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CES Working Papers

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2014.98

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Abstract: This paper documents the paradoxical short-term effects of training and job programmes implemented by oil companies in the region of Onelga, Rivers State (Nigeria). We use two multidimensional indexes as dependent variables: the UNDP's Multidimensional Poverty Index (MPI) and a `Relational Deprivation Index' (RDI) that measures the quality of social fabric. We find that while the programmes significantly reduce conventional poverty, their impact on RDI is twofold: the beneficiaries' integration into networks improves at the expense of deteriorated private relations.

These different effects promote measuring poverty and development as multidimensional phenomena and taking into consideration social aspects of development.

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1. Introduction

Over and beyond their direct effect on physical health and material wellness, most development programmes have important effects on people's relational wellbeing. For example, if we consider professional training – a crucial part of the development project under study in this paper – improving the employability of members of local communities should enhance their ability to socialise, even if they are unable to find a job in the near future. More generally, like roads or mobile phones, education is a key capital that helps populations to connect with each other. As such, it can improve not only the material wellbeing of people, but also the quality and quantity of their social connectedness. This latter aspect is the main focus of this paper. As such, it belongs to a growing body of literature that underlines the importance of perceiving development as a multidimensional phenomenon. This line of inquiry has been initiated by the UNDP, since the 1990 Human Development Report which defines the three components of the HDI – longevity, knowledge and living standards (UNDP, 1990). For the last decade, A. Sen (1999)'s capability approach has been expanded by the Human Development and Capability Association (HDCA) and the Oxford Poverty and Human Development Initiative (OPHI). Their work recently led to the introduction of a Multidimensional Poverty Index (Alkire & Santos, 2010; UNDP, 2010; Alkire & Foster, 2011). Although the MPI is not prescriptive in terms on dimensions but rather characterised by an aggregation methodology, its current form is associated with the three dimensions that have been used for empirical applications since the 2010 Human Development Report, that is, health, education and living standards. In this paper, we will call 'MPI' the particular version of this index based on these dimensions, and refer to it as 'conventional poverty', to avoid confusion with the second multidimensional index we use to measure relational deprivation.

Do private development projects, such as those put into practice by oil companies in the Niger Delta, help their beneficiaries improve the way they socialise? At first glance, the

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answer is far from obvious for at least two reasons: first, extractive industries can produce sharp increases in social inequality, and it has been shown that the presence of oil can induce violence and corruption (Human Rights Watch, 2005; Ikelegbe, 2005; Guichaoua, 2009; Frynas, 2010; [reference deleted to maintain the integrity of the review process]). Second, how should we capture the quality of the myriad ways in which people socialise?

In this paper, we study the impact of oil companies' development programmes in the Niger Delta (Nigeria), in relation not only to conventional poverty, but also to social exclusion. Therefore, we base our analysis both on the MPI and on a `Relational Deprivation Index' (RDI). The RDI aims to measure some of the dimensions related to poverty and exclusion; it focuses on the deprivations endured by people in terms of quality of relationships. It includes three dimensions: integration into networks, private relations and civic commitments[1].

Our contribution to the field is threefold. First, this paper is part of a research programme initiated in 2008. To the best of our knowledge, it is the first attempt to quantitatively assess the impact of oil companies' corporate social responsibility programmes in Nigeria[2].

Our second – and most important – contribution is to pave the road towards a study of development in terms of relational capabilities using composite indexes as outcome variables. To understand the mechanisms at play and the channels through which the MPI and RDI are impacted by companies' development projects, we analyse the impact of their programmes on each and every one of the components and dimensions of these two composite indexes. We find that while benefiting from a memorandum of understanding (MoU) significantly reduces conventional poverty (measured through the MPI), the impact of training programmes on relational capabilities is twofold: participating in the programmes significantly decreases

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deprivations in the population's integration into networks, but it also yields a significant increase of deprivations in private relations, perhaps due to rivalries between the beneficiaries of the programmes and others. This sheds new light on the role the diffusion of knowledge plays as a key factor of development: in the short term, an unequal distribution of new knowledge may worsen the quality of private relationships, even though the average education level has improved.

Third, we contribute to the methodological issue on the kind of quantitative evaluation that can be done when randomised experiments are not feasible – see, for instance, Bamberger, Rao & Woolcock (2010) and Barrett & Carter (2010) for a review of the strengths and risks of such methods. The political and security conditions prevailing in the Niger Delta for the last decade have been indeed so problematic that, for the time being, a randomised controlled trial is out of the scope of any practically feasible inquiry led by scholars[3]. However, both the legal environment and the means adopted by companies to contribute to development seem rather favourable, as will be developed in the next section. Conversely, several observers claim that the social troubles that pervade Nigerian society are not unrelated to the presence of oil companies. Therefore, we cannot wait for perfect data before we start addressing the issue of the impact of oil companies on development. In addition, although the design of our quantitative survey is far from perfect, it is the only one we have. We feel that the best way for scholars to contribute to future improvements to quantitative methods is to use surveys conducted within the existing political and security constraints in a conceptually coherent manner, so as to better identify their limitations. Our paper can thus also be viewed as an attempt to evaluate the internal consistency of the existing design, and to pinpoint the areas in which progress needs to be made. Lastly, we benefit from almost 10 years of qualitative fieldwork in the area. Combining our quantitative analysis with a qualitative assessment can be very useful to interpret the results, and we believe these methods can

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enrich one another, especially in a complex socioeconomic context such as the one under study – see, for instance, White (2002) for an argumentation on how applying mixed methods can yield productive synergies in the field of poverty analysis.

The paper proceeds as follows. Next, we present the context of oil activity in the Niger Delta, and our data and outcomes (section 2). The third section presents the empirical strategy, which is based on an instrumental variable (IV) approach. Section 4 presents the main results. Additional results are gathered in an appendix available online [Hyperlink deleted to maintain the integrity of the review process] together with the dataset and questionnaire used for the paper.

2. Context and data

(a) Oil activity in the Niger Delta

In recent years, monetary assistance towards sub-Saharan Africa countries has been joined with societal programmes. Foreign direct investment (FDI) supposedly brings direct and indirect positive economic effects, through the structuring of industry, subcontracting and purchases from local SMEs, local employment and technology transfers (Mallampally & Sauvant, 1999). In 2012, flows of official development assistance towards the African continent amounted to USD 48.2 billion (OECD, 2013), and flows of FDI amounted to USD 42.7 billion (CNUCED, 2012).

On the other hand, since the early 2000s, oil revenues have accounted for 77 per cent of the Nigerian state budget on average[4]. Considering the last 50 years of oil production, Nigeria has the second largest GDP in Africa after South Africa, but is ranked 153rd in terms

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of HDI, with a score of 0.45; its poverty rate is 68 per cent[5], and its official unemployment rate is 23.9 per cent (National Bureau of Statistics, 2012, p.8).

The Nigeria Federal State asked oil companies to directly invest in local development, and to spend at least 3 per cent of their yearly budget for the funding of the Niger Delta Development Commission (created in 2000). With the implementation of the Nigerian Content Act (2010), the Nigerian state began to organise the development and transfer of skills and expertise, and to promote an increase of economic benefits for local people. The Act sets minimum levels of local employment and local contracting for oil companies, as well as the obligation for these companies to contribute to the construction of professional training centres. In 2010 two companies, Shell and Total, spent USD 65 million and USD 50 million, respectively, on societal development programmes. Therefore, both the legal environment and the means adopted by companies to contribute to development seem rather favourable.

Our research team has been studying the effects of oil activity and of the companies' CSR programmes on human development in the region since 2004, using a comparative and evolutionary approach. [reference deleted to maintain the integrity of the review process] defines a general framework on multinational companies' different levels of corporate responsibility, and focuses in particular on the case of Total in Nigeria. [reference deleted to maintain the integrity of the review process] defend `relational capability' as a core component of human development, and suggest a means of evaluating the contribution of extractive companies to the communities located near to their industrial sites in extremely poor areas; they do not focus on the viewpoint of material resources and growth, but on the quality of the social environment and empowerment.

[reference deleted to maintain the integrity of the review process] study the relation between CSR and inequalities in the Niger Delta, and argue that oil companies have a role to play in

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the reduction of inequalities and imbalances, and in the promotion of sustainable development through their societal policies in this area. [reference deleted to maintain the integrity of the review process] focus on the notion of justice, and define the conditions necessary for a more just social order that is adapted to the local realities of the Niger Delta.

In addition to the qualitative research, we have conducted two surveys, one in 2008 and one in 2012, in two areas directly and indirectly impacted by oil production: the Onelga Local Government Area, in Rivers State, where Total and Agip have been operating onshore since the 1960s; and the Eastern Obolo Local Government Area, in Akwa Ibom State, which is impacted by offshore oil production.

To our knowledge, there has been no other quantitative study in the Niger Delta on the effects of oil projects on local development. A quantitative study on propensity to violence (Oyefusi, 2007) has been carried out by the World Bank, and qualitative research has been conducted by academics – for example Watts, in connection with Berkeley (Watts, 2008), Pérouse de Montclos, and other researchers (Cesarz, Morrison, & Cooke, 2003), in particular by NGOs like Amnesty – to show the destructive effects of oil rents on the environment. Rao et al. (2009) use national statistics to study the links between growth, development and gender inequality and stress the importance of human and social capital in the Nigerian context.

The research agreement signed in 2007 by Total with [institution name deleted to maintain the integrity of the review process] is the first of its kind: until then, the company had never funded research other than in `hard sciences'. Total began to think about the extent of its societal impacts six years ago. Most surveys are not conducted on location where their context is countries that are considered unstable and dangerous.

This paper represents an initial attempt to provide a quantitative impact evaluation of some of these oil companies' CSR programmes on human development. It focuses on the

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2012 survey in Onelga. Data has been collected on four types of communities within this region: `Total Core' and `Agip Host' communities host oil infrastructures from Total and Agip, respectively, whereas `Total Non-Core' and `Agip Non-Host' communities are respectively close to Total and Agip's areas of implantation, but do not host infrastructures.

The Total and Agip areas differ in terms of the types of contracts the companies have signed with the communities. Total chose to sign a `pooling' contract, whereas Agip's contracts are `separating'. In other words, Agip negotiates separately with each of its communities, while Total negotiates with the whole clan – called the Egi clan – that populates its area of implantation, which includes both `Core' and `Non-Core' communities. This reveals a willingness from Total to compensate the effects of its activity across a broader spectrum.

In these communities, the two oil companies have dedicated money to two kinds of projects: some projects benefit the whole community – for instance, electricity installation or road construction, while other MoUs only benefit specific individuals – for example scholarships, training or contracts.

Based on qualitative interviews in the Total area, [reference deleted to maintain the integrity of the review process] explain that while these individual programmes were supposed to be allocated rotationally and in a transparent way between families regardless of their economic or social status, in fact relations and social status played an important part in the allocation process. In particular, the authors mention an issue of asymmetric information in a context where the company did not audit the community to control the ways in which these scholarships and training programmes were allocated. A difficulty for our empirical analysis is thus to disentangle the effect of social relations – which are closely linked to relational capabilities – on the probability of benefiting from the programme, and the effect of the programme on relational capabilities. This is one of the main reasons for our choice of

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using an instrumental approach and, in particular, a three-stage least squares model, as presented below.

(b) Our surveys

The data presented in this paper come from one wave of surveys led in March and April 2012 in the onshore oil production area of Onelga, in Rivers State. It includes data on 502 people from 21 villages or communities[6] .

The individuals were selected for the survey through several steps. First, communities were selected according to specific criteria: their location, size, and the type of development infrastructures present. Second, within each community, about 20 to 30 individuals were selected by using a random path: each surveyor walked from the house of the village head in a different direction, and stopped every 100 feet to select a household. One individual was then chosen from the household respecting gender and age (16 to 80) quota, and interviewed.

The questionnaire applied in our sample is quite comprehensive. It includes more than 200 questions that aim to perceive most dimensions of human development. The first part focuses on the characteristics of the interviewee and his/her income sources. The second addresses the daily quality of life of the interviewee, including perceptions of his/her functionings and capabilities. It also includes questions about the opportunities that have been offered to the interviewee in relation to participating in the oil companies' programmes, and on the interviewee's opinion on the fairness of, and redistribution opportunities arising from, these programmes.

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We also used data from interviews with leaders of the villages to obtain information on programmes that have benefited the communities as a whole. This information was cross-referenced with data provided by Total.

Our main variable of interest in this paper is a dummy for participation in individual training and job programmes. We call this variable `Participation'. It is constructed from the following question: *Have you so far personally benefited from any oil company's or oil activity-related programme?* In addition to this question, individuals were asked about the types of individual programmes they had benefited from. These could be scholarships, skills acquisition programmes, contracts, jobs, advice on agriculture or microcredit programmes. However, only two people out of 119 mentioned having benefited from the last two, so we decided to consider only scholarships, training or professional contracts. The institutions these programmes came from were mainly Agip or Total, although some of the programmes were founded by these companies but implemented by the local government or an association. Almost 30 per cent of the respondents in our sample stated that they had benefited from this type of MoU, with more participants in the Total (Core and Non-Core) and Agip Host areas having benefited than those in the Agip Non-Host area, due to the differences in contracts explained above.

The second type of programmes financed by oil companies are community programmes; these benefit entire villages. We divided these into six types of projects: road, education, health, water, electricity and other projects. Their repartition is also unbalanced in the sample, which is why we include these variables as covariates in our regressions. For instance, the repartition of beneficiaries of community health projects varies from 0 per cent in the Agip Non-Host area to 100 per cent in the Total Non-Core area; electricity projects vary from 0 per cent in Agip Non-Host to 100 per cent in Total (Core and Non-Core). The online appendix provides descriptive statistics on the repartition of these programmes.

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We tested different specifications, some of which included dummies for each type of project, while others included only the dummy for the community projects related to the studied outcomes (for instance, regressions on electricity include the dummy for electricity projects, but not for road projects); in addition, one specification included only the total number of projects in the village. We use this latter specification in the present paper.

INSERT TABLE 1 HERE

Table 1 presents basic statistics on the main socioeconomic variables we used, for the four areas under study: Total Core, Total Non-Core, Agip Host and Agip Non-Host.

Our sample includes more males than females, and three equally distributed age groups (35 years or under, 35 to 50 years and 50 years or over); 80 per cent of our sample are married; almost half of the sample owns land, half works in the agriculture sector; and we divided the sample into four quartiles in relation to revenue. Religion is not presented in Table 1; nor is it included in the selection model, since almost all of the respondents in our sample declared themselves to be believers, where the main religions are protestant and catholic. Level of education is not included as an explanatory variable either, since it will be used as an outcome within MPI; however, half of our sample has an education level that is inferior or equal to junior secondary or technical school and the other half has a level that is superior or equal to senior secondary school.

Thus, the variables we have kept as covariates for the impact assessment are gender (with a dummy for males), age (with a discrete variable equal to 1 (2, 3) for the age group `under 35' (respectively, `35 to 50', `over 50')), matrimonial status (with two dummies: one for

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married people and the other for widows), disability (with a dummy for disabled), social status (measured by a dummy equal to one if the individual is an ordinary member), birthplace (measured by a dummy for those who were born in the village in which they still live), land ownership status (with a dummy for land owners), and working in the agriculture sector (with a dummy for those who do work in this sector).

Table 1 shows that these variables are not balanced between the four areas, and have reasons to affect multidimensional poverty and relational capabilities, which is why we include them in the regressions.

(c) 'Conventional' Multidimensional Poverty and Relational Capabilities

In order to assess the impact of oil companies' programmes on human development, our two main outcomes are the Multidimensional Poverty Index (MPI) and the Relational Deprivation Index (RDI).

Our approach is quite unique, in the sense that we use composite indexes as our variables of interest. This is in line with our belief that poverty and development cannot be measured only in material terms, and that in the impact evaluation of companies' CSR programmes attention should be given to a large number of outcomes, including the quality of the social bonds among people and between groups. Finding a positive impact of a development programme on the beneficiaries' revenues does not say anything about how they used the additional money, or the potential indirect impact it had on their social life.

From our point of view, using the MPI and RDI jointly as outcome measures allows us to take into account these types of effects, and to obtain a more accurate estimation of the real impact of the programmes on the lives of the people who benefited from them.

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However, using multidimensional indexes as outcomes also presents some drawbacks: first, raw results from the regressions do not give precise information on the channels through which these indexes were affected, and, second, we may lose statistical significance, since two components within the same index that are affected in different directions could cancel each other out, and other components with very little variation could reduce the variance of our index. This is why we studied the impact of oil companies' development programmes not only on the indexes, but also on each and every one of the components and dimensions they are made up of.

INSERT TABLE 2 HERE

Table 2 presents the components and weights of the MPI (Alkire & Santos, 2010; UNDP, 2010). It entails three components: health, education, and living standards. While the importance of these components for poverty measurement is a matter of consensus, the initiators of this index underline the importance of focusing on other human capabilities as well. Alkire & Santos (2010), for instance, emphasise that `a key priority for future work on multidimensional poverty must be gathering more and better data around core areas such as informal work, empowerment, safety from violence, and human relationship (social capital and respect versus humiliation)'. Our viewpoint is that development is also, and primarily, a matter of human relationships [reference deleted to maintain the integrity of the review process]. For this reason, we use a second index, namely the RDI, as an outcome in our analysis.

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INSERT TABLE 3 HERE

Table 3 presents the cutoffs and weights of our RDI. The RDI is based on three dimensions: integration into networks, private relations and civic commitment. These three pillars aim to represent the economic, social and political spheres of life from Walzer's perspective (Walzer, 1983). They also reflect the different dimensions of social cohesion defined by Bernard (1999) and [reference deleted to maintain the integrity of the review process]. Each dimension is constructed from several components that represent specific aspects of the dimension. A more complete justification of our choices for dimensions and components can be found in [reference deleted to maintain the integrity of the review process].

Each of the components of the MPI and RDI are dummies equal to one if the person is deprived. Dimension values are computed from arithmetical means of the dimension's components. In this paper, we also use arithmetical means to compute index values from the dimensional values. [reference deleted to maintain the integrity of the review process] define a more complete methodology for a coherent poverty index, which we chose not to apply here for simplicity of comprehension. Computing the index values of MPI and RDI for each individual in our sample indicates the intensity of conventional and relational poverty respectively.

We also compute and use as an outcome the `incidence' of conventional and relational poverty; that is to say, the share of deprived people according to each measure. To that end, we define index poverty lines for our two indexes. For MPI we use the poverty line defined by UNDP and OPHI: someone is conventionally poor if they are deprived in at least 33.33 per cent of the weighted components. For RDI, we define the poverty line as the existence of at

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least one deprivation in all dimensions. This choice is consistent with the Walzerian theory of justice underlying our approach: for a person to be relationally non-poor, it `suffices' that they succeed in being non-deprived in at least one relevant social sphere.

INSERT TABLE 4 HERE

INSERT TABLE 5 HERE

Tables 4 and 5 present descriptive statistics of the MPI and the RDI components, respectively. They show that deprivations in conventional poverty are lower in the core areas of oil companies than in the non-core ones, and relational deprivations are of comparable scale in the 4 areas.

We also computed the averages values of our indexes in each area. The MPI was computed by multiplying the incidence of poverty (percentage of people below the poverty line) by the intensity of poverty (average number of deprivations), following the decomposition defined by OPHI and UNDP. The results are: 0.28 in Total Core, 0.30 in Total Non-Core, 0.28 in Agip Host and 0.36 in Agip Non-Host. The RDI was computed following a similar decomposition, using the poverty line defined in the previous subsection. We find the following results: 0.19 in Total Core, 0.21 in Total Non-Core, 0.20 in Agip Host, 0.24 in Agip Non-Host.

Indeed, the Total Core and Agip Host areas are better off in some of the components of conventional poverty, which explains their lower MPI scores: for instance, years of schooling,

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electricity or sanitation. On the contrary and interestingly, there are more deprivations in the component `nutrition' in the core areas than in the non-core ones. As for the RDI components, we observe that while the Total Core and Agip Host areas are better off in terms of transportation, telecommunications and information, their average level of trust in the community is lower than in the non-core areas.

The next two sections present the methodology and results of the impact assessment of the job and training programmes the oil companies have offered to part of the sample in relation to MPI and RDI, and their dimensions and components.

3. Empirical strategy

(a) Instrumental variable (IV) approach

Beneficiaries of the individual programmes (jobs, training or scholarships) under study were supposed to be chosen by the communities based on a criterion of rotation between families. In fact, a qualitative assessment showed that social position may have been a determinant in the choice of programme beneficiaries. Our dependent variables – components and dimensions of the RDI – may then have an effect (which is most likely to be negative) on our independent variable – probability of benefiting from the contracts.

The same issue can also be verified for conventional poverty. Under a situation of self-selection, beneficiaries may have become part of the programme because at baseline they were conventionally poorer compared to others. Under this hypothesis, for instance, someone who already went to university would not apply for a scholarship. On the contrary, we could imagine a situation in which economic capital is a way to gain bargaining power and more

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easily access certain individual resources, while the poorest are increasingly discriminated against.

In other words, our other dependent variables – MPI components and dimensions – could also have a reverse effect – either positive or negative – on the probability of benefiting from the contracts. Our data allows for endogeneity, and in this context, ordinary least squares or matching estimates would be biased. This is why we used the IV approach, which consists of using an exogenous variable that is highly correlated with participation in the programme, but only has an effect on the outcome through the programme.

Our data provide us with a good option for the choice of our IVs. Indeed, the area in which the village is located – out of Total Core, Total Non-Core, Agip Host, and Agip Non-Host – implies a lot of variation in the probability of benefiting from training and job programmes: the proportion of beneficiaries from these individual programmes in our sample is 39 per cent in Total Core, 30.1 per cent in Agip Host, 28 per cent in Total Non-Core and only 8.1 per cent in Agip Non-Host. Moreover, this variable is external: a qualitative assessment revealed that the 21 villages are comparable in terms of political and socioeconomic situation, and that the contracts do not imply migrations from one area to another. In this context, the IV approach leads to consistent estimations, as demonstrated by Heckman (2008).

We tested five specifications of the IVs, which were all based on the variation in the villages' area. In all specifications, the instrumented variable is a dummy indicating participation in training and job programmes.

Four specifications are just-identified: there is only one instrument. The first specification uses a discrete instrument that takes four values for the four areas; the second is based on an instrument that opposes the Total area – Core and Non-Core – and the Agip area –

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Host and Non-Host; the third is based on an instrument that opposes the Total Core area and the other three areas; and the fourth uses an instrument that opposes the Total Core and Agip Host areas and the Total Non-Core and Agip Non-Host areas.

Our last specification is over-identified: we use two instruments, one that opposes the Total and Agip areas and one that opposes Core/Host and Non-Core/Non-Host, for only one instrumented variable.

Table 6 summarises these five specifications.

INSERT TABLE 6 HERE

We used the two-stage least-squares method to compute our IV estimates. We controlled for the socio-demographic variables presented above, and a discrete variable representing the number of community projects present in the village.

(b) Relevance and validity of our instruments

In our first-stage regressions, estimates for our instruments are always very significant and positive, as illustrated by Column (1) of Table 5. These results mean that being in the Total area or in the Core area of either of the two companies increases an individual's probability of benefiting from the training and job programmes.

INSERT TABLE 7 HERE

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Column (3) of Table 7 displays the other significant covariates from the first-stage regressions. We can see that whatever the instrument used, the significant covariates are always the same: gender, social status and the dummy for landowners. The coefficient for gender is positive and significant at a 95 per cent confidence interval, and its estimate is between 0.10 and 0.11, depending on the specification. The coefficient for social status is always negative and significant at a 90 or 95 per cent interval depending on the specification, while its estimate is between -0.12 and -0.09. The coefficient for landowners is always positive and significant at a 99 per cent confidence interval, and its estimate is between 0.12 and 0.13.

Men and landowners thus have a higher likelihood of participating in job and training programmes than women and persons with no land, respectively; ordinary members have a lower probability of being involved compared to people with specific social status. This provides initial confirmation of the qualitative findings from [reference deleted to maintain the integrity of the review process] that social position is a key element in accessing such job and training programmes, and that they were thus not distributed fairly in the communities.

It is interesting to compare the values of the estimates for gender, social status and land possession to those of the instruments presented in Table 7: the increase induced by the area the individual lives in relation to the probability of participating in the programme is higher than the increase induced by social status. This importance of the type of area in relation to variations in participation, conditionally on other covariates, confirms its pertinence as an instrument.

We also performed three kinds of tests to assess the pertinence and validity of the instruments presented in Table 6.

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First, we computed Durbin-Wu-Hausman (endogeneity) tests. The null hypothesis of these tests is that the instrumented variable is exogenous, which means that IV is not the adapted methodology. For the regressions on MPI, its third dimension (living standards) and the first two dimensions of RDI (integration into networks and private relations), we always rejected the null hypothesis. For the other specifications, the p-value was not low enough to draw a conclusion – or was only low enough in a few of our specifications – but we can extend the previous result with confidence, and conclude that all instrumented variables are endogenous.

We also tested the instrument's strength, in order to verify that the type of area was a good predictor of the probability to participate in job and training programmes. F-statistics from our first-stage regressions are presented in Table 7; they are all close, or superior, to 10, meaning that the instruments are highly correlated with the independent variable, conditional on other covariates. Among our dummies, the instruments with the strongest predictive power are Core/Host – instrument 4 – and Total – instrument 2.

Finally, we computed over-identification tests for specification (5) of Table 6 – the over-identified model. The null hypothesis of these tests is that all the tested instruments are valid. We could not reject null hypothesis, which leads us to prefer the over-identified model among the five presented above.

(c) Three-stage least squares (3SLS)

Since our data is cross-sectional, a simultaneity issue could threaten the validity of our IV estimates. For this reason, we also used a three-stage least squares model. This type of model was conceptualised by Zellner & Theil (1962). It makes it possible to simultaneously estimate systems of several equations, and take into account the correlations between the error

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terms of the different equations. The three stages consist in, first, estimating parameters of the model's reduced form with ordinary least squares (OLS); second, computing the coefficients for each equation with two-stage least squares (2SLS); and third, computing generalised least squares (GLS) estimates and estimating the asymptotic covariance matrix. Given the potential presence of reverse correlations between our dependent and independent variables, and in the absence of pre-tests, this method allows us to decompose between the effect of our explanatory variable (participation in programme) on our explained variables (MPI, RDI and components), and the reverse effect of the explained variables on the explanatory ones.

More precisely, we tested different specifications. A first group of specifications separates regressions on conventional and relational poverty, while another group includes MPI as an exogenous variable for RDI, and vice versa. In this paper we only present estimates of the latter, and for specifications that only include the covariates that resulted significant in larger specifications we tested. Results from the other specifications are available upon request.

The covariates we used to assess the programme's impact on MPI are divided as follows: we used the dummy for landowners and the instrument Core/Host in both equations; age, birthplace, the dummy for working in the agricultural sector, and number of projects in the community only in the regression of participation on MPI; gender, dummy for the Total area and RDI only in the regression of MPI on participation. We thus estimate the following system of two equations:

$$
\left\{
\begin{aligned}
MPI = {}& \beta_0 + \beta_1 . PARTICIPATION + \beta_2 . AGE + \beta_3 . OWNSLAND + \beta_4 . BIRTHPLACE \\
& + \beta_5 . AGRICULTURE + \beta_6 . COREHOST + \beta_7 . PROJECTNUMBER + \varepsilon \\
¿\, PARTICIPATION = {}& \gamma_0 + \gamma_1 . MALE + \gamma_2 . OWNSLAND + \gamma_3 . MPI + \gamma_4 . RDI \\
& + \gamma_5 . COREHOST + \gamma_6 . TOTAL + \omega
\end{aligned}
\right.
$$

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With regard to the RDI, we used gender in both equations; age, dummy for being married, dummy for working in the agricultural sector, dummy for landowners, and number of projects in the community only in the regression of participation on RDI; MPI, Core/Host and Total only in the regression of MPI on participation. The estimated system is thus the following:

$$
\begin{cases}
RDI = \beta_0 + \beta_1 . PARTICIPATION + \beta_2 . MALE + \beta_3 . AGE + \beta_4 . MARRIED \\
\quad + \beta_5 . AGRICULTURE + \beta_6 . OWNSLAND + \beta_7 . PROJECTNUMBER + \varepsilon \\
\quad\quad PARTICIPATION = \gamma_0 + \gamma_1 . MPI + \gamma_2 . RDI + \gamma_3 . MALE \\
\quad\quad\quad + \gamma_4 . COREHOST + \gamma_5 . TOTAL + \omega
\end{cases}
$$

For simplicity, we present in this paper the same specification for all six regressions on

the dimensions of RDI and MPI, which are denoted as $DIMENSION_K$ in the following.

We use Core/Host and the dummy for landowners as common covariates in the two

regressions of the system; age, birthplace, the dummy for agricultural workers in the

regressions of the programme on the dimension; and gender and Total in the regressions of the

dimension on the programme. Thus, we estimate the following system:

$$
\begin{cases}
DIMENSION_K = \beta_0 + \beta_1 . PARTICIPATION + \beta_2 . AGE + \beta_3 . OWNSLAND \\
\quad + \beta_4 . BIRTHPLACE + \beta_5 . AGRICULTURE + \beta_6 . COREHOST + \varepsilon \\
PARTICIPATION = \gamma_0 + \gamma_1 . MALE + \gamma_2 . OWNSLAND + \gamma_3 . DIMENSION_K \\
\quad\quad + \gamma_4 . COREHOST + \gamma_5 . TOTAL + \omega
\end{cases}
$$

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4. When an unequal distribution of knowledge leads to distrust in the community: the results

As explained above, we tested three types of outcomes: the intensity of – conventional or relational – deprivations; the incidence of – conventional or relational – poverty measured by the probability of being under or above poverty lines; and the binary components of these multidimensional indexes.

The results of our impact analysis on these three types of outcomes show that benefiting from job and training programmes improves conventional development, but the impact on relational development is more complex because the overall effect on the index includes two types of impact: a positive one on socioeconomic components, and a negative one on trust in the community.

In this section, for simplicity, we only present the coefficient of the estimates corresponding to our main variable of interest: the dummy for benefiting from job and training programmes. In Table 8, specifications are shown horizontally, and outcomes vertically. Complete results, including all covariates for the over-identified 2SLS model and for the 3SLS specification presented above, are presented in the online appendix.

Results from the other specifications are available upon request.

(a) Impact on the indexes and dimension values

Table 8 presents estimates of the impact of MoUs on the intensity of relational and conventional poverty.

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INSERT TABLE 8 HERE

Column (5) shows that job and training programmes improve conventional development. The coefficient of our variable of interest is always negative, and significant in four out of six specifications for MPI. The last three columns show that living standards are the main channel that explains this decline in conventional poverty: benefiting from MoUs significantly reduces deprivations in this dimension, according to four specifications, and this decline is significant at a 99 per cent confidence interval according to three specifications.

The results related to education are quite surprising. One would expect this dimension to be the most affected by job and training programmes, and the instruments opposing Total to Agip to yield the most significant results, since Total funds more scholarship programmes than Agip. Column (6) shows that, on the contrary, the only instrument that yields significant results for this dimension is the one that opposes Core/Host areas of both companies to Non-Core/Non-Host areas. One interpretation of this is that in the Total Non-Core area there was less follow-up regarding how effectively the money allocated to scholarships was used. As a consequence, several cases were reported in which scholarship funds were used for other purposes. Total acknowledges the current difficulty related to a lack of follow-up, during years, of the scholarships and training programmes. Interviews led with the persons in charge of these CSR programmes highlighted the sensitivity of this topic: they belong to these communities and have received repeated threats for the past years because they were carrying out monitoring and evaluation of these programmes[7].

With respect to relational capabilities, column (1) shows that the effect of the job and training programmes on RDI is almost always negative, but close to zero and only significant

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in one specification of the 2SLS model. A key result is that this small decrease in relational deprivations in fact reflects two opposite effects on the first two dimensions of our index. The programme has a significant, negative impact on deprivations in integration to networks – see column (2) – and a positive impact on deprivations in private relations, which are significant in four out of six specifications – see column (3). The impact on the third dimension, civic commitment, is insignificant and close to zero.

In other words, and interestingly, the results tend to show that Total and Agip's training and scholarship programmes increased the conventional wellbeing of their beneficiaries, as well as their access to basic networks, but had a side effect: they damaged the beneficiaries' private relations. This finding confirms some of the conclusions from the qualitative analysis. Indeed series of qualitative interviews with randomly selected persons in diverse communities in 2009, 2010, 2011 and 2012 evidenced a growing frustration expressed by community people towards the ones they call 'benefit captors' – who have been able to participate in MoUs' negotiations with the Company for years and who give priority to their direct family members. Thus, although MoUs are supposed to benefit to the whole extended family (for example, as far as the scholarships are concerned, the nuclear families who benefit from the scholarships are supposed to rotate every year), the same people tend to enjoy the social benefits of the MoUs. This creates rivalries and jealousies within the families themselves.

Our results are also quite coherent with multiple correspondence analysis we computed on the data, which highlighted that the components from the first dimension of our RDI, integration into network, were closer to the variables we used to compute the MPI than to those of the other two dimensions of the RDI.

Table 8 shows that the different specifications we tested are very coherent, especially for MPI and its dimensions. Nevertheless, the RDI estimate from the 3SLS model is much

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bigger than the estimates from the other models, and is the only significant one at a 99 per cent confidence interval, which can be related to the fact that the positive estimate on the second dimension is very limited and non-significant for this specification, while the estimate of the first dimension is similar to the 2SLS estimates.

Our online appendix also presents the complete results of the 2SLS over-identified model and the 3SLS model. Among the most important covariates is gender: being male reduces relational deprivations and deprivations in education, but increases deprivations in health; in the first-stage regressions being male very significantly increases the probability of benefiting from a programme. This result is consistent with the fact that the MoUs are negotiated and signed mostly by men, one representative of the women association symbolically attending the negotiations. Women have access neither to the decision making process nor to the implementation committees and they tend to be culturally left aside – although there is a growing demand from the women to have access to the diverse opportunities related to the MoUs. Age is also an important covariate for conventional poverty: it increases deprivations in education and health. Important covariates for relational poverty are matrimonial status – married people are less deprived than single, separated or widowed people; social status – ordinary members of the community are more deprived than leaders, chiefs or members of associations; and the fact of owning land, which reduces relational deprivations.

These results also allow us to verify our hypothesis about the endogeneity of the data. We find that the reverse effect of relational deprivations on participation in a programme is very significant and negative, while the estimate of MPI is non-significant, negative, but close to zero. This finding consolidates the qualitative assessment's conclusion that jobs, training and scholarships were not distributed fairly across the community, but rather were given to people with a better social position and more bargaining power.

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(b) Impact on the probability of being deprived

Our second type of outcomes represent the incidence of conventional and relational poverty: we studied the impact of the job and training programmes on the probability of being under conventional and relational poverty lines. As explained above, the poverty line for MPI corresponds to deprivations in 33.33 per cent of the weighted components. We used the same poverty line for MPI dimensions. The poverty line for RDI dimensions corresponds to at least one deprivation in the dimension. The poverty line for the RDI score corresponds to deprivations in all three dimensions.

INSERT TABLE 9 HERE

Table 9 presents the results of the analysis. It shows that the direction of the effects of the programme on deprivations is the same as in our previous regressions on the intensity of deprivations, but that the scale of the effects is different, especially for relational deprivations. Comparing columns (2) and (3) shows that the impact of the programmes on the probability of being deprived in the second dimension of RDI – private relations – is of bigger scale than the opposite impact on the probability of being deprived in the first dimension – integration into networks. This yields a positive impact on relational deprivations, significant at a 90 per cent level in three of our five specifications. Again, this result is consistent with the qualitative assessment concerning the evolution of the social climate in the communities benefiting from CSR programmes. Many people acknowledge the improvement of the content of the

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programmes (very often they use the same expression: 'Total is trying') while criticising the local elites for not distributing fairly the access to these programmes.

The online appendix presents detailed results of the analysis for the 2SLS over-identified model.

(c) Decomposition into components

All of the outcome variables presented up to this point were composite variables; for a deeper understanding of the mechanisms at play, it is interesting to study the programmes' impact of each and every one of the components of these variables. Though not all of these components are significantly impacted by the programmes, we chose to present estimates for all of them.

INSERT TABLE 10 HERE

INSERT TABLE 11 HERE

Tables 10 and 11 present estimates of the programmes' effects on the 14 components of RDI, and 10 components of MPI. The online appendix presents the detailed results for these outcomes.

The main channels that explain the negative impact of the programmes on conventional deprivations are sanitation facilities – see column (6) of Table 10 – and access to

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drinking water – see column (7). Deprivations in access to electricity – column (5) – and cooking fuel – column (9) – also decrease for beneficiaries of the job and training programmes, though to a lesser extent.

We tested other specifications that include, in addition to the number of projects in the community, specific dummies related to the outcome variables. More precisely, these specifications concern: the regression for the outcome `access to electricity', which includes a dummy for communities who benefited from electricity projects; the regression for `Child enrolment', which includes a dummy for communities who have benefited from school projects, and so forth. We found similar results from these; in particular, electricity, toilets, drinking water and cooking fuel are still significantly affected by job and training programmes, which tends to show that besides the improvement experienced by the whole community, these contracts brought economic empowerment to the beneficiary, which in turn improved conventional development. The results of these regressions are not presented in this article for simplicity of reading, but are available upon request.

Table 11 shows that the improvement in the first dimension of relational capabilities can mainly be explained with reference to improved access to transportation – column (2), to information – column (4), and, to a lesser extent, to telecommunications – column (3). Like the MPI components, these effects are still significant when we add dummies for each type of community project in the regressions.

The increase in deprivations in the second dimension of the RDI is clearly explained with reference to a loss of trust in the community – column (9). It is very interesting to compare the value of this effect to the other components of MPI and RDI affected by the programmes. The side effect on trust is the biggest of all the components that were affected; it is significant at a 95 per cent level for all specifications, and at a 99 per cent level for two

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specifications out of five. One interpretation of this could be that the – unequally spread – improvement in conventional development induced by the job and training programmes happens at the expense of social bonds, which is also a conclusion of our qualitative analyses. As already mentioned, this appears as a consequence of rent seeking by a minority of the population – the 'benefit captors' (traditional elites and youth groups' leaders) – that have gained a preferential access to MoU's negotiation and implementation; they were considered 20 years ago as fighting for the common good of the clan but are now viewed as looking for their sole private interests and are no longer trusted by the other community members [reference deleted to maintain the integrity of the review process].

This key result shows that it is important to take into account all aspects of human development when evaluating a social programme, even those that were not intended to be impacted by the programme.

5. Conclusion

We have studied the impact of training and job acquisition programmes from oil companies in the Niger Delta (Nigeria) on human development, using as outcomes the Multidimensional Poverty Index, the Relational Deprivation Index and their dimensions and components. This choice of indexes expresses our belief that development is a multidimensional phenomenon and cannot be reduced to its conventional aspects, but is also, and most importantly, a matter of human relationships.

We tested three types of outcomes: the intensity of – conventional or relational – deprivations; the incidence of – conventional or relational – poverty measured by the probability of being under or above the poverty line; and the binary components of these multidimensional indexes.

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Our main finding is that benefiting from a scholarship, training or professional contract from oil companies' societal programmes improves conventional development, but that the impact on relational capabilities is more complex because the overall effect on the index includes two types of impact, a positive one on the first dimension – integration into networks – and a negative one on the second dimension – private relations.

At the component level, the main channels that explain the negative impact of the programme on conventional poverty are sanitation facilities and access to drinking water. With respect to relational capabilities, the improvement in the first dimension of RDI is mainly explained by better access to transportation, information and telecommunications. The increase in deprivations in the second dimension of RDI is clearly explained by a loss of trust in the community. One key finding is that this side effect on trust has the highest value of all the components affected. This highlights the importance of taking into account the distribution of aid when implementing a development programme: too unequal a distribution of job and training acquisition programmes might contribute to fostering distrust in the community, at least in the short run. This might well confirm the intuition that `knowledge is power' – not only in the sense used by Bacon (1597), namely that knowledge provides a way to control natural phenomena, but also in the sense of making one capable of exerting power over his neighbours. As such, the distribution of knowledge seems to be as important as knowledge itself.

On the other hand, if the short-run paradoxical effect of fostering skill acquisition of a minority of beneficiaries, at the expense of the vast majority of the population, were to be confirmed, this would lead to the following important question: How does the diffusion of knowledge ultimately overcome, in the medium- or long-term, the disrupting effect of too unequal an initial distribution of skills?

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These findings represent key issues as far as the reflection on CSR and public policies in oil-rich developing or emerging countries is concerned. Indeed the negative side effects of CSR programmes have to be assessed in the long run and a focus on RDI can help public authorities as well as companies' management reflect on more durable practices. In Nigeria, companies have replaced public authorities on some development aspects (the MoUs' expenses being deducted from the taxes paid to the State). The negative consequences of these clientelism practices in terms of interpersonal trust within the communities (and not only towards the company) tend to show the unsustainability of these behaviours.

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