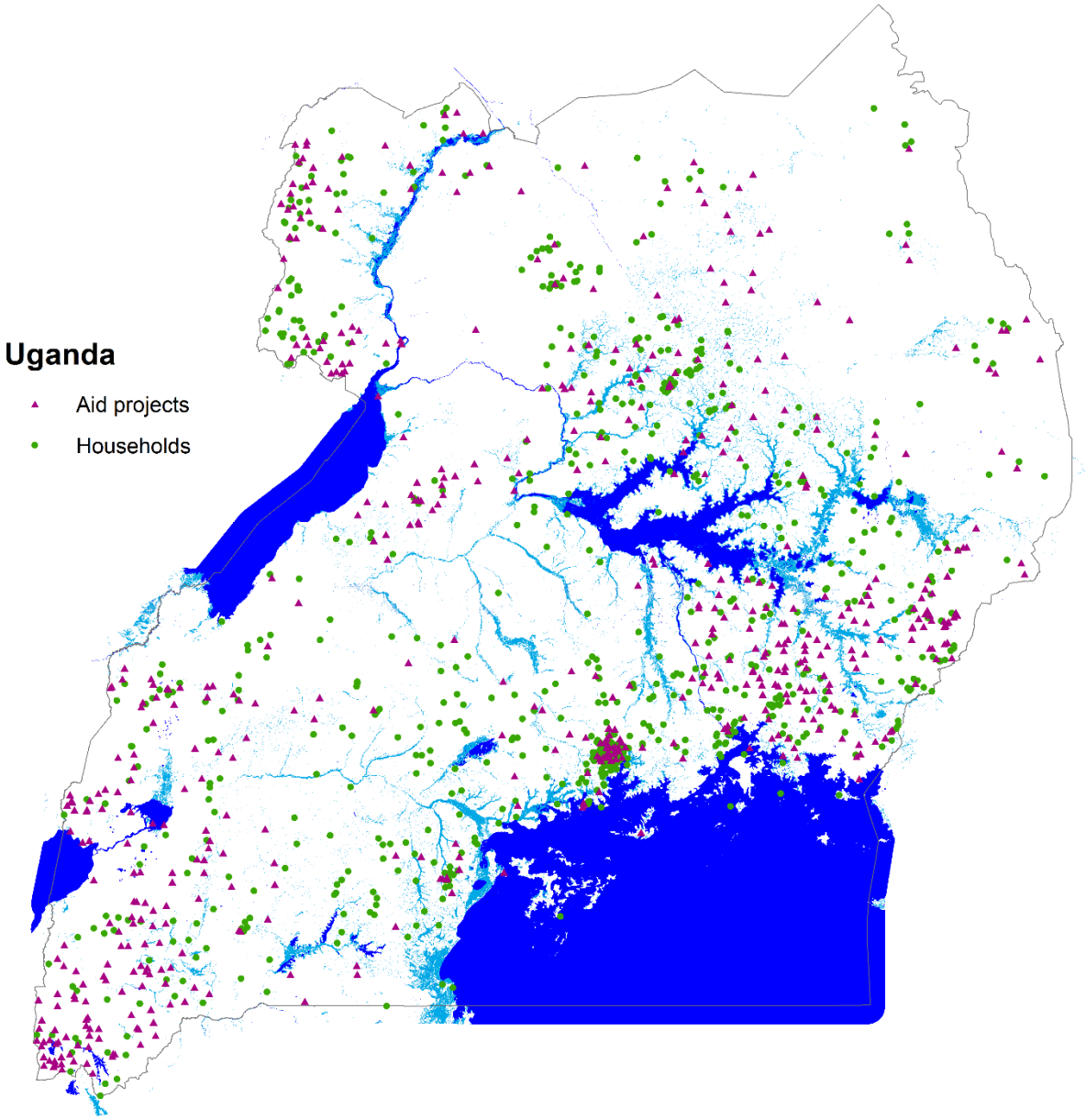

Figure 1. Aid projects and household locations in Uganda.

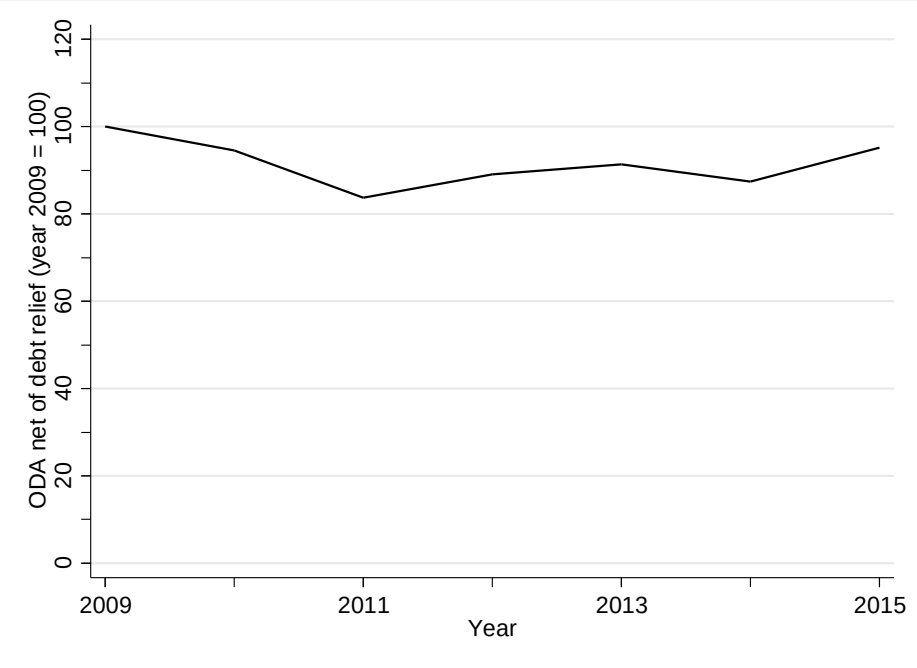

Figure B.1 Foreign aid in Uganda 2009-2015

Notes: The sum of total ODA disbursed, net of debt relief, from all donors tracked in the OECD-DAC reporting system. The index set to 100 in year 2009. Source of data: OECD-DAC (2017).

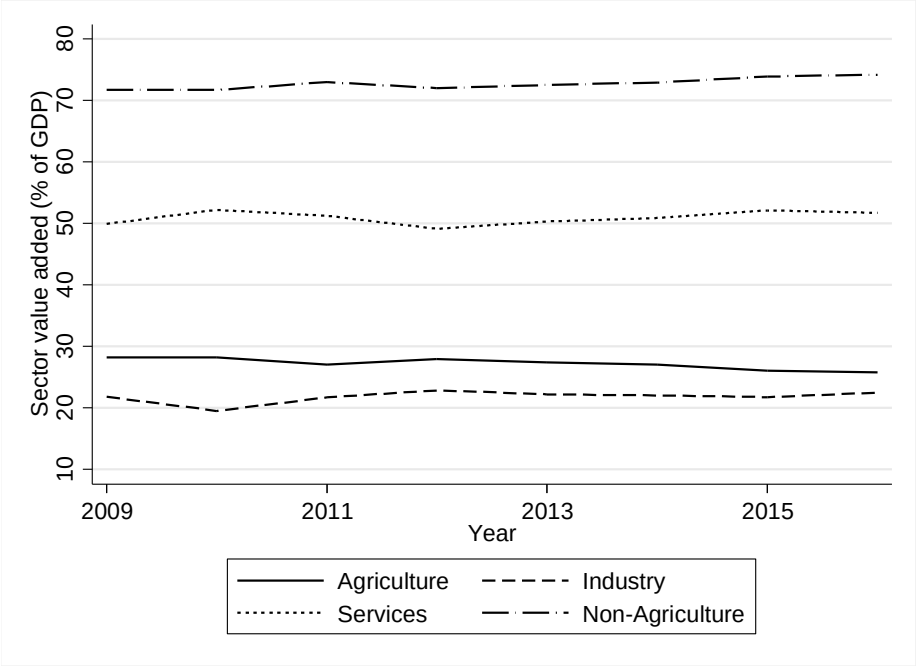

Figure B.2 Economic sectors in Uganda 2009-2016

Notes: The figures represent value added of agriculture, industry, services, and non-agriculture (the sum of industry and services), all in percent of GDP. Source of data: WDI (2018).

Table 1. Foreign aid and structural transformation

	(1)	(2)	(3)	(4)
		Dependent variable: Work on Hh farm		
Specification:	*DD*	*Parish FE*	*LD*	*FE*
Ongoing aid/capita	0.07***	0.09***	0.12***	0.06**
	(0.02)	(0.03)	(0.04)	(0.03)
Future aid/capita	-0.07**			
	(0.03)			
Lag of Work on Hh farm			0.25***	
			(0.01)	
Difference: Ongoing - Future	0.13			
F-test of difference	16.27***			
F-test of difference: p-value	0.000			
Parish fixed effects		Yes	Yes	Yes
N	24,986	24,986	15,024	24,039
R^2	0.22	0.28	0.34	0.06

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. All specifications include the following control variables. Sex, age and age-squared, ethnic group dummies, ethnic group-by-gender-dummies, urban dummy, a gender-by-urban dummy, log of population density in year 2000, log of 1 + light emission in year 2000, log of parish area, log of parish population, log of annual mean temperature, log of annual precipitation, log of distance to market, log of distance to headquarters of district of residence, log of distance to nearest land border crossing, log of distance to nearest major road, log of distance to nearest population center, log of elevation, log of mean temperature of wettest quarter, log of 1+ percent agriculture within 1 km buffer, log of precipitation of wettest quarter, log of 1 + slope, district fixed effects (parish fixed effects in Columns 2-4), linear district time trends, and year-by-month fixed effects. Constants are included the specifications but not reported. In Column 4, the sample is restricted to individuals for which the reported coordinates fall within the same parish in all waves the individual is included, and the within-R^2 is reported. See the main text and Table A.2 for variable descriptions and data sources.

Table 2. Hours worked outside the Hh farm and total hours worked

	(1)	(2)	(3)	(4)
Dependent variable:	*Work outside Hh farm*		*Any work*	
Specification:	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	-0.03	-0.10**	0.04	0.02
	(0.02)	(0.04)	(0.02)	(0.06)
Future aid/capita	0.08***		0.01	
	(0.03)		(0.03)	
Lag of dependent variable		0.36***		0.21***
		(0.02)		(0.01)
Difference: Ongoing - Future	-0.11		0.02	
F-test of difference	10.65***		0.53	
F-test of difference: p-value	0.001		0.468	
Parish fixed effects		Yes		Yes
N	24,986	15,024	24,986	15,024
R^2	0.27	0.42	0.24	0.33

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table 3. Robustness

	Dependent variable: Work on Hh farm		*Ongoing aid/capita*		*Future aid/capita*		*Diff.: Ongoing - Future*	*F-test of diff.*	*P-value of F-test*	*N*	R^2
(1)	Baseline (Table 1)	*DD*	0.07***	(0.02)	-0.07**	(0.03)	0.13	16.27	0.000	24,986	0.22
		LD	0.12***	(0.04)						15,024	0.34
(2)	Additional control variables included	*DD*	0.07***	(0.02)	-0.05*	(0.03)	0.12	12.70	0.000	24,563	0.24
		LD	0.10***	(0.04)						14,957	0.35
(3)	County fixed effects and trends (instead of district fixed effects and trends)	*DD*	0.08***	(0.02)	-0.07**	(0.03)	0.15	23.29	0.000	24,986	0.24
		LD	0.14***	(0.04)						15,024	0.35
(4)	Only individuals in counties that have received (the last five years), now recieve, or will recieve aid	*DD*	0.07***	(0.02)	-0.06**	(0.03)	0.13	16.15	0.000	22,355	0.23
		LD	0.12***	(0.04)						13,447	0.35
(5)	Only individuals in counties that have not recieved aid before (the last five years)	*DD*	0.09***	(0.02)	-0.05	(0.03)	0.13	11.44	0.001	16,080	0.18
		LD	0.12**	(0.05)						8,855	0.31
(6)	All household members included (including servants and those that have not stayed with the household for at least six of the last twelve months)	*DD*	0.06***	(0.02)	-0.06**	(0.03)	0.13	12.77	0.000	28,007	0.21
		LD	0.15***	(0.04)						16,973	0.33
(7)	Economic migrants excluded	*DD*	0.07***	(0.02)	-0.08***	(0.03)	0.15	20.13	0.000	22,098	0.21
		LD	0.17***	(0.07)						13,269	0.33
(8)	All individuals from age 18 instead of age 10 included	*DD*	0.08***	(0.02)	-0.10**	(0.04)	0.18	15.43	0.000	16,052	0.26
		LD	0.08**	(0.04)						9,704	0.40
(9)	Only one wave (2009/2010) used	*DD*	0.11***	(0.03)	-0.09**	(0.04)	0.20	14.53	0.000	9,589	0.24
(10)	Parishes with large physical size (>75km2) omitted	*DD*	0.07***	(0.02)	-0.07**	(0.03)	0.13	18.14	0.000	22,423	0.23
		LD	0.13***	(0.04)						13,487	0.35
(11)	Parishes with small physical size (<3.5 km2) omitted	*DD*	0.07***	(0.02)	-0.05*	(0.03)	0.13	13.86	0.000	22,704	0.19
		LD	0.12***	(0.04)						13,743	0.32
(12)	Parishes with large populations (>15 000 people) omitted	*DD*	0.09***	(0.02)	-0.06**	(0.03)	0.15	19.76	0.000	22,503	0.19
		LD	0.13***	(0.05)						13,534	0.32
(13)	Parishes with small populations (<2500 people) omitted	*DD*	0.08***	(0.02)	-0.05*	(0.03)	0.13	16.27	0.000	22,846	0.22
		LD	0.13***	(0.04)						13,864	0.34
(14)	Parishes with high population density (>3000 persons/km2) omitted	*DD*	0.08***	(0.02)	-0.06*	(0.03)	0.14	15.38	0.000	22,751	0.17
		LD	0.13***	(0.05)						13,766	0.30
(15)	Parishes with low population density (<100 persons/km2) omitted	*DD*	0.07***	(0.02)	-0.04*	(0.03)	0.11	13.68	0.000	22,421	0.23
		LD	0.13***	(0.04)						13,532	0.35
(16)	Parishes with few individuals included in the baseline sample (<15 individuals) omitted	*DD*	0.06***	(0.02)	-0.07**	(0.03)	0.13	13.78	0.000	23,915	0.22
		LD	0.14***	(0.04)						14,375	0.32

Notes:

Estimated with OLS using Equations 1 (*DD*) and 3 (*LD*). Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Additional control variables included in (2) are the following. Individual level: married monogamously, married polygamously, divorced, widow/-er, finished primary school level 3, finished secondary school level 3, can read and write, relation to household head (separate dummies for head, spouse, son/daughter, grand child, parent of head or spouse, sister/brother of head or spouse, nephew/niece, other relatives, non-relative, and other (not servant)); Household level: adult equivalents, male-headed household, household head finished primary school level 3, household head finished secondary school level 3, and household head can read and write. Control variables that are always included are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table 4. Economic sector

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	*Agricultural sector*		*Non-agricultural sector*		*Industrial sector*		*Service sector*	
Specification:	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	0.05***	0.15***	-0.02	-0.14***	-0.01	-0.05	-0.01	-0.09**
	(0.02)	(0.05)	(0.02)	(0.03)	(0.01)	(0.05)	(0.02)	(0.04)
Future aid/capita	-0.06*		0.07**		0.06***		0.02	
	(0.03)		(0.03)		(0.02)		(0.03)	
Lag of dependent variable		0.25***		0.42***		0.37***		0.44***
		(0.01)		(0.02)		(0.04)		(0.02)
Difference: Ongoing - Future	0.11		-0.09		-0.07		-0.03	
F-test of difference	9.83***		7.41***		9.09***		0.76	
F-test of difference: p-value	0.002		0.007		0.003		0.384	
Parish fixed effects		Yes		Yes		Yes		Yes
N	24,986	15,024	24,986	15,024	24,986	15,024	24,986	15,024
R^2	0.24	0.36	0.26	0.45	0.06	0.26	0.22	0.44

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table 5. Occupation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	*Agricultural occupation*		*Non-agricultural occupation*		*Industrial occupation*		*Service occupation*	
Specification:	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	0.06***	0.12***	-0.02	-0.09**	0.01	-0.06	-0.03	-0.03
	(0.02)	(0.04)	(0.02)	(0.05)	(0.02)	(0.05)	(0.02)	(0.04)
Future aid/capita	-0.06**		0.08***		0.06**		0.02	
	(0.03)		(0.03)		(0.03)		(0.03)	
Lag of dependent variable		0.25***		0.41***		0.31***		0.40***
		(0.01)		(0.02)		(0.02)		(0.02)
Difference: Ongoing - Future	0.12		-0.10		-0.06		-0.04	
F-test of difference	14.41***		9.10***		4.05**		1.71	
F-test of difference: p-value	0.000		0.003		0.045		0.191	
Parish fixed effects		Yes		Yes		Yes		Yes
N	24,986	15,024	24,986	15,024	24,986	15,024	24,986	15,024
R^2	0.23	0.36	0.27	0.45	0.14	0.29	0.16	0.37

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table 6. Wages

	(1)	(2)	(3)	(4)	(5)	(6)
			Dependent variable: Wage			
Sector:	*Any*		*Agricultural*		*Non-agricultural*	
Specification:	*DD*	*Parish FE*	*DD*	*Parish FE*	*DD*	*Parish FE*
Ongoing aid/capita	-0.09*	-0.12*	0.00	-0.04	-0.12**	-0.10*
	(0.05)	(0.06)	(0.08)	(0.10)	(0.05)	(0.06)
Future aid/capita	0.08		0.06		0.05	
	(0.06)		(0.08)		(0.06)	
Difference: Ongoing - Future	-0.17		-0.06		-0.17	
F-test of difference	7.82***		0.33		6.84***	
F-test of difference: p-value	0.005		0.566		0.009	
Parish fixed effects		Yes		Yes		Yes
N	2,176	2,176	425	425	1,633	1,633
R^2	0.36	0.56	0.61	0.84	0.29	0.52

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables as in Table 1, see notes to that table, with the exeption that the ethnic group dummies and linear district time trends are omitted. See the main text and Table A.2 in the appendix for details.

Table 7. Household expenditures

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Household expenditures					
Sector:	*Any*		*Agricultural*		*Non-agricultural*	
Specification:	*DD*	*Parish FE*	*DD*	*Parish FE*	*DD*	*Parish FE*
Ongoing aid/capita	-0.04*	-0.04*	-0.00	-0.00	-0.07***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.05)	(0.02)	(0.04)
Future aid/capita	0.04		0.01		0.04	
	(0.04)		(0.05)		(0.05)	
Difference: Ongoing - Future	-0.08		-0.01		-0.12	
F-test of difference	5.16**		0.07		7.10***	
F-test of difference: p-value	0.024		0.789		0.008	
Parish fixed effects		Yes		Yes		Yes
N	6,319	6,319	3,567	3,567	2,220	2,220
R^2	0.39	0.52	0.31	0.44	0.40	0.60

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The dependent variables is household expenditures per adult equivalent. The sample consists of all household heads in the sample that are not more than 65 years old. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table A.1. Summary statistics

	N	Mean	Std.Dev.	Min	Max
Panel A: Individual level					
Age	27007	29.73	18.07	10	101
Agricultural occupation	27025	1.31	1.43	0	4.83
Agricultural sector	27025	1.35	1.44	0	4.83
Any work	27025	1.93	1.53	0	5.04
Attending school	26956	0.36	0.48	0	1
Industrial occupation	27025	0.27	0.95	0	4.82
Industrial sector	27025	0.11	0.61	0	4.61
Male	27025	0.48	0.50	0	1
Non-agricultural occupation	27025	0.61	1.38	0	5.04
Non-agricultural sector	27025	0.55	1.33	0	5.04
Off-farm employment	27025	0.31	1.03	0	4.82
Off-farm self-employment	27025	0.33	1.05	0	5.04
Running a business	27025	0.13	0.34	0	1
Service occupation	27025	0.34	1.09	0	5.04
Service sector	27025	0.44	1.22	0	5.04
Skilled occupation	27025	0.43	1.20	0	5.04
Unemployment	27025	0.01	0.08	0	1
Unskilled occupation	27025	1.49	1.48	0	4.83
Wage	2359	10.12	1.20	1.26	16.74
Work in government	27025	0.06	0.48	0	4.68
Work in other household	27025	0.21	0.82	0	4.73
Work on Hh farm	27025	1.21	1.41	0	4.52
Work outside Hh farm	27025	0.72	1.45	0	5.04
Zero hours worked	27025	0.09	0.29	0	1
Panel B: Household level					
Annual mean temperature	27022	5.39	0.08	5	5.58
Annual precipitation	27022	7.11	0.16	6.53	7.62
Distance to district administration centre	27022	2.60	1.00	-2.52	5.31
Distance to land border crossing	27022	4.33	0.88	-3.51	5.34
Distance to major road	27001	1.21	1.58	-9.21	3.73
Distance to nearest market	27022	3.06	1.00	-2.52	4.76
Distance to population centre	27022	2.65	1.07	-2.52	4.63
Elevation	27022	7.10	0.18	6.43	7.78
Household expenditures	7706	11.3	0.84	3.74	15.87
Light emission in 2000	27025	0.53	1.15	0	4.16
Mean temperature of wettest quarter	27022	5.38	0.07	5	5.54
Percent agriculture within 1 km	27022	3.55	0.91	0	4.62
Population density in 2000	26850	5.49	1.30	1.86	8.97
Precipitation of wettest quarter	27022	6.11	0.17	5.63	6.79
Slope	27022	1.84	0.66	0	3.92
Urban area	27025	0.21	0.41	0	1
Panel C: Parish level					
Future aid/capita	26769	0.05	0.40	0	5.75
Ongoing aid/capita	26769	0.16	0.69	0	5.96
Parish area (log)	27025	2.97	1.41	-1.48	10.25
Parish population	26769	8.73	0.76	5.51	11.2

Notes:

In the table are unweighted figures for individuals that are usual, non-servant, members of the household, at least ten years old, who live in a parish without a completed aid project, and for which there is information about ethnic group. For variable descriptions, see the main text and Table A.2 in the appendix.

Table A.2. Variable descriptions

Variable	Description
	Panel A: Individual level
Age	Age in years. Source: UNPS (2017).
Agricultural occupation	Natural log of 1 + number of hours worked in an agricultural occupation, i.e., the ISCO-code corresponds to Agricultural or Fishery workers. Source: UNPS (2017).
Agricultural sector	Natural log of 1 + number of hours worked in the agricultural sector, i.e., the ISIC-code corresponds to Agriculture, hunting & forestry, or Fishing. Source: UNPS (2017).
Attending school	Dummy for attending school. Source: UNPS (2017).
Household expenditures	Natural log of total household consumption expenditures, per adult equivalent. Expenditures are sum of the value of items purchased or home produced. Items included are (i) Food, Beverage, and Tobacco, (ii) Non-Durable Goods and Frequently Purchased Services, and (iii) Semi-Durable Goods and Durable Goods and Service. Since recall periods are seven days before survey for (i), 30 days for (2), and 365 days for (3), the values are rescaled to a common 30 day period. Values are in Ugandan Shilling (2010) and deflated using the national consumer price index. Source: UNPS (2017) and WDI (2018).
Hours worked	Natural log of 1 + number of hours worked in the main income generating activity during the week before the survey. Source: UNPS (2017).
Industrial occupation	Natural log of 1 + number of hours worked in an industrial occupation, i.e., the ISCO-code corresponds to Craft and related workers, Plant, machine operators and assemblers, or Elementary occupations. Source: UNPS (2017).
Industrial sector	Natural log of 1 + number of hours worked in the industrial sector, i.e., the ISIC-code corresponds to Mining and quarrying, Manufacturing, Electricity, gas & water supply, or Construction. Source: UNPS (2017).
Male	Dummy for being male. Source: UNPS (2017).
Off-farm self-employment	Natural log of 1 + number of hours worked if working as an own-account worker, rather than working for someone else for pay, being an employer, helping without pay in a household business, being an apprentice, or working on the household farm or with household livestock. Source: UNPS (2017).
Off-farm employment	Natural log of 1 + number of hours worked for someone else for pay, rather than being an own-account worker, being an employer, helping without pay in a household business, being an apprentice, or working on the household farm or with household livestock. Source: UNPS (2017).
Productivity of occupation (expenditure-based)	Natural log of the real total household expendiures for each occupational class. Calculated as the weighted average for households within that specific occupational class living in parish without completed or ongoing aid projects. The occupational classes, which are based on the ISCO-codes, are: 1. Legislators, Senior officials, Managers and administrators, 2. Professionals (graduates), 3. Associate professionals (diploma and certificate holders), 4. Clerks, 5. Service workers, shop and market sales workers, 6. Agricultural or Fishery workers, 7. Craft and related workers, 8. Plant, machine operators and assemblers, and 9. Elementary occupations. Source: UNPS (2017) and WDI (2018).

Productivity of occupation (wage-based)	Natural log of the real market wage for each occupational class. The real market wage in each occupational class is calculated as the weighted average of the cash wage (see Wage) for individuals within that specific occupational class working for either the national or local government or for a private enterprise (including commercial banks) living in a parish without completed or ongoing aid projects. The occupational classes, which are based on the ISCO-codes, are: 1. Legislators, Senior officials, Managers and administrators, 2. Professionals (graduates), 3. Associate professionals (diploma and certificate holders), 4. Clerks, 5. Service workers, shop and market sales workers, 6. Agricultural or Fishery workers, 7. Craft and related workers, 8. Plant, machine operators and assemblers, and 9. Elementary occupations. Source: UNPS (2017) and WDI (2018).
Running a business	Equal to one if ran a business during the week before the survey. Source: UNPS (2017).
Service occupation	Natural log of 1 + number of hours worked in an service occupation, i.e., the ISCO-code corresponds to Legislators, Senior officials, Managers and administrators, Professionals (graduates), Associate professionals (diploma and certificate holders), Clerks, or Service workers, shop and market sales workers. Source: UNPS (2017).
Service sector	Natural log of 1 + number of hours worked in the service sector, i.e., the ISIC-code corresponds to Sale, maintanance, and repair, of motor vehicles, motorcycles and personal and household goods, Hotels and restaurants, Transport, storage and communications, Financial intermediation, Real estate, renting and business activities, Public administration and defence (compulsory social security), Education, Health and social work, or Other community, social and personal service activities. Source: UNPS (2017).
Skilled	Natural log of 1 + number of hours worked in a skilled occupation, i.e., the ISCO-code corresponds to Legislators, Senior officials, Managers and administrators, Professionals (graduates), Associate professionals (diploma and certificate holders), Clerks, Service workers, shop and market sales workers, Craft and related workers, or Plant, machine operators and assemblers. Source: UNPS (2017).
Unemployment	Dummy for being unemployed. Source: UNPS (2017).
Unskilled	Natural log of 1 + number of hours worked in a skilled occupation, i.e., the ISCO-code corresponds to Agricultural or Fishery workers, or Elementary occupations. Source: UNPS (2017).
Wage	Natural log of the cash wage from the main income generating activity during the week before the survey for individuals for which this is a non-zero amount. Wages are in Ugandan Shillings (2010) and deflated using the national consumer price index. Source: UNPS (2017) and WDI (2018).
Work in Government	Natural log of 1 + number of hours worked in national government, local government, or government controlled business. Source: UNPS (2017).
Work in Other household	Natural log of 1 + number of hours worked in a private household. Source: UNPS (2017).
Work on Hh farm	Natural log of 1 + number of hours worked if the main income generating activity during the week before the survey was working on Hh farm or with Hh livestock. Source: UNPS (2017).
Work outside Hh farm	Natural log of 1 + number of hours worked if the main income generating activity during the week before the survey was not working on Hh farm or with Hh livestock. Source: UNPS (2017).
Zero hours worked	Dummy for reporting zero hours worked. Source: UNPS (2017).

	Panel B: Household level
Annual mean temperature	Natural log of annual mean temperature (degrees celsius * 10). Source: UNPS (2017).
Annual precipitation	Natural log of annual precipitation (mm). Source: UNPS (2017).
Distance to district administration centre	Natural log of distance to headquarters of district of residence (km). Source: UNPS (2017).
Distance to market	Natural log of distance to nearest market (km). Source: UNPS (2017).
Distance to land border crossing	Natural log of distance to nearest land border crossing (km). Source: UNPS (2017).
Distance to major road	Natural log of distance to nearest major road (km). Source: UNPS (2017).
Distance to population centre	Natural log of distance to nearest population center with >20,000 inhabitants (km). Source: UNPS (2017).
Elevation	Natural log of elevation (km). Source: UNPS (2017).
Light in year 2000	Natural log of 1+ light emission in year 2000. Source: NOAA (2017).
Mean temperature of wettest quarter	Natural log of mean temperature of wettest quarter (degrees celsius * 10). Source: UNPS (2017).
Percent agriculture within 1km	Percent agriculture within 1 km buffer. Source: UNPS (2017).
Population density in year 2000	Natural log of population density in year 2000. Source: GPW (2017).
Precipitation of wettest quarter	Natural log of 1+ precipitation of wettest quarter (mm). Source: UNPS (2017).
Slope	Slope in percent. Source: UNPS (2017).
Urban area	Dummy for urban area. Source: UNPS (2017).
	Panel C: Parish level
Future aid/capita	Natural log of 1 + aid amount in future, but not ongoing or completed, aid projects, per capita, in the household's parish. Future aid projects are projects that started no earlier than the year after the survey. Household coordinates from UNPS (2017) and aid projects with precision code 1 or 2 from AidData (2017). Parish boundaries from RCMRD (2017) and population from GPW (2017).
Ongoing aid/capita	Natural log of 1 + aid amount in ongoing projects, per capita, in the household's parish. Ongoing aid-projects are projects that had a start no later than the year of the survey and had an end date not prior to the year of survey. Household coordinates from UNPS (2017) and aid projects with precision code 1 or 2from AidData (2017). Parish boundaries from RCMRD (2017) and population from GPW (2017).
Parish area	Natural log of parish area (km). Parish boundaries from RCMRD (2017).
Parish population	Natural log of parish population in the year prior to each survey. Parish boundaries from RCMRD (2017) and population from GPW (2017).

Table C.1. Pre-trends

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: ΔOngoing aid/capita $_{t+1,t}$							
ΔWork on Hh farm$_{t,t-1}$	-0.00							
	(0.02)							
ΔWork outside Hh farm$_{t,t-1}$		-0.01						
		(0.03)						
ΔAgricultural sector$_{t,t-1}$			-0.01					
			(0.02)					
ΔNon-agricultural sector$_{t,t-1}$				-0.01				
				(0.04)				
ΔAgricultural occupation$_{t,t-1}$					-0.00			
					(0.03)			
ΔNon-agricultural occupation$_{t,t-}$						-0.01		
						(0.03)		
ΔWage$_{t,t-1}$							-0.01	
							(0.01)	
ΔHousehold expenditures$_{t,t-1}$								-0.04
								(0.03)
N	565	565	565	565	565	565	565	559
R^2	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.20

Notes:

Estimated with OLS. Robust standard errors, clustered at the district level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. The unit of observations is the parish. All variables are calculated as the weighted mean for each parish. The dependent variable captures changes in the parish mean from year *t* to year *t+1* and the reported independent variables capture changes in the parish mean from year *t-1* to year *t*. The control variables listed in Table 1 that are not included here are the ethnic group dummies, the ethnic group-by-gender dummies, and the district trends. All control variables represent year *t-1*, except for the year-by-month fixed effects which represent year *t*. See the main text and Table A.2 for variable descriptions and data sources.

Table D.1. Donor class

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable: Work on Hh farm					
Donor class:	*Western bilateral*		*Multilateral*		*Mixed*	
Specification:	*DD*	*Parish FE*	*DD*	*Parish FE*	*DD*	*Parish FE*
Ongoing aid/capita	0.07**	0.12***	0.08**	-0.03	0.06**	0.10***
	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Future aid/capita	-0.11		0.04		-0.07***	
	(0.08)		(0.03)		(0.02)	
Difference: Ongoing - Future	0.18		0.04		0.13	
F-test of difference	6.57**		0.94		12.21***	
F-test of difference: p-value	0.011		0.334		0.001	
Parish fixed effects		Yes		Yes		Yes
N	24,986	24,986	24,986	24,986	24,986	24,986
R^2	0.22	0.28	0.22	0.28	0.22	0.28

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Donor classes are: Western bilateral, if project by a single OECD- or Western country. Multilateral, if project by multilateral donor(s) such as the World Bank (IDA or IBRD), the EU, or the UN only. Mixed, if project by both Western bilateral and Multilateral. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table D.2. Aid sector

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Work on Hh farm							
Aid sector:	*Human capital*		*Infrastructure*		*Official service*		*Agriculture*	
Specification:	*DD*	*Parish FE*	*DD*	*Parish FE*	*DD*	*Parish FE*	*DD*	*Parish FE*
Ongoing aid/capita	0.09***	0.15***	0.05*	0.07*	0.08	-0.05	-0.10	0.15***
	(0.02)	(0.04)	(0.03)	(0.04)	(0.06)	(0.07)	(0.08)	(0.05)
Future aid/capita	-0.00		-0.05**		0.12***		-0.25**	
	(0.06)		(0.02)		(0.04)		(0.12)	
Difference: Ongoing - Future	0.09		0.10		-0.04		0.16	
F-test of difference	2.07		6.51**		0.30		3.45*	
F-test of difference: p-value	0.151		0.011		0.586		0.064	
Parish fixed effects		Yes		Yes		Yes		Yes
N	24,986	24,986	24,986	24,986	24,986	24,986	24,986	24,986
R^2	0.22	0.28	0.22	0.28	0.22	0.28	0.22	0.28

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Aid sector categories are based on AidData (2016a) sector codes. Human capital if AidData sector (sector code): Education (110), or Health (120). Infrastructure: Water supply and sanitation (140), Transport and storage (210), or Energy generation and supply (230). Official service: Government and civil society, general (151), or Other social infrastructure and services (160). Agriculture: Agriculture (311). Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table E.1. Skill-level of occupation

	(1)	(2)	(3)	(4)
Dependent variable:	*Unskilled*		*Skilled*	
Specification:	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	0.06***	0.10	-0.02	-0.07*
	(0.02)	(0.06)	(0.02)	(0.04)
Future aid/capita	-0.03		0.05	
	(0.03)		(0.03)	
Lag of dependent variable		0.23***		0.40***
		(0.01)		(0.02)
Difference: Ongoing - Future	0.09		-0.07	
F-test of difference	6.91***		4.19**	
F-test of difference: p-value	0.009		0.041	
Parish fixed effects		Yes		Yes
N	24,986	15,024	24,986	15,024
R^2	0.19	0.31	0.21	0.40

Notes:
Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table E.2. Place and type of work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	*Work in Government*		*Work in Other household*		*Off-farm employment*		*Running a business*		*Off-farm self-employment*	
Specification:	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	-0.00	-0.04	-0.02	-0.05	0.02	0.06	-0.01***	-0.06***	-0.04**	-0.14**
	(0.01)	(0.03)	(0.01)	(0.03)	(0.02)	(0.04)	(0.00)	(0.02)	(0.02)	(0.05)
Future aid/capita	-0.00		-0.00		0.05		0.02*		0.02	
	(0.01)		(0.03)		(0.04)		(0.01)		(0.02)	
Lag of dependent variable		0.58***		0.12***		0.41***		0.38***		0.40***
		(0.04)		(0.02)		(0.02)		(0.02)		(0.02)
Difference: Ongoing - Future	-0.00		-0.02		-0.04		-0.03		-0.06	
F-test of difference	0.01		0.42		0.86		11.48		6.53	
F-test of difference: p-value	0.919		0.515		0.355		0.001		0.011	
Parish fixed effects		Yes		Yes		Yes		Yes		Yes
N	24,986	15,024	24,986	15,024	24,986	15,024	24,986	15,024	24,986	15,024
R^2	0.06	0.44	0.07	0.18	0.15	0.36	0.14	0.34	0.14	0.33

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table E.3. Unemployment, zero hours reported, and school attendance

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*Unemployment*		*Zero hours worked*		*Attending school*	
Specification:	*DD*	*LD*	*DD*	*LD*	*DD*	*LD*
Ongoing aid/capita	-0.00	-0.00	-0.00	-0.00	0.00	-0.01*
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)
Future aid/capita	-0.00		-0.00		0.00	
	(0.00)		(0.00)		(0.01)	
Lag of dependent variable		0.15***		0.01		0.67***
		(0.06)		(0.01)		(0.02)
Difference: Ongoing - Future	-0.00		0.00		-0.00	
F-test of difference	0.14		0.14		0.00	
F-test of difference: p-value	0.706		0.711		0.962	
Parish fixed effects		Yes		Yes		Yes
N	24,986	15,024	24,986	15,024	24,923	14,314
R^2	0.03	0.12	0.06	0.13	0.66	0.83

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.

Table F.1. Wages and expenditures by sector and occupation

	Median Wage	*Median Household Expenditures*
Agricultural Sector	10,000	68,000
Industrial Sector	30,000	105,000
Service Sector	42,000	132,000
Agricultural Occupation	10,000	68,000
Industrial Occupation	18,000	102,000
Service Occupation	50,000	138,000

Notes:

The figures are the median of the real weekly wage (among those that have one), by sector or occupation, and the median of the real monthly household expenditures per adult equivalent, by the sector or occupation the household head is active in. The figures, which are in Ugandan Shillings (UGS year 2010), are rounded. See the main text and Table A.2 in the appendix for details.

Table F.2. Productivity

	(1)	(2)	(3)	(4)
	Dependent variable: Productivity of occupation			
	Wage-based		**Expenditure-based**	
Specification:	*DD*	*Parish FE*	*DD*	*Parish FE*
Ongoing aid/capita	-0.01*	-0.02*	-0.01**	-0.01**
	(0.01)	(0.01)	(0.00)	(0.00)
Future aid/capita	0.03***		0.02**	
	(0.01)		(0.01)	
Difference: Ongoing - Future	-0.04		-0.02	
F-test of difference	10.86		8.48	
F-test of difference: p-value	0.001		0.004	
Parish fixed effects		Yes		Yes
N	18,933	18,933	18,933	18,933
R^2	0.33	0.45	0.36	0.47

Notes:

Estimated with OLS. Robust standard errors, clustered at the parish level, in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Control variables are listed in the notes to Table 1. See the main text and Table A.2 in the appendix for details.