Resource discoveries and FDI bonanzas: An illustration from Mozambique

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Abstract

This paper examines the effect of giant oil and gas discoveries on foreign direct investment in developing economies. Across countries, we document a 73% increase in non-extraction FDI in the 2 years following a giant discovery, an event which is unpredictable due to the uncertainty of exploration. This effect is driven by a 37% increase in the number of projects and a 17% increase in targeted sectors. Mozambique's recent FDI boom provides a telling confirmation of this mechanism. Using project-level FDI data combined with multiple waves of household surveys and firm censuses we estimate that each FDI job results in 6.2 additional local jobs, linking the gas-driven FDI bonanza in Mozambique to widespread job creation.

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1 INTRODUCTION

The natural-resource price boom of the early 2000s and the accompanying discoveries, many of them in sub-Saharan Africa, revived economists interest in the effect of resources on development. A recurrent theme in the literature is that natural resources, notably oil, may be a curse rather than a blessing for developing countries (Sachs and Warner, 2001; van der Ploeg, 2011; Ross, 2012). As Venables (2016) writes in a recent review, developing economies with weak governance have found it hard to use natural resources to improve economic performance. This is often because only the prospect of resource wealth unleashes malign political forces. Oil discoveries have been shown to increase the incidence of internal armed conflict (Lei and Michaels, 2014) and to deteriorate democratic institutions (Tsui, 2011). Newfound resource wealth in developing countries may also lead to premature de-industrialization (Rodrik, 2016) as a booming primary sector crowds out manufacturing (Corden and Neary, 1982). It is a recent study by Arezki et al. (2017) however that emphasized that discoveries themselves have economic consequences before windfalls start pouring in. This is because giant oil and gas discoveries may act as news shocks, driving the business cycle notably via investment. This is certainly a channel that needs to be taken into account when analysing the effects of natural resources on economic development.

In this paper we look at the effect of giant oil or gas discoveries on non-extraction foreign direct investment (FDI) into developing economies. There are two main reasons for this focus on FDI. The first is that FDI is a key part of economic development (Hirschman, 1957; De Mello Jr, 1997). It has been found to be associated with transfers of technology, skills, and higher wages (Javorcik, 2015), as well as creating backward and forward linkages with local firms (Javorcik, 2004; Gorg and Strobl, 2001). Aizenman and Sushko (2011) suggests that FDI inflows are associated with growth takeoffs, i.e. 5-year growth spurts that follow 5 years of stagnation.[1] Yet poor countries with weak institutions have found it hard to attract FDI (Gourinchas and Jeanne, 2013; Alfaro et al., 2008). Hence it is important to understand how resources may affect FDI inflows.[2] The second reason for our focus on FDI is that we know little about the effects of news shocks on investment in capital-scarce developing economies where FDI is likely the main source of investment. Given these two reasons and in light of the resource-curse literature we believe it is important to evaluate whether oil and gas discoveries attract or deter FDI in developing countries.

To examine the FDI response to natural resource discoveries we merge data on giant oil and gas discoveries from Horn (2011) with a project-level FDI data set compiled by fDiMarkets, part of the Financial Times Group. As the timing of giant discoveries is unpredictable due to the uncertain nature of exploration and as it precedes extraction by 5 years on average, it provides a plausibly exogenous news shock (see Arezki et al. (2017)) that allows us to identify the causal effect of resource discoveries on FDI. In addition, the project-level FDI database allows us to identify FDI flows which are unrelated to the extraction of natural resources. This distinction is particularly important as the development potential of FDI is mostly associated with *quality FDI* in manufacturing and services rather than in extractive industries (Alfaro and

[1]Some doubt remains especially among development practitioners about the all-benign nature of FDI. We discuss these in Section 4.

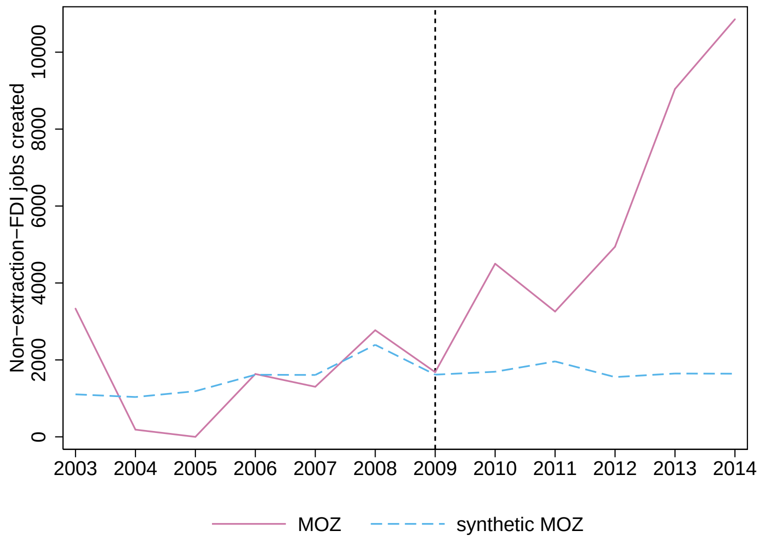
[2]The FDI effects of resources are understudied. Poelhekke and van der Ploeg (2013) is one notable exception which suggests resource rents crowd out non-resource FDI. We discuss this study further in Section 3.

Charlton, 2013). We're thus able to filter out the investment of oil and gas companies directly related to the giant discovery and to decompose the FDI effect into margins, i.e. the number of FDI projects, their average value, the range of source countries and the number of targeted sectors. This allows us to estimate the discovery effects on the amount of FDI and on its diversification.

We find that resource discoveries in developing countries cause FDI bonanzas. Lower bound estimates suggest that in the 2 years following a large discovery, non-extraction FDI inflows increase by 73%, the number of FDI projects increases by 37%, the number of sectors and source countries increase by around 20% and the number of jobs created increases by 68%. What's more, we find the effect to be stronger in poor countries with weak governance. When we break down FDI by business activity and by location, we find the strongest FDI effects in manufacturing, information and communication technologies, and retail in the country's largest city while in the rest of the country the FDI effects are strongest in business services and construction, as well as in electricity and extraction.

We then illustrate this mechanism using Mozambique's recent experience. The latter is a case in point as in late 2009, news of large natural gas discoveries off its coast created much fanfare among economists and policymakers as it became clear the country now had an incredible opportunity to grow out of poverty. According to Arezki et al. (2017), Mozambique's offshore natural gas discoveries in the Rovuma basin since 2009 have been nothing short of prolific, with a discounted net value around 50 times its GDP. While these fields are still under development as of August 2017, fDiMarkets data suggests that foreign firms moved in right after the first discovery in a multitude of industries, creating around 10,000 jobs in the following 3 years, all across the

FIGURE 1
The FDI effect of the Mozambique gas discovery



Note: The *MOZ* line is the estimated number of jobs created by FDI projects, as reported by fDiMarkets. *Synthetic MOZ* is a synthetic counterfactual, i.e. a weighted average of FDI jobs in non-OECD countries with no discoveries that mimics Mozambique until its first large discovery in 2009. See Abadie et al. (2010) for details on this method.

country. In 2014 alone it attracted \$9 billion worth of FDI. A counterfactual analysis suggests that none of this would have happened without the gas discovery. Indeed, the number of jobs created by non-extraction FDI in a synthetic control, a weighted average of FDI jobs in non-OECD countries with no discoveries that mimics Mozambique before 2010, remains flat around 1,500 jobs per year (see Figure 1).

To gauge the direct as well as indirect job-creation effect of the Mozambique FDI bonanza we link FDI projects from the fDiMarkets database (FT) as well as data on firms from the 2002 and 2014 firm censuses (CEMPRE) to household outcomes across districts, sectors, and periods using data from two waves of Household Budget Surveys from 2002 to 2014. This allows us to estimate FDI-job multipliers.[3] Since FDI and employment vary across these three dimensions we are able to estimate job multipliers using a triple difference-in-differences model controlling for all district-sector-, district-year- and sector-year-specific sources of endogeneity. To fully account for other sources of remaining endogeneity, for example business expectations within Mozambique driving both FDI and non-FDI business creation, we also use an instrumental variable strategy. Our instrument is based on the idea that the distribution of discovery-driven FDI bonanzas across sectors and cities follows a distinctive pattern across countries that is unrelated to the country specificities. We thus use the product of the average shares of FDI across sectors and cities ranked by population in Ghana, Ethiopia, and Tanzania as an instrument for FDI across Mozambique's cities and sectors. These three countries are the only other sub-Saharan African countries that experienced a first giant discovery and a subsequent FDI bonanza since 2003.

Our baseline estimate suggests that for each new FDI job an extra 6.2 are created in the same sector in the same district. Since 131,486 jobs were directly associated with FDI firms in 2014, we can infer that almost 1 million jobs, out of around 9.5 million total jobs in Mozambique, are the result of the FDI multiplier. Our results suggest that around 55% of the extra jobs created are informal rather than formal, around 65% are women jobs rather than men's, and that it is only workers with at least secondary education that benefit from the wave of job creation. We also estimate the FDI multiplier at the city level, rather than at the city-sector level, and find an equally large multiplier. This suggests that backward and forward linkages from FDI projects to firms in the

[3] Our matching of household survey data with FDI projects is akin to the methods used by Atkin et al. (2015) and Basker (2005) to study the job effects of Walmart or those used in studies of the local impact of resource extraction projects (see Cust and Poelhekke (2015)).

same sector may be the main source of additional jobs in a particular city.

Our results shed new light on the literature linking natural resources and development. While many studies have suggested resource-curse effects in the long-run, we highlight a short-run FDI effect with a potential long-run development implication. Indeed our results suggest discoveries may lead to simultaneous investment in many sectors, possibly diversifying economies and increasing capabilities (Hidalgo and Hausmann, 2009) and thus providing a window of opportunity for a growth takeoff (Murphy et al., 1989; Sachs and Warner, 1999; Aizenman and Sushko, 2011). The Mozambique experience suggests that the FDI jobs are associated with a large multiplier, as each extra FDI job is associated with 6.2 additional jobs in both the formal and informal sectors. These findings add to our understanding of local multipliers (Moretti, 2010) by focusing on the case of FDI multipliers in a developing country. It also adds to our understanding of potential Dutch Disease effects. While recent contributions such as Rodrik (2016), who suggested that newfound resource wealth may lead to premature de-industrialization, and Gollin et al. (2016), who suggested that resource discoveries lead to urbanization without industrialization, our paper points to another mechanism at play in the short run. Finally, our results add to our understanding of the determinants of FDI by highlighting the under-appreciated role of resource discoveries.[4]

The rest of our paper is structured as follows. In Section 2 we present a framework to analyse the effect of giant discoveries on firms' expectations and investment decisions. In Section 3 we present cross-country evidence on the effect of giant discoveries on FDI. We then delve into the case of Mozambique

[4] A recent meta analysis of FDI determinants does not mention resource discoveries (Blonigen and Piger, 2014).

in Section 4 where we estimate the FDI job multiplier. We conclude in Section 5.

2 HOW DISCOVERIES AFFECT FDI: A CONCEPTUAL FRAMEWORK

Economists have long claimed expectations of future demand to be an important driver of investment, at least since Keynes (1936) (Eisner, 1978). Recent empirical work has provided evidence in this direction. For example, Gennaioli et al. (2016) have shown that investment is well explained by CFOs expectations of earnings growth and Arif and Lee (2014) that aggregate investment is associated with optimistic expectations of profits, measured by analysts' forecasts of one-year-ahead earnings. Yet the identification of causality from expectations to investment has not been easy to establish as both forecasts and investment may be driven by other firm attributes.

As argued by Arezki et al. (2017), giant discoveries provide an ideal natural experiment to examine the effects of expectations on investment. Due to their unexpected nature and to the long-delay between discoveries and actual windfalls (see section 3), giant discoveries can be thought of as news shocks that only *change* expectations about the discovery country. To illustrate how multinationals' expectations of future income may change after a discovery we provide a simple analytical framework below.

We can think of a multinational choosing to invest in location i if it expects high earnings, $E[\pi_i]$. The expectation of earnings depends on both expected revenues and expected costs. Expected revenues depend on expected local consumption which can be linked to expected income $E[Y_i]$. Expected costs depend on the fixed cost F_i of establishing a plant and on the expected marginal cost of production $E[c_i]$. To keep it simple we can assume that fixed costs are constant so that the expected earnings of a new FDI project boil down to a function increasing in expected income, $\frac{\partial E[\pi_i]}{\partial E[Y_i]} > 0$, and decreasing in marginal production costs , $\frac{\partial E[\pi_i]}{\partial E[c_i]} < 0$. We discuss in turn how both $E[Y_i]$ and $E[c_i]$ can be affected by giant discoveries.

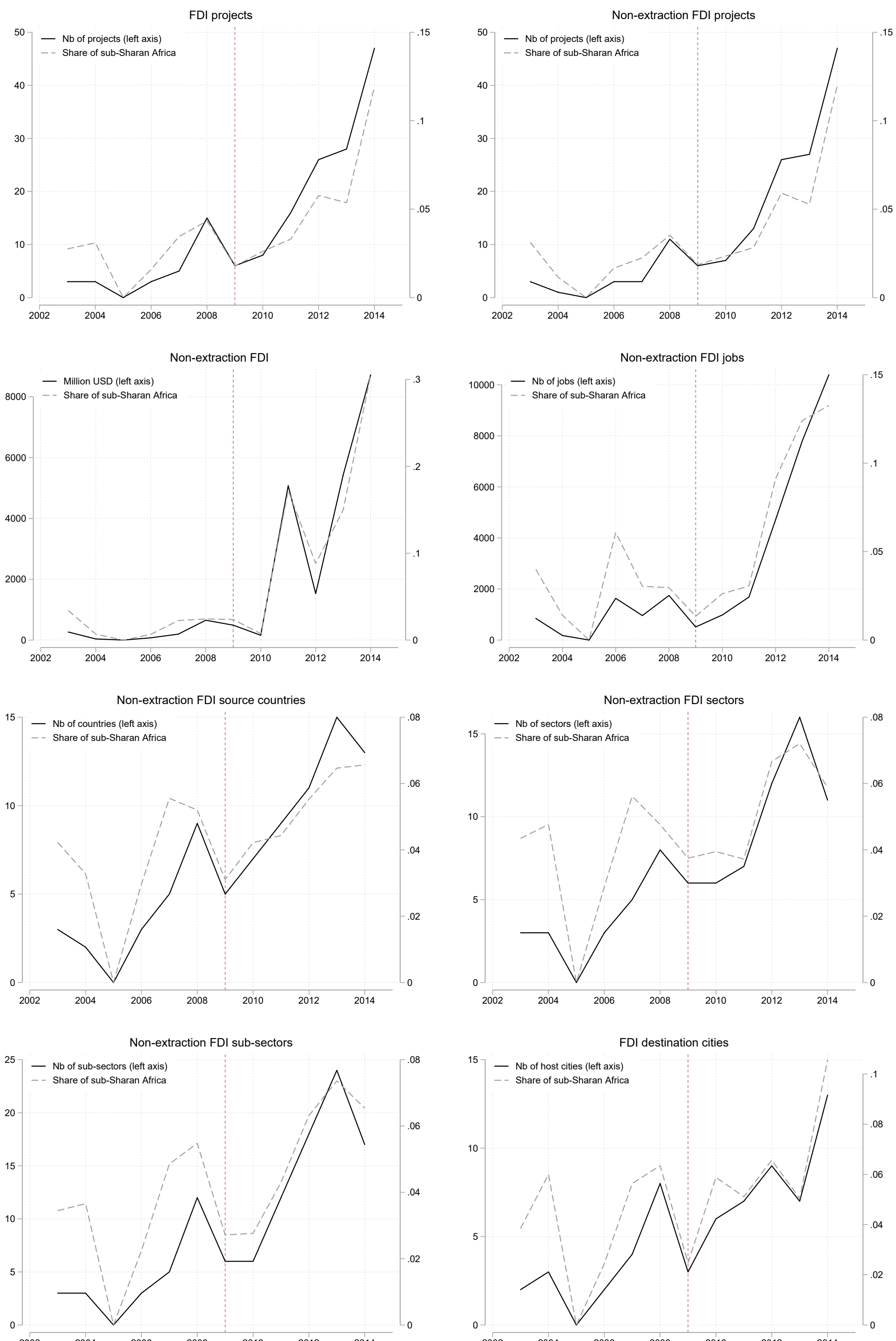
Recent research by Cust and Mihalyi (2017) suggests that across countries IMF growth forecasts are on average 1 percentage point higher in the four years following a giant discovery. The experience of Mozambique is again a case in point. While at the time of the first giant discoveries in 2009-2010, growth rates were around 6.5%, the IMF forecasted growth rates around 7.8% for the 2012-2016 period. This would suggest that $\frac{\partial E[Y_i]}{\partial Discovery_i} > 0$ and could explain the observed FDI bonanza (Figure 2). The number of yearly FDI projects quadrupled from 2010 to 2014 while the value of the investments and the number of direct jobs created increased almost by a factor of 10. Mozambique attracted \$9 billion worth of FDI in 2014 alone, accounting for 30% of all of sub-Saharan Africa's FDI.[5] The graphs in Figure 2 also show how the FDI boom was spread across cities and across sectors. And while most projects are from Portuguese, British and South African companies, companies from 32 countries invested in Mozambique since 2003.[6]

Yet it is not obvious why discoveries would increase expectations of

[5] Real estate projects led the pack for the first time in 2014 and included Belgium Pyloss dozen shopping malls around the country and South Africa's Atterbury Property Developments various plans in Pemba, Beira and Nacala.

[6] A counterfactual analysis suggests that none of this would have happened without the gas discovery (See Figures 1 and 13).

FIGURE 2
The Mozambique FDI bonanza



income in the following years. As written in the introduction, oil discoveries increase the incidence of internal armed conflict (Lei and Michaels, 2014) and deteriorate democratic institutions (Tsui, 2011). They could thus also be associated with lowered income expectations. Furthermore, while in the long run we can confidently expect that the wealth discovered below the ground will be transformed into windfalls trickling down to consumers, this will not happen in the four years following a discovery. Across countries the delay between discovery and extraction is on average 5 years and in developing countries this often exceeds a decade. As of August 2017 almost 8 years have passed since Mozambique's first discovery and the country is still a few years away from extracting natural gas from the Rovuma basin. While IMF forecasts may wrongly associate discoveries with immediate windfalls, especially in times of high commodity prices, it is more likely that other economic variables are at play in the short run.

Expectations of higher income following a discovery may be directly linked to the activities of the oil companies. The years of preparation before extraction may involve increased investment in infrastructure, an increased demand for law firms and environmental consultancies, as well as a high-skilled labor force flowing in from abroad. In other words, expectations of higher income may be due to the expectation that investment in the resource sector will spillover to the rest of the economy. Another possibility is that multinationals, or the IMF for that matter, expect governments and consumers to bring forward expenditure and investment by borrowing (van der Ploeg and Venables, 2013), using the newly found wealth as collateral. Or firms might also expect FDI bonanzas based on past experiences. Discoveries would thus operate as a signal leading to a coordinated investment by many firms, possibly amplified by animal spirits and herd behavior (Akerlof and Shiller, 2009). Last but not least, interviews with multinationals that invested in Mozambique do suggest that the gas discovery raised expected earnings and that this led to investment. One of the most explicit links between Mozambique's expected increase in market size and the gas discovery comes from Carlos Moreno, Mozambique manager of ALE, a company providing services in transportation: "*As ALE are continuing to grow and look for ways to better service our clients, we made the decision to establish ourselves in Mozambique as the country is quickly becoming a dominant location for the industry, particularly because of the recently discovered massive gas reserves in northern Mozambique.*"

While we might have a few reasons to believe that expected income goes up with a giant discovery, the formation of expectations on the marginal cost of production following a giant resource discovery, $\frac{\partial E[c_i]}{\partial Discovery_i}$, is less clear. Standard theories of Dutch Disease would suggest that in situations in which factors of production are fully employed a booming resource sector should push up production costs due to supply constraints (Corden and Neary, 1982). While discoveries are not synonymous with a booming resource sector, we could expect them to cause similar effects in the short run. On the other hand, the possible pre-boom boom, i.e. the coordinated increase in investment across sectors, as well as the possible extra infrastructure, may lead to a decrease in marginal costs via agglomeration economies (Glaeser, 2010). Hence the effect of discoveries on expected earnings can be decomposed as follows:

$$(1) \quad \frac{dE[\pi_i]}{d[Discovery_i]} = \overbrace{\frac{\partial E[\pi_i]}{\partial E[Y_i]}}^{+}\overbrace{\frac{dE[Y_i]}{d[Discovery_i]}}^{+} + \overbrace{\frac{\partial E[\pi_i]}{\partial E[c_i]}}^{-}\overbrace{\frac{dE[c_i]}{d[Discovery_i]}}^{?}$$

While the effect of discoveries on expectations of production costs and even of income may be ambiguous, our discussion above suggests that the expected profitability of a project is likely to increase with discoveries as multinationals' are likely to expect discoveries to raise income. Our empirical analysis in the next section will provide evidence supportive of this hypothesis.

3 THE FDI EFFECT OF DISCOVERIES: EVIDENCE ACROSS COUNTRIES

3.1 DATA AND IDENTIFICATION

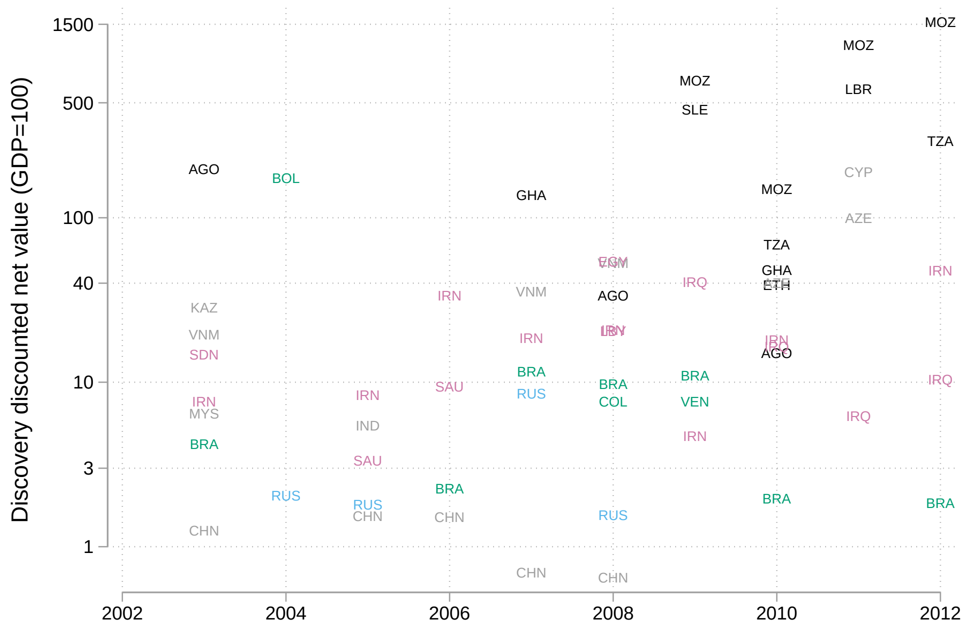
To examine the FDI response to natural resource discoveries across countries we merge data on giant oil and gas discoveries with a project-level FDI data set.

The data on discoveries are reported by Horn (2011) in *Giant Oil and Gas Fields of the World*. Giant discoveries are defined as fields containing at least 500 million barrels of ultimately recoverable oil equivalent. Figure 3 graphs the net present value of giant oil and gas discoveries as a share of GDP in non-OECD countries since 2003 as estimated by Arezki et al. (2017).[7] In total, 74 giant discoveries have been made in 29 countries between 2003 and 2014. Approximately half of the countries made only one giant discovery in this period such that the remaining 59 discoveries have been made by 14 countries. This feature of discoveries, i.e. that initial discoveries tend to trigger a number of subsequent discoveries, is discussed further below. The average

[7] Due to FDI data constraints our period of study is 2003-2014. The only OECD countries with giant discoveries in that period are the US and Australia.

FIGURE 3

Discoveries in non-OECD countries (since 2003)



Note: The discounted net value is from Arezki et al. (2017) who calculated it as the "sum of gross oil revenue derived from an approximated oil production profile discounted by country-specific discounting factors, and valued at the oil price prevailing at the time of the discovery".

value of discoveries relative to GDP in this period was around 90%.

The data on FDI projects is from fDiMarkets, part of fDi Intelligence, itself part of the Financial Times Group (FT). fDiMarkets has been tracking and verifying individual cross-border greenfield investment projects since 2003 and is now a primary source of data for UNCTAD, the World Bank and the Economist Intelligence Unit (fDiIntelligence, 2016). The database provides information on the value of investments and the estimated number of jobs created.

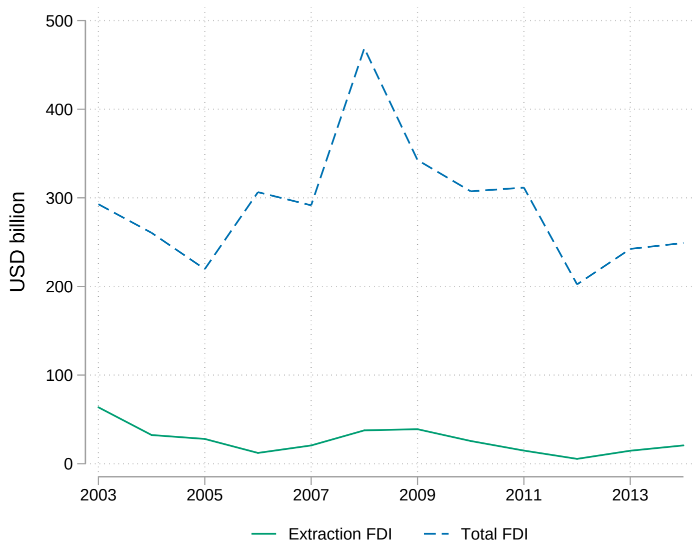
Importantly, fDiMarkets provides information on the business activity of every project. We use this information to identify FDI flows which are unrelated to the extraction of natural resources. We define FDI projects that are not in the "Extraction" Business Activity as *non-extraction FDI*. This distinction is particularly important as it allows us to identify the FDI flows driven by income expectations rather than the investment of oil and gas companies directly related to the giant discovery. It also allows us to focus on the type of FDI which has been associated with productivity spillovers (Matsuyama, 1992; Gorg and Strobl, 2001) and which may have a higher capacity to create jobs than the capital-intensive extraction sector (Ross, 2012). Indeed, the FDI data does suggest non-extraction projects create more jobs on average. While there are large differences in project size across countries, the number of jobs created by non-extraction projects is on average four times larger than in extraction projects.

Figure 4 reveals that non-extraction FDI drawfs extraction FDI even in countries with giant discoveries. During 2003-2014 FDI in non-extraction activities oscillated around USD 300 billion a year while extraction FDI was below USD 50 billion on average.

The data also allows for the analysis to go beyond the country or sector FDI aggregates. Indeed it allows us to decompose FDI into extensive and intensive margins, i.e. the number of projects vs. average value of projects, as well as number of sectors and of source countries. In Figure 16 in the appendix A.1 we summarize the number of FDI projects, source countries and target sectors in discovery countries. Further summary statistics can also be found in Table 8 of the same section.

Our strategy to identify the causal effect of discoveries on the margins of FDI inflows relies on the unpredictability of giant discoveries. As we detail in

FIGURE 4
FDI to discovery countries

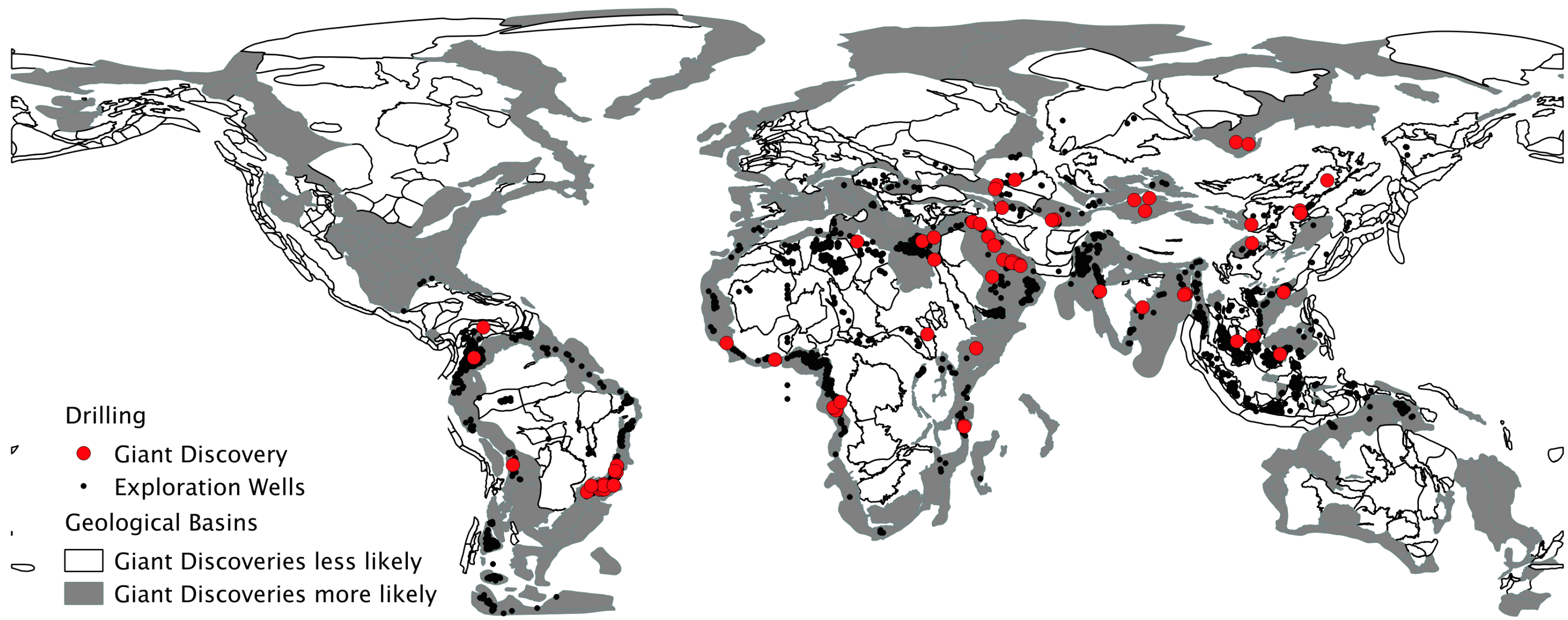


Note: Extraction FDI is as defined by fDiMarkets.

this section, the uncertain nature of exploration creates a source of plausibly exogenous variation that allows us to estimate the causal effect of giant oil and gas discoveries. We thus use a simple difference-in-differences model to compare FDI flows in the year of a giant discovery and in the two following years to FDI in other years. Hence, the timing of a discovery is at the core of our identification strategy.

FIGURE 5

Basins, drilling, and giant discoveries in non-OECD countries (since 2003)



Note: Black dots are exploration wells (Source: Horn (2011)), red dots giant discoveries (Source: Wood Mackenzie (2015)). Grey indicate basins were exploration drilling is particularly likely to result in giant discoveries. (Source: Shapefile has been constructed by Robertson CGG (2016) while Mann et al. (2001) provide an analysis on which type of basin is particularly likely to result in a giant discovery. Drilling activity and giant discoveries in OECD countries is excluded from the Figure.

Previous studies such as Arezki et al. (2017), Tsui (2011), and Lei and Michaels (2014) have suggested that the timing of giant oil discoveries is plausibly exogenous and unpredictable due to the uncertain nature of exploration.[8] To examine this claim further we matched the discovery data with data on exploration wells from Wood Mackenzie (2015) and geological basins from Robertson CGG (2016) for all non-OECD countries. This data is mapped in Figure 5. Grey areas indicate basins where exploration drilling has been particularly likely to result in giant discoveries (Mann et al., 2001). It clearly shows that companies have not made large discoveries everywhere they have drilled exploration wells.

Oil and gas companies are always looking for particularly large, and preferably giant, discoveries. This is because fixed costs represent a large share of total costs in developing and operating a successful well (Adelman, 1962). Thus, exploration wells drilled tend to cluster in areas which are considered to be particularly productive (see Figure 5). While the data suggests that the probability of a giant discovery conditional on exploration drilling is around 2%, there is no deterministic relationship between exploration and discovery. Exploring for 100 years does not guarantee a giant discovery. This has already been emphasized by Adelman (1962): "There is no amount of chronological time which can be said to correspond to the exploration long run." For example, South Africa has been digging exploration wells since 1968 but has still haven't found a giant field. The Financial Times also provides a telling example of the uncertain nature of the timing of discoveries (Kavanagh, 2013). In 2010 Lundin Petroleum made the largest discovery of the year and one of the biggest ever in Norway. It was found three meters away from where

[8]Similarly Cotet and Tsui (2013) and Cavalcanti et al. (2015) suggested that *luck* in exploration is random and allows for the causal identification of oil discoveries.

Elf Aquitaine drilled but failed to find oil in 1971.

To evaluate the effect of giant discoveries on FDI flows we estimate the following specification:

$$(2) \quad FDI_{it} = \beta D_{it} + \alpha_i + \sigma_t + \epsilon_{it}$$

where FDI_{it} is a placeholder for different measures of FDI inflows in country i in year t such as the total value of FDI inflows, the number of FDI projects, the number of jobs created, the number of source countries and of target sectors. To include observations where there is no FDI and thus include zeros we use an inverse hyperbolic sine transformation instead of the log transformation (Burbidge et al., 1988; MacKinnon and Magee, 1990). D_{it} is a dummy equal to 1 in the year of the discovery and the two subsequent years. The coefficient of interest is β. α_i is a country fixed effect that picks up factors that do not vary over time within countries such as geography as well as variables which vary little year-on-year such as formal or informal institutions. And σ_t is a year fixed effect that controls for global factors such as the oil price. ϵ_{it} represents the error term which we allow to correlate arbitrarily across years within a country and across countries within a year. In alternative specifications we limit the country sample to countries with at least one exploration well, i.e. *exploration countries*, and to countries with at least one giant discovery during 2003-2014, i.e. *discovery countries*. These alternative country samples provide a more conservative counterfactual in the event exploration is endogenous.

3.2 RESULTS AND ROBUSTNESS

Our main results are presented in Tables 1 and 2. The Tables provide estimates of β (see equation 2) for seven different measures of FDI in three panels based on three different country samples. The sample in Panel A includes all non-OECD countries, while Panel B includes only *exploration countries* and Panel C only *discovery countries*.

We find that non-extraction FDI inflows are 73% higher in the 2 years following a giant discovery. This is the lower bound estimate from Panel C, yet there is no significant difference in estimates across panels which suggests that the choice of counterfactual does not affect our main result. We also find that the number of FDI projects increases by 37% and the number of jobs created by 68%, while the average size of projects is not significantly affected. This suggests that the FDI effect is driven by the extensive margin rather than the intensive margin. Results in Table 2 further confirm that the extensive margin plays a key role in the response of FDI flows to giant discoveries. We find that the number of FDI sectors and source countries increases by 20% in the 2 years following a giant discovery. These results are again very similar across panels.

The results suggest that giant discoveries attract non-extraction FDI. The FDI inflow occurs several years *before* production actually starts and, thus, precede the potential oil boom (which occurs on average 5 years after a discovery). As discussed above non-extraction FDI tends to be labor intensive and, thus, giant discoveries have indirectly the potential to create many jobs, a mechanism we explore further using Mozambique's experience in the next section. Also, this influx of FDI is driven by the extensive rather than intensive

Table 1: Non-extraction FDI

Panel A: All countries

	(1) FDI (USD million)	(2) Nb projects	(3) Avg project size	(4) Jobs created
Discovery in past 2 years	0.616**	0.300**	0.341	0.571*
	(0.263)	(0.123)	(0.217)	(0.261)
N	1992	1992	1992	1992
R-sq	0.75	0.91	0.48	0.75

Panel B: Only exploration countries

	(1) FDI (USD million)	(2) Nb projects	(3) Avg project size	(4) Jobs created
Discovery in past 2 years	0.594**	0.303**	0.314	0.549*
	(0.264)	(0.126)	(0.211)	(0.251)
N	1080	1080	1080	1080
R-sq	0.72	0.90	0.41	0.75

Panel C: Only discovery countries

	(1) FDI (USD million)	(2) Nb projects	(3) Avg project size	(4) Jobs created
Discovery in past 2 years	0.551*	0.318**	0.245	0.519*
	(0.286)	(0.140)	(0.219)	(0.267)
N	300	300	300	300
R-sq	0.73	0.90	0.37	0.75

Country and year fixed effects included in all regressions. Standard errors in parenthesis clustered by country and year. Non-dummy variables are in inverse-hyperbolic sines.

Table 2: Extensive margins

Panel A: All countries

	(1) Nb source countries	(2) Nb sub-sectors	(3) Nb sectors
Discovery in past 2 years	0.204**	0.251**	0.192**
	(0.076)	(0.082)	(0.069)
N	1992	1992	1992
R-sq	0.87	0.90	0.87

Panel B: Only exploration countries

	(1) Nb source countries	(2) Nb sub-sectors	(3) Nb sectors
Discovery in past 2 years	0.188**	0.193*	0.158**
	(0.078)	(0.088)	(0.071)
N	1080	1080	1080
R-sq	0.86	0.89	0.86

Panel C: Only discovery countries

	(1) Nb source countries	(2) Nb sub-sectors	(3) Nb sectors
Discovery in past 2 years	0.197*	0.246**	0.189**
	(0.090)	(0.095)	(0.080)
N	300	300	300
R-sq	0.81	0.88	0.82

Country and year fixed effects included in all regressions. Standard errors in parenthesis clustered by country and year. Non-dummy variables are in inverse-hyperbolic sines.

margin such that it provides a source of diversification for the economy as jobs are created across a variety of sectors. The increase in the number of source countries is also consistent with the idea that giant discoveries act as news shocks about future market size propagated across countries. Hence, giant discoveries may work as a coordination device which exogenously determine the timing of investment from different countries and sectors thereby providing a window of opportunity for a big push.

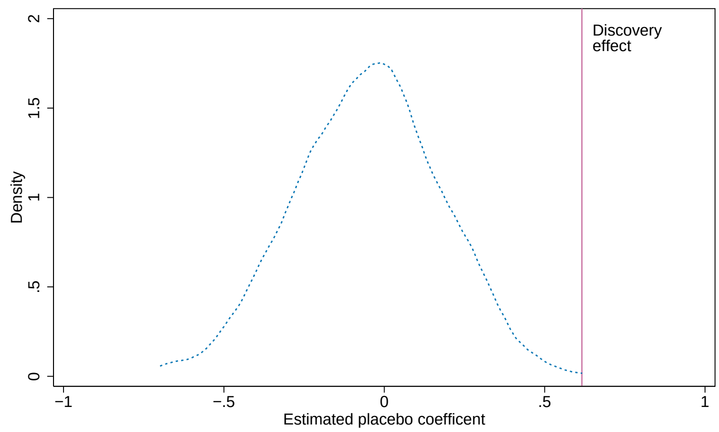
Our results are in line with Arezki et al. (2017) who show that in a panel of up to 180 countries during the period 1970-2012 that investment rises robustly right after the news of a giant discovery arrives.[9] And while our results seem to go against Poelhekke and van der Ploeg (2013) it is worth noting that the latter showed that resource rents, rather than discoveries, crowded out non-resource FDI, and that was mostly in the longer run and focusing on the period 1985-2002, i.e. before the latest boom. Our results are thus complementary rather than contradicting.

Robustness In the next paragraphs we describe a battery of robustness checks to reinforce our main result. Our first check is a falsification exercise to highlight the importance of the timing of the discoveries across years. In this check we generated placebo discoveries by shuffling the discovery years randomly within discovery countries across years and used this "false" data to re-estimate equation 2 five hundred times on our Panel A sample. As we show in Figure 6, reshuffling the discoveries randomly does not give similar results. Indeed, the distribution of 500 randomized discoveries is centred around zero, and only 19 random draws out of 500 came out positive and significant. Based on the standard error of the placebo distribution, the probability of obtaining our benchmark estimate of 0.616, as shown by the vertical line, is below 0.01. This adds confidence in our identification based on the exogenous timing of the discoveries.

As a second robustness check we experiment with various time horizons

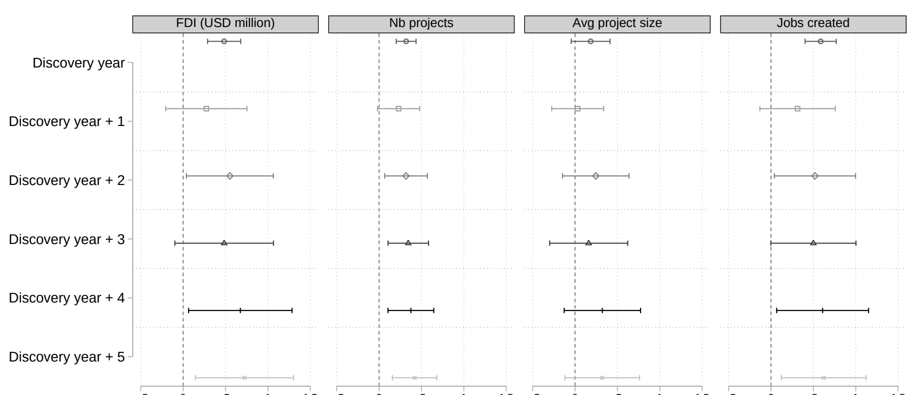
[9] While Arezki et al. (2017) looked at private and public investment, their data did not allow them to distinguish extractive vs. non-extractive investment. Our FDI data is thus ideal to complement our understanding of the effects of giant oil discoveries. The latter also find that employment decreases slightly after the news. While we find that FDI creates jobs we examine the effect on total employment in Mozambique and find no such jobs crowding out.

FIGURE 6
Distribution of 500 placebo discovery effects



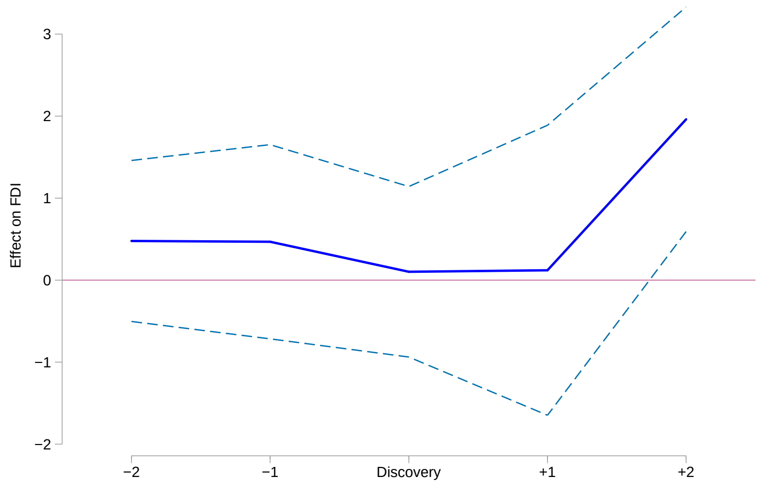
Note: The 500 placebo discoveries were generated by reshuffling randomly the discovery years within countries across years. Their effects on non-extraction FDI were estimated using our baseline specification in equation 2. The vertical red line gives our benchmark estimate (column 1 of Table 1).

FIGURE 7
Discovery effect on FDI: Varying time horizons



Note: The effects on non-extraction FDI are estimated in a specification akin to our baseline (Table 1) where the "Discovery in past 2 years" dummy is replaced with dummies for alternate time horizons. For example, Discovery year+4 is a dummy equal to 1 in the Discovery year and the 4 subsequent ones. The dummy Discovery year+2 is thus the same as in our baseline. The capped lines are 90% confidence intervals.

FIGURE 8



Note: The yearly effects on non-extraction FDI are estimated in a specification akin to our baseline (Table 1) where the 2-year discovery dummy is replaced with five dummies, one for each year from 2 years before to 2 years after the discovery.

as our 2-year cut-off may be arbitrary. We estimate our baseline regression (Panel A) but replacing our "Discovery in past 2 years" dummy with dummies for alternate time horizons, i.e. from 1 to 5 years after the discovery. For example, Discovery year+4 is a dummy equal to 1 in the Discovery year and the 4 subsequent ones. Our estimates, summarized in Figure 7, suggest that our baseline results are robust to the choice of time horizon. FDI projects increase significantly in the year of the discovery and in the following 5 years. It is only when considering only the year of the discovery and the following year that we find less convincing effects, though the coefficients' magnitude is not statistically different. Indeed there is no significant differences across the estimates using different time horizons.

In a third robustness check we restrain our sample to the years before and the 3 years after the *first* giant discovery in each country in our sample.

By eliminating subsequent giant discoveries from our sample we can estimate a more flexible specification which allows us to explore the dynamics of the response in non-extraction FDI in more detail while avoiding potential biases introduced by successive discoveries. We thus estimate equation 2 but we replace D_{it} with 5 dummies (two lags, two leads and one dummy for the year of the discovery). The results of this specification are presented in Figure 8. We find a positive effect on non-extraction FDI two years after the discovery and there is no evidence of higher non-extraction FDI flows in the years preceding a discovery.

Our fourth robustness check is to re-estimate equation 2 using FDI data from UNCTAD rather than from fDiMarkets. While UNCTAD is the most commonly used source of FDI across countries, it does not allow us to isolate non-extraction FDI nor to disaggregate FDI into margins. It does however allow us to expand the sample period to 1970-2014. Results in Table 9 in appendix A.2 confirm our baseline.

In additional robustness checks we show that our results also hold when we include the number of previous discoveries as an additional control in equation 2 as in Arezki et al. (2017) (see Figure 9) or when we estimate a Poisson pseudo-maximum likelihood (Silva and Tenreyro, 2006) instead of a linear model (results available upon request).

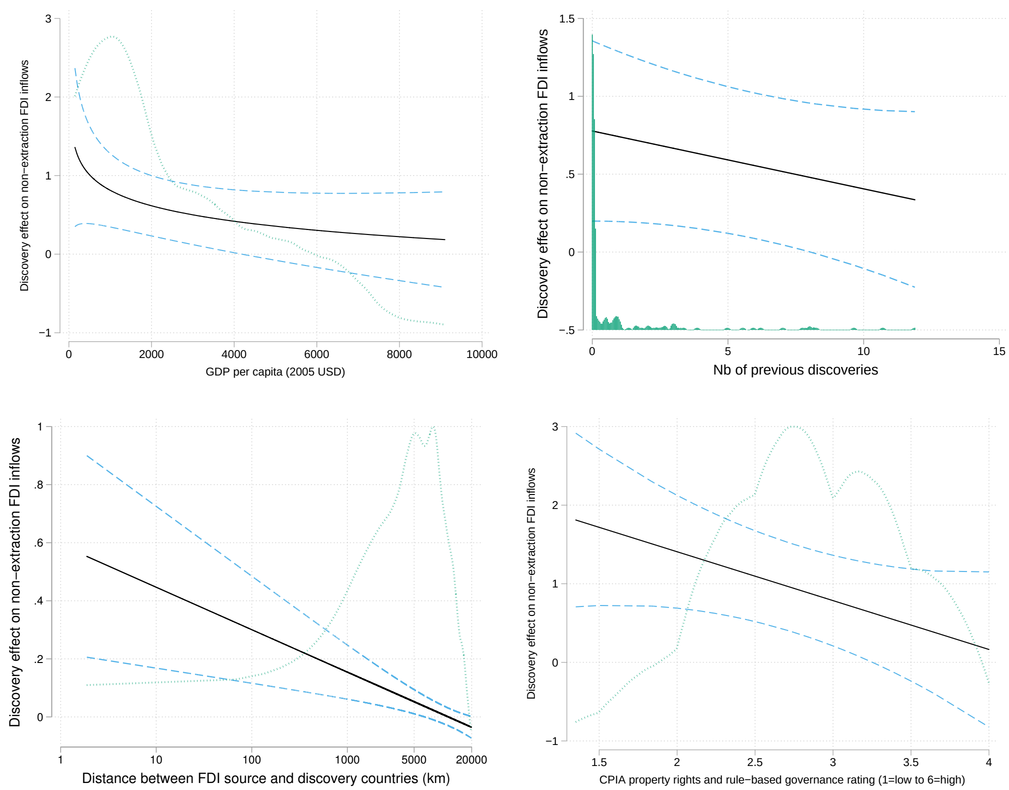
Heterogeneity To examine further the effect of giant discoveries on FDI we look at how it varies across destination countries based on their level of development, the quality of their institutions, their distance from the discovery country, as well as on their previous giant discoveries. To do so we augment equation 2 by interacting the discovery dummy with real GDP per capita (in 2005 US dollars, from the World Development Indicators), with the number of previous discoveries, and with measures of institutional quality, i.e. the CPIA property rights and rule-based governance rating from the World Development Indicators.[10] We also check if the effect's size depends on the geodesic distance between the destination and the source countries. To do so we turn our main specification into a gravity model with bilateral FDI flows, i.e. we include FDI from each source country rather than aggregate them by destination county (we include source-year and country-pair fixed effects but none for destination-year as we want to estimate the effect of the discovery dummy). The results are shown in Figure 9. We find the effect to be stronger and statistically significant only in poor countries with an average GDP per capita below $4,000 during 2003-2014. Weak institutions do not seem to affect the relationship significantly, though if anything the resource effect is reduced by better institutions. This may reflect the fact that poor countries have weak institutions and it is in those countries that a giant discovery is a bigger deal.[11] We also find that the effect is stronger on FDI from nearer countries, maybe as the news of the discovery resonates more in neighbouring countries who also have more information about the discovery country. Finally we find that the effect is less strong when the country has had giant discoveries in the past, though this relationship is not statistically significant.

[10] CPIA stands for Country Policy and Institutional Assessment and it focuses only on low-income countries. The results also hold if we use the rule of law index from the World Bank Governance Indicators.

[11] This result also suggests that resources may provide a missing piece to the allocation puzzle whereby low-productivity growth countries have higher FDI to GDP ratios (Gourinchas and Jeanne, 2013). While Alfaro et al. (2008) suggest that low institutional quality is the leading explanation, our results point to resources as a third variable linking FDI inflows and low productivity growth.

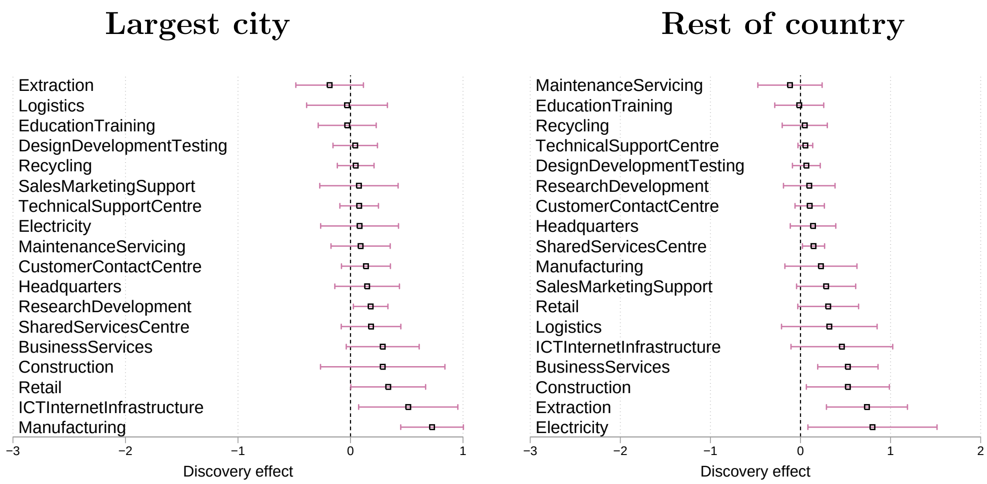
FIGURE 9

Heterogeneity of the FDI effects across countries



Note: Specification of Table 1 where the discovery dummy is interacted with the x-axis variable. The data on GDP per capita and on institutional quality is from the World Bank Development indicators.

FIGURE 10
Discovery effect on FDI by business activity



Note: The bars show β coefficients estimated running regression 2 by business activity. Business activity is a level of aggregation above sectors in fDi Intelligence industry classification system.

Finally we explore the FDI response across business activities and location by re-estimating equation 2 by business activity for both FDI to the country's metropolis and to the rest of the country.[12]. The results in Figure 10 suggest that the strongest response comes from FDI in manufacturing, information and communication technologies, and retail in the country's largest city while in the rest of the country the FDI effects are strongest in business services and construction, as well as in electricity and extraction. Note that some of those activities, in particular manufacturing, construction and retail are likely to be labor intensive and provide the potential for the creation of many jobs in developing countries. Also, the effect on business services might be linked to the deepening of retail banking and thus ease financial constraints which are

[12]We opted for business activity rather than sectors as these make a clear distinction between manufacturing and services and also because it aggregates FDI projects into 18 categories rather than 39 and thus ease the presentation of the results

frequently considered a strong impediment to development. Most importantly, these findings add to our understanding of potential Dutch Disease effects. While newfound resource wealth may lead to premature deindustrialization Rodrik (2016) and urbanization without industrialization Gollin et al. (2016), our results suggest that another "industrialization" mechanism may be at play in the short run. The reaction of FDI in manufacturing, construction and in business services can be interpreted as "expectation-driven" FDI whereby foreign firms flock in expecting future growth.

4 THE JOB EFFECTS OF AN FDI BONANZA: THE CASE OF MOZAMBIQUE

4.1 DATA AND IDENTIFICATION

Our results so far suggest that giant oil and gas discoveries lead to FDI bonanzas of new projects, in new sectors, from new source countries. As discoveries precede production by 5 years on average, we argue that the FDI effect is driven by expectations of higher income. The FDI bonanza that followed the unprecedented giant gas discoveries off Mozambique but precedes the actual field exploitation illustrates tellingly this FDI effect. It thus provides a unique opportunity to go one step further and evaluate the local job effects of the FDI projects. While most economists see FDI as a key part of economic development (see De Mello Jr (1997)), the cross-country evidence does not suggest a clear-cut positive effect of FDI on growth. For example, Carkovic and Levine (2005) suggests that when FDI is instrumented to rule out reverse casuality it has no robust positive influence on economic growth. Borensztein et al. (1998) on the other hand suggests that FDI does contribute to growth but only when the host country has a minimum stock of human capital. Moreover, other studies have shown that countries undercut each other's labor and environmental standards to attract FDI in a race to the bottom that may hurt development (Davies and Vadlamannati, 2013; Olney, 2013; Poelhekke and van der Ploeg, 2015). A recent study of FDI in Vietnam (McLaren and Yoo, 2016) even suggests that FDI is associated with a decline in living standards for households within a province if they do not have a member employed by the foreign enterprises, and with only modest gains for households who do. Hence it is not clear in advance whether the FDI bonanza in Mozambique has been development-friendly, especially as it is one of the poorest countries in the world.

Our aim here is to determine whether the FDI bonanza in Mozambique has been pro-job. Our focus on employment stems from our belief that the development effect of FDI comes first and foremost from job creation. Most micro-level studies cited above have skipped the probably-too-obvious employment effect to focus on the wage or productivity effects. But the employment effects are not so obvious. In its review of the labor market effects of US FDI in developing countries, Lipsey (2004) suggests that affiliates, while labor-intensive relative to their parent firm, generate less employment than local firms as they are more productive and skill intensive. In the same vein, Marelli et al. (2014) finds no positive effects of FDI on employment in Southern and Central and Eastern European regions while Axarloglou and Pournarakis (2007) finds that FDI inflows in manufacturing have only weak effects on local employment across US states. Last but not least, Atkin et al. (2015) estimate the effect of foreign supermarket entry (mostly WalMart) on household welfare in Mexico and find little evidence of changes in average municipality-level employment. Even across US States it is not clear whether the expansion of WalMart has created or destroyed jobs. Basker (2005) suggests that Wal-Mart entry increases retail employment by 100 jobs in the year of entry in a US county while Neumark et al. (2008) suggest it reduces it by about 150 workers. Hence it is surely a worthy endeavour to check whether the boom in FDI projects across Mozambique has increased household employment or not.

Our approach to gauge the job-creation effect of the Mozambique FDI bonanza is inspired by the local multiplier literature, i.e. the idea that *every time a local economy generates a new job by attracting a new business, additional jobs might also be created* (Moretti, 2010), as well as by empirical studies on the local employment effect of mines such as Aragon and Rud (2013) and Kotsadam and Tolonen (2016).

In our particular setting, we expect FDI jobs to have a multiplier effect due to two distinct channels. First, the newly created FDI jobs are likely to be associated with higher salaries (Javorcik, 2015). In the context of Sub-Saharan Africa, Blanas et al. (2017) have shown that foreign-owned firms not only pay higher wages to non-production and managerial workers but they also offer more secure, i.e. less-temporary work. These newly created jobs are likely to increase local income and in turn demand for local goods and services. For example, the multinational employees might increase the demand for local agricultural goods such as fruit and vegetables, as well as for services such as housing, restaurants and bars. Such an increase in demand will be met by local firms by adjusting production, creating more jobs and reinforcing the initial increase in demand. Hence, the increased demand for local goods and services pushes the economy to a new equilibrium by multiplying the initial number of jobs directly created by multinationals (Hirschman, 1957; Moretti, 2010).[13].

Additionally, backward and forward linkages between multinationals and local firms might increase the demand for local goods and services (Javorcik, 2004). In particular, newly arrived multinationals might demand services such as catering, driving and cleaning services, as well as services from local law firms and consultancies which are more experienced with the economic and legal environment. While both mechanisms may contribute to the job multiplier, we expect linkages to be strongest within the sector of investment. Indeed, previous work on Input-Output tables documents that linkages across firms are predominantly formed within the same sector (Miller and Blair, 2009). On the other hand the multiplier effect operating via the increased demand for local goods and services should affect the local economy more equally across sectors. We investigate this conjecture in our data analysis below.

To estimate such a multiplier we match the FDI projects to job numbers across cities, sectors, and periods using data from two waves of Household Surveys from 2002 to 2014. Since FDI and employment vary across three dimensions, i.e. across districts, sectors, and periods, we are able to estimate a triple difference-in-differences model controlling for all district-sector-, district-year- and sector-year-specific sources of endogeneity. Sector-year fixed effects allow us to control for country-level trends such as the servicification

[13]While in Moretti (2010) the increased demand for labor is met by a spatial reallocation of labor which is determined by local differences in wages and idiosyncratic preferences for locations, in the context of a developing country, such as Mozambique, the increased demand may also be met by a reserve of surplus labor as in LEWIS (1954)

of the economy, district-year fixed effects capture market potential, and district-sector fixed effects geographic factors that may influence FDI in some sectors over others. More formally, we estimate the following specification:

$$Jobs_{ijt} = \gamma FDI_{ijt} + \alpha_{ij} + \Omega_{it} + \lambda_{jt} + \epsilon_{ijt}$$

where $Jobs_{ijt}$ is the number of individuals employed in non-FDI jobs, whether formal or informal, in district i in sector j in year t; FDI_{ijt} is the number of jobs directly created by FDI projects, or the number of FDI projects; α_{ij} is a sector-district fixed effect; Ω_{it} is a sector-year fixed effect; λ_{jt} is a district-year fixed effect and ϵ_{ijt} is the error term which is clustered by district and sector. The coefficient on γ thus captures the multiplier effect of FDI jobs.

While the exogenous nature of the FDI boom, i.e. it being the result of the unexpected giant discovery, suggests that our triple diff-in-diff model will provide quasi-causal estimates, we can nonetheless be worried that its distribution across cities and sectors is driven by expectations within Mozambique that also drive non-FDI business creation. To control for such potential endogeneity we also use an instrumental variable strategy based on the distribution of FDI booms across sectors and cities in three African countries that also had their first giant discovery in the late 2000s. We detail this strategy as a first robustness check after describing our baseline results.

While fDiMarkets provides yearly information on the location FDI projects at the district level, 87 of the 215 projects listed from 2003 to 2014 have unknown locations.[14] We thus also use FDI data from the 2002 and 2014

[14] While this may be because the investment has been announced but not realized, 128 of the projects have been confirmed by internet searches.

firm censuses (Censo de Empresas or CEMPRE) which was completed by the national statistics institute (INE) as an alternate source of FDI data. The firm census includes information on each firm's share of foreign ownership, which allows us to estimate the number of FDI firms, as well as the number of employees in those firms. This information is available only from the 2014 census and thus refers to FDI stocks rather than flows. We are nonetheless able to estimate yearly FDI flows using the registration year of the firms surveyed in 2014. This estimate includes only firms that survived until 2014 and it assumes that surviving foreign-owned firms in 2014 were foreign-owned since their registration year, i.e. not acquired. This estimate suggests more than four times more FDI projects than fDiMarkets. Hence while fDiMarkets is most likely an underestimate of the number of FDI projects, our FDI flows based on CEMPRE data may be an overestimate or an underestimate. For robustness we use both FDI estimates in our regressions. We compare our two sources of data on FDI in Figure 18 in appendix A.4.

To link the information on FDI projects to household-level data, we use two individual waves of the household budget survey from 2002/2003 (IAF02), and 2014/2015 (IOF14).[15] Every survey contains information on the sector of employment of each individual in the household. Since we are interested in the effects of FDI inflows on employment we reduce our sample to individuals between 15 and 59 years old. For a consistent matching of FDI projects and households across districts and sectors we aggregate the available information into 9 sectors, namely Construction, Manufacturing, Extraction, Transportation, Services, Agriculture, Education, Health, and

[15]The surveys were conducted by the National Statistical Institute. To collect the information, a series of interviews were conducted over a one-week period for each household. They are representative for the rural and urban zones and each of the ten provinces plus Maputo City.

Administration.[16] Quite conveniently, the census years of 2002 and 2014 match the household survey years.

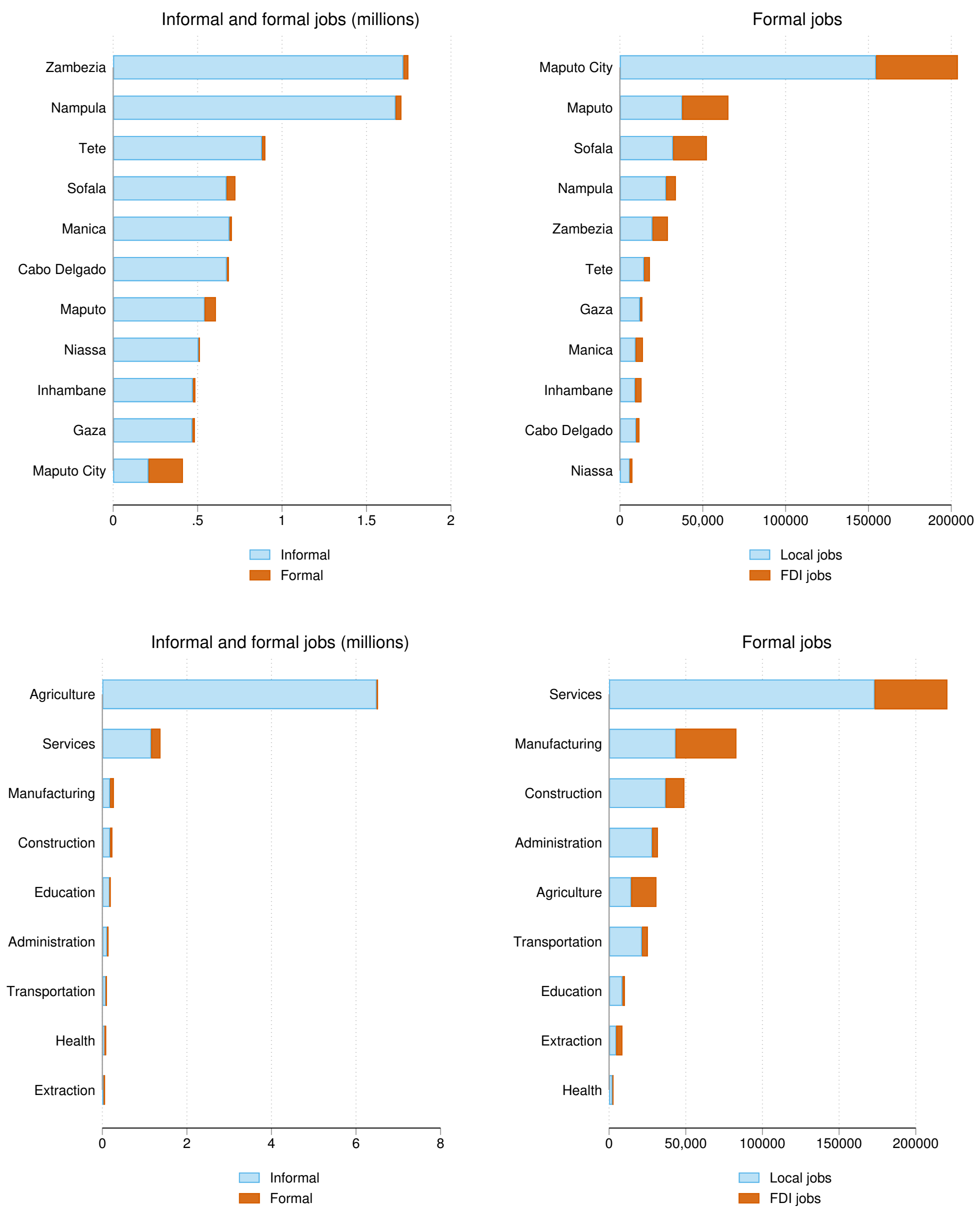
We estimate the total number of jobs using the total number of people reporting being employed in each district, sector and year and by grossing up the weights provided in the survey (see Blundell et al. (2004) for an example of grossing up weights). To estimate the number of informal jobs we subtract from total jobs the number of formal local jobs as per the 2002 and 2014 firm censuses and the number of FDI jobs from either the firm censuses or fDiMarkets, depending on which source of FDI data we use in the regression. The job numbers, based on CEMPRE data are presented in Figure 11. The larger majority of jobs in Mozambique are informal. Even in the capital and biggest city, Maputo, the share of formal jobs is just around 50%. And while most formal jobs are in services, FDI accounts for a larger share of formal jobs in manufacturing. Further summary statistics and a detailed description of the variables employed in the analysis can be found in Table 11 and 10 in appendix A.3.

4.2 RESULTS AND ROBUSTNESS

Results Our baseline estimates are presented in Table 3. The estimated coefficients in the top panel give us the FDI-job multiplier, i.e. the number of additional non-FDI jobs created by an extra FDI job. The bottom panel estimates are for the multiplier associated with an extra FDI project. Using

[16] Services include Business Services, Retail, Maintenance and Servicing, Headquarters, ICT and Internet Infrastructure, Sales Marketing and Support, and Electricity from the fDiMarkets categories. From the CEMPRE data it includes a wide array of activities from wholesale and retail to hotels and restaurants, banking, consulting, real estate, arts and sports, as well as utilities such as water, gas and electricity. Our matching categories are available upon request.

FIGURE 11
Jobs in Mozambique in 2014



Note: The numbers are based on Household Budget Survey (IOF14) and the firm census (CEMPRE).

FDI job numbers from the firm census (CEMPRE) suggests a multiplier of 6.2 (column 1) and the order of magnitude of this multiplier is confirmed by the fDiMarkets (FT) data which suggests a multiplier of 6.7 (column 2). Columns (3-6) break down non-FDI jobs into formal and informal jobs. It suggests that out of the 6.2 additional jobs created by an FDI job, 2.9 are formal and 3.4 are informal. Again the estimates based on fDiMarkets suggest similar numbers. These multipliers suggest large job-creation effects for FDI jobs but are nonetheless of the same magnitude as the local multipliers estimated by Moretti (2010) for high-skilled jobs.

The estimates in the bottom panel of Table 3 suggest that an extra FDI project is associated with 120 non-FDI additional jobs, 50 in the formal economy and 70 in the informal sector. It confirms the larger impact of FDI on the informal sector than on the formal sector. The numbers are of a larger magnitude when using FDI data from fDiMarkets. The latter suggests that each extra FDI projects creates 1,846 additional jobs. This difference might be explained by a selection of mostly large projects in the fDiMarkets data.

Robustness to potential endogeneity While our triple diff-in-diff should control for most sources of endogenity, we might still be worried that our results are driven by particularly successful cities that attracted much FDI and saw local business growth or by general trends like the servicification of the economy. To test for this possibility we create 100 placebo FDI projects by shuffling existing projects within sector-year (as well as within district-year). Figure 12 gives the distribution of these placebo estimates. The fact that these are distributed around zero and that our estimated multiplier of 6.2 is

Table 3: FDI job multipliers

Panel A: Job-level multipliers

	(1) Non-FDI jobs	(2) Non-FDI jobs	(3) Formal jobs	(4) Formal jobs	(5) Informal jobs	(6) Informal jobs
FDI jobs (CEMPRE)	6.228***		2.861***		3.417***	
	(1.000)		(0.331)		(0.838)	
FDI jobs (FT)		6.681		2.199		4.252
		(5.532)		(3.003)		(2.760)
N	1012	1012	1012	1012	1012	1012
R-sq	0.96	0.96	0.97	0.94	0.96	0.96

Panel B: Project-level multipliers

	(1) Non-FDI jobs	(2) Non-FDI jobs	(3) Formal jobs	(4) Formal jobs	(5) Informal jobs	(6) Informal jobs
FDI projects (CEMPRE)	119.963***		50.109***		70.430***	
	(13.368)		(2.522)		(13.665)	
FDI projects (FT)		1846.264***		958.713***		891.961***
		(132.935)		(14.992)		(123.008)
N	1012	1012	1012	1012	1012	1012
R-sq	0.96	0.96	0.97	0.98	0.96	0.96

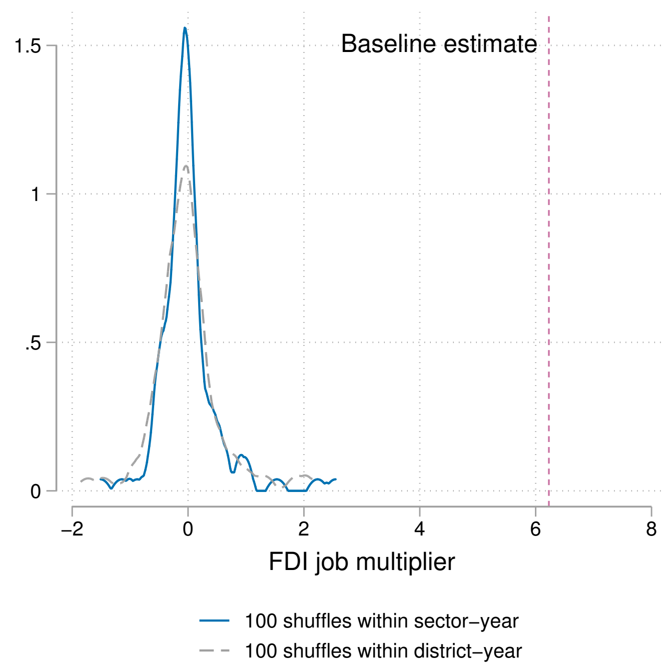
Note: District-year and district-sector and sector-year fixed effects included in all regressions. Standard errors in parenthesis clustered by district and sector, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

far to the right of the distribution's right tail increase our confidence that our estimates are not picking up general city or sector effects. It suggests that the FDI projects are not correlated with local jobs in all districts but only in the districts where they actually take place.

As mentioned earlier we can nonetheless be worried that the distribution of FDI projects and jobs across cities and sectors is driven by expectations within Mozambique that also drive non-FDI business and job creation. To confirm that our results are robust to this potential endogeneity we use an instrumental variable strategy. The latter is based on the idea that the distribution of discovery-driven FDI bonanzas across sectors and cities follows a distinctive pattern that is unrelated to the country specificities.

Figure 13 illustrates the effect of discoveries on FDI inflows for Ghana, Ethiopia, Tanzania as well as Mozambique. These four sub-Saharan African

FIGURE 12
Placebo FDI job multipliers

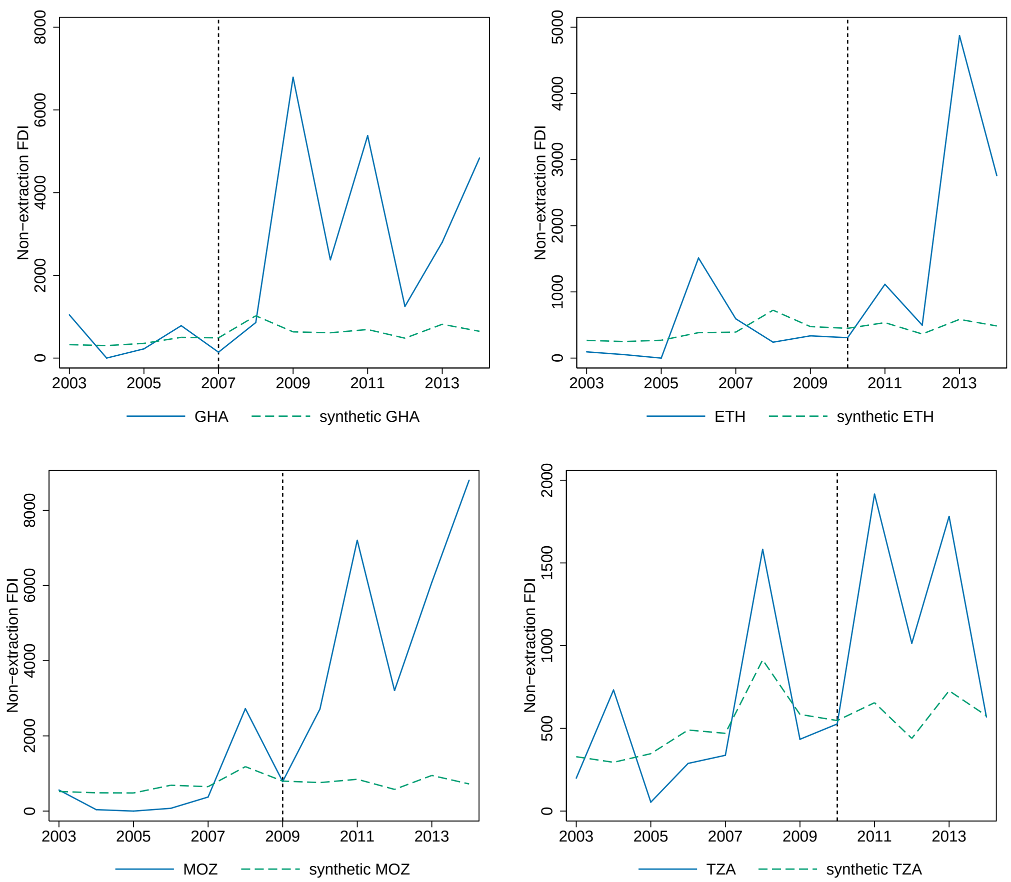


Note: The 100 placebo allocations of FDI jobs were generated by reshuffling randomly the FDI jobs within district-years and within sector-years. Their effects on non-FDI jobs were estimated using our baseline specification (Panel A of Table 3). The vertical red line gives our baseline estimate (column 1).

countries announced their first giant discoveries in the late 2000s. The fDiMarkets data suggests that foreign firms moved in en masse in the years following the first discovery and a counterfactual analysis suggests that this FDI wave would not have happened without the giant discovery. Indeed, the size of non-extraction FDI inflows in the synthetic controls, i.e. weighted averages of non-extraction FDI in non-OECD countries with no discoveries, remains flat.

The distribution of FDI booms, measured in FDI jobs as well as projects,

FIGURE 13
FDI: Discovery countries vs. synthetic counterfactuals

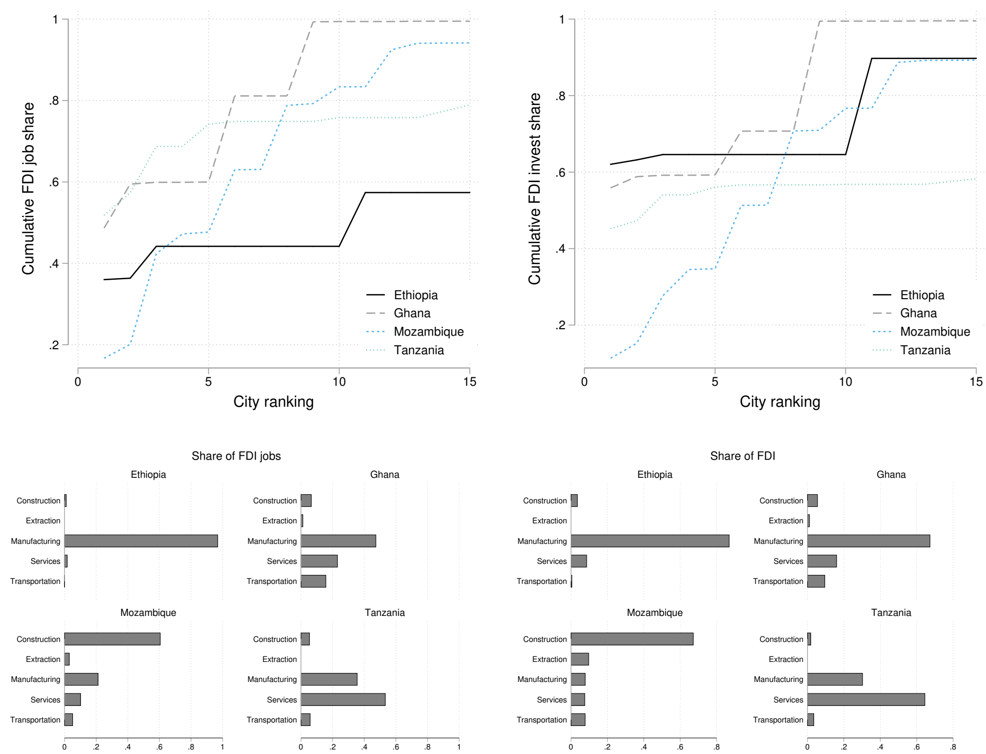


Note: Discovery countries are defined as countries with at least one giant discovery since 2003 (shown in Figure 3). Synthetic counterfactuals are weighted averages of non-extraction FDI in other countries. The weights are generated so that the differences in FDI inflows between the country and its synthetic version are minimized prior to the discovery. Each country is thus compared to a synthetic version of itself, similar in terms of FDI inflows prior to the discovery. See Abadie et al. (2010) for details on this method.

across sectors and cities in these four African countries is shown in Figure 14. While the distributions of FDI jobs across cities ranked by population seem to follow similar power laws across countries, the distribution of FDI jobs across sectors is more random. Nonetheless, we use the average shares of FDI jobs by sectors and city rank in the three other African countries to construct an instrument for FDI in Mozambique. The intuition is that the common distributional features of FDI in countries with similar giant discoveries provides variation across districts and sectors that is not driven by Mozambique-specific expectations but rather by the usual pull forces at play in discovery countries. We thus multiply the average of FDI shares across sectors and city rank in post-discovery years in Ghana, Ethiopia and Tanzania (we assume zero FDI jobs in 2002) and use it to instrument FDI jobs in Mozambique. The first stage results in column (1) of Table 4 confirm the relevance of our instruments. For both FDI jobs and FDI projects the instrument effect is significant at the 1% level and its F statistic is way above 10, confirming it is not weak. The second-stage results in columns (2-4) are not statistically different from our simple triple diff-in-diff estimates. The number of non-FDI jobs caused by FDI jobs is estimated at 6.52 while FDI projects are found to cause 117.4 extra jobs on average. We also confirm our previous results that the multiplier effect is slightly larger on the informal sector. All in all these IV estimates increase our confidence in our previous results and confirm the large job-creating effects of FDI projects.

Additional results In Table 5 we further decompose the job multiplier by gender and skills, where skilled individuals are those with at least a completed secondary education. Since this information is only available in the household

FIGURE 14
FDI and FDI Jobs in post-discovery years



Note: Post-discovery years are as in Figure 13. The numbers are based on fDiMarkets data.

Table 4: FDI job multipliers - Instrumental variable estimates

Panel A: Job-level multipliers

	(1) FDI jobs (CEMPRE)	(2) Non-FDI jobs	(3) Formal jobs	(4) Informal jobs
Instrument	1.492***			
	(0.068)			
FDI jobs (CEMPRE)		6.515***	1.855***	4.166***
		(1.527)	(0.153)	(1.525)
N	1012	1012	1012	1012
R-sq	0.12	0.08	0.51	0.02
F IV		476.65	476.65	476.65

Panel B: Project-level multipliers

	(1) FDI projects (CEMPRE)	(2) Non-FDI jobs	(3) Formal jobs	(4) Informal jobs
Instrument	13.044***			
	(0.238)			
FDI projects (CEMPRE)		117.408***	50.728***	66.504***
		(14.781)	(1.298)	(15.427)
N	1012	1012	1012	1012
R-sq	0.87	0.10	0.61	0.04
F IV		2996.85	2996.85	2996.85

Note: District-year, district-sector and sector-year fixed effects included in all regressions. Standard errors in parenthesis clustered by district, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level. The IV is the product of the average FDI job shares by sector and by ranked cities in post-discovery years in Ghana, Ethiopia, and Tanzania.

survey, and not in the firm census, we can only divide total jobs by gender and skills, rather than strictly non-FDI jobs. The multiplier in column (1) in panel A suggests that an extra FDI job is associated with 7.2 total jobs, i.e. the 6.2 additional jobs estimated above in Table 3, plus the FDI job itself. The decomposition of this multiplier by gender suggests that FDI is especially beneficial for women. It suggests a multiplier of 4.7 for women and 2.5 for men. Note that these numbers also include the FDI job itself. This gender bias is robust to using fDiMarkets (FT) data as well as to using FDI project numbers. In panel C the estimates suggest that an extra FDI project is associated with around 135 new jobs, 42 for men and 94 for women. The decomposition by skills suggest a skill-biased multiplier, with FDI jobs being associated with a reduction in unskilled employment and a large increase in skilled employment. The baseline numbers suggest that the 7.2 total jobs created are 8.4 skilled jobs created and 1.2 unskilled jobs destroyed. This skill bias also shows up in the 3 other specifications. To investigate this gender and skill bias further we estimate our regression model but at the individual level rather than aggregated by sector. Results are in appendix A.5.

Table 5: FDI job multipliers - by Gender and Education

Panel A: Job-level multipliers

	(1) Total jobs	(2) Men employed	(3) Women employed	(4) Skilled employed	(5) Unskilled employed
FDI jobs (CEMPRE)	7.229***	2.543***	4.686***	8.407***	-1.178*
	(1.002)	(0.281)	(0.764)	(0.840)	(0.554)
N	1012	1012	1012	1012	1012
R-sq	0.96	0.96	0.96	0.91	0.96

Panel B: Job-level multipliers - IV

	(1) Total jobs	(2) Men employed	(3) Women employed	(4) Skilled employed	(5) Unskilled employed
FDI jobs (CEMPRE)	7.567***	3.136***	4.430***	7.988***	-0.422
	(1.532)	(0.729)	(0.872)	(0.513)	(1.064)
N	1012	1012	1012	1012	1012
R-sq	0.10	0.07	0.10	0.58	0.00
F IV	476.65	476.65	476.65	476.65	476.65

Panel C: Project-level multipliers

	(1) Total jobs	(2) Men employed	(3) Women employed	(4) Skilled employed	(5) Unskilled employed
FDI projects (CEMPRE)	135.434***	41.864***	93.570***	160.871***	-25.436***
	(13.317)	(6.195)	(8.161)	(7.438)	(7.414)
N	1012	1012	1012	1012	1012
R-sq	0.96	0.96	0.96	0.94	0.96

Panel D: Project-level multipliers - IV

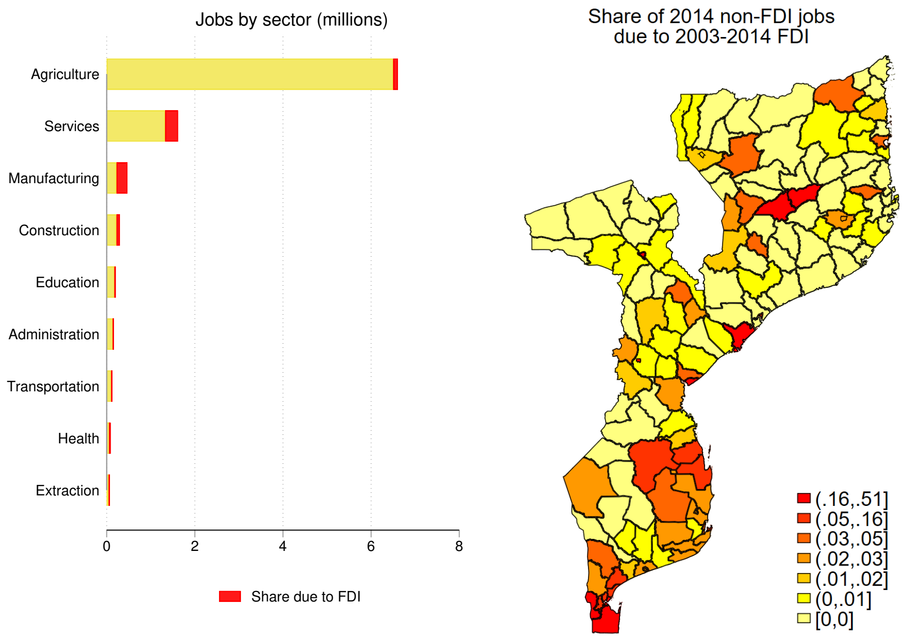
	(1) Total jobs	(2) Men employed	(3) Women employed	(4) Skilled employed	(5) Unskilled employed
FDI projects (CEMPRE)	133.858***	55.481***	78.376***	141.315***	-7.458
	(29.011)	(13.877)	(16.234)	(11.233)	(18.720)
N	1012	1012	1012	1012	1012
R-sq	0.12	0.06	0.14	0.71	0.00
F IV	659.86	659.86	659.86	659.86	659.86

District-year and district-sector and sector-year fixed effects included in all regressions. Standard errors in parenthesis clustered by district and sector, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

In Table 7 we explore the relationship between the FDI bonanza and various outcomes at the district level. Consistent with our previous results we find that one additional FDI job is associated with nearly 6 additional jobs at the district level (Column 2 in Panel B). Note that the total number of jobs created at the district level is very close to the estimate from our baseline specification in which we explore the number of jobs created within the same sector as the FDI project. This suggests that backward and forward linkages from multinationals to local firms may explain most of the multiplier effect. Moreover, one additional FDI job increases the population by approximately 3.5 individuals and pulls on average slightly more than 3 individuals into the labor force. At the same time, the number of unemployed increases by less than 1 implying a decrease in the unemployment rate. Thus, our results suggest that most of the increase in the local labor force is absorbed by a large increase in local labor demand.

In order to better grasp the magnitude of our benchmark estimate of a multiplier of 6.2 we proceed with a thought experiment. If we removed all FDI projects from Mozambique in 2014, how many jobs would disappear? This includes all the jobs directly associated with FDI firms (131,486 jobs in 2014) but also all the non-FDI jobs due to the multiplier. We simulate this drop using our benchmark multiplier and present the results by district and sector in Figure 15. We find that there would be almost 1 million less jobs, out of around 9.5 million total jobs in Mozambique. The drop would be especially acute in manufacturing and in Maputo (city), where more than half the jobs would disappear. In general urban districts would see the largest drops. The number of jobs in services and even agriculture would also drop substantially, given the large number of people employed in these sectors.

FIGURE 15
FDI projects and job creation in 2014



Note: The dark red part in the bar graph indicates the number of jobs due to FDI as per our multiplier estimate of 6.228 (column (1) in Table 3). The heat map gives the share of non-FDI jobs due to the same FDI multiplier by district.

5 CONCLUSION

This paper suggests that across countries giant oil and gas discoveries lead to FDI bonanzas. FDI in non-extractive sectors increases by 73% in the 2 years following a giant discovery. This result is driven by the extensive margin, i.e. by new projects, in new sectors, from new source countries. As discoveries precede production by 5 years on average, we argue that the FDI effect is driven by expectations. Giant oil and gas discoveries could thus act as news shocks creating expectations of future income and driving an influx of diversified investment which in turn could provide an opportunity for a growth takeoff (Murphy et al., 1989). Our paper also suggests that FDI bonanzas triggered by giant discoveries can have large job-creation effects notably via a multiplier effect. In the context of Mozambique, our preferred estimate of the FDI multiplier suggests that one extra FDI project creates around 120 additional non-FDI jobs in its host district and sector. This result points to the importance of estimating FDI multipliers in poor countries to better gauge the role of FDI in development. Overall our results suggest that resources can indeed be a blessing rather than a curse. Yet this does not mean that growth and diversification follow automatically from a large discovery. The Mozambique FDI bonanza occurred while the government accumulated an unsustainable level of debt and many of the FDI projects may only have short-run effects. According to O Pais the FDI boom in Tete in northern Mozambique went from Eldorado to nightmare. FDI bonanzas do provide a growth opportunity but giant discoveries have other side effects. Nonetheless the FDI channel needs to be taken into account when analysing the effects of natural resources on economic development, especially since the literature has mostly argued that newfound resource wealth in developing countries may lead to premature de-industrialization (e.g. Rodrik (2016)).

Table 6: FDI multipliers - District level regressions

Panel A: Job-level multipliers

	(1) Total jobs	(2) Non-FDI jobs	(3) Formal jobs	(4) Informal jobs
FDI jobs (CEMPRE)	5.278***	4.424***	2.071***	2.200*
	(1.351)	(1.287)	(0.576)	(1.271)
N	266	266	266	266
R-sq	0.14	0.10	0.74	0.03

Panel B: Job-level multipliers - IV

	(1) FDI jobs (CEMPRE)	(2) Total jobs	(3) Non-FDI jobs	(4) Formal jobs	(5) Informal jobs
Instrument	4.459***				
	(0.245)				
FDI jobs (CEMPRE)		5.903***	4.921***	2.712***	1.976**
		(0.821)	(0.818)	(0.083)	(0.864)
N	266	266	266	266	266
R-sq	0.68	0.14	0.10	0.67	0.03
F IV		331.15	331.15	331.15	331.15

Panel C: Project-level multipliers

	(1) Total jobs	(2) Non-FDI jobs	(3) Formal jobs	(4) Informal jobs
FDI projects (CEMPRE)	133.524***	111.019***	59.646***	46.385
	(29.650)	(29.216)	(3.174)	(29.915)
N	266	266	266	266
R-sq	0.13	0.09	0.91	0.02

Panel D: Project-level multipliers - IV

	(1) FDI projects (CEMPRE)	(2) Total jobs	(3) Non-FDI jobs	(4) Formal jobs	(5) Informal jobs
Instrument	0.197***				
	(0.010)				
FDI projects (CEMPRE)		133.772***	111.508***	61.448***	44.772**
		(19.738)	(19.490)	(1.649)	(19.951)
N	266	266	266	266	266
R-sq	0.90	0.13	0.09	0.91	0.02
F IV		356.61	356.61	356.61	356.61

District and year fixed effects included in all regressions. Standard errors in parenthesis clustered by district and sector, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

Table 7: Additional district level regressions

Panel A: The effect of an FDI job

	(1) Pop (15-59)	(2) Employed	(3) Unemployed	(4) Inactive
FDI jobs (CEMPRE)	3.726**	5.278***	0.761***	-2.312**
	(1.587)	(1.348)	(0.245)	(0.916)
N	266	266	266	266
R-sq	0.96	0.92	0.94	0.97

Panel B: The effect of an FDI job - IV

	(1) Pop (15-59)	(2) Employed	(3) Unemployed	(4) Inactive
FDI jobs (CEMPRE)	3.518***	5.903***	0.822***	-3.207***
	(1.207)	(0.819)	(0.261)	(0.292)
N	266	266	266	266
R-sq	0.96	0.92	0.94	0.97
F IV	332.40	332.40	332.40	332.40

Panel C: The effect of an FDI project

	(1) Pop (15-59)	(2) Employed	(3) Unemployed	(4) Inactive
FDI projects (CEMPRE)	85.569**	133.524***	22.817**	-70.772***
	(39.735)	(29.594)	(9.284)	(7.532)
N	266	266	266	266
R-sq	0.96	0.92	0.94	0.98

Panel D: The effect of an FDI project - IV

	(1) Pop (15-59)	(2) Employed	(3) Unemployed	(4) Inactive
FDI projects (CEMPRE)	79.717***	133.772***	18.625***	-72.680***
	(27.903)	(19.700)	(5.971)	(6.449)
N	266	266	266	266
R-sq	0.96	0.92	0.94	0.98
F IV	357.97	357.97	357.97	357.97

District and year fixed effects included in all regressions. Standard errors in parenthesis clustered by district and sector, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

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A APPENDIX

A.1 Additional descriptive statistics - Cross country data

Table 8 summarizes the key variables of our cross country analysis. It is particularly informative to compare the means of variables calculated using all FDI projects and means of variables which are calculated using only non-extractive FDI. First, the descriptives confirm that the number of extractive projects is much smaller relative to the total number of non-extractive projects. Second, while extractive projects are larger on average, non-extractive projects have much greater potential to generate jobs. This is consistent with our prior that the resource sector is capital intensive relative to other sectors.

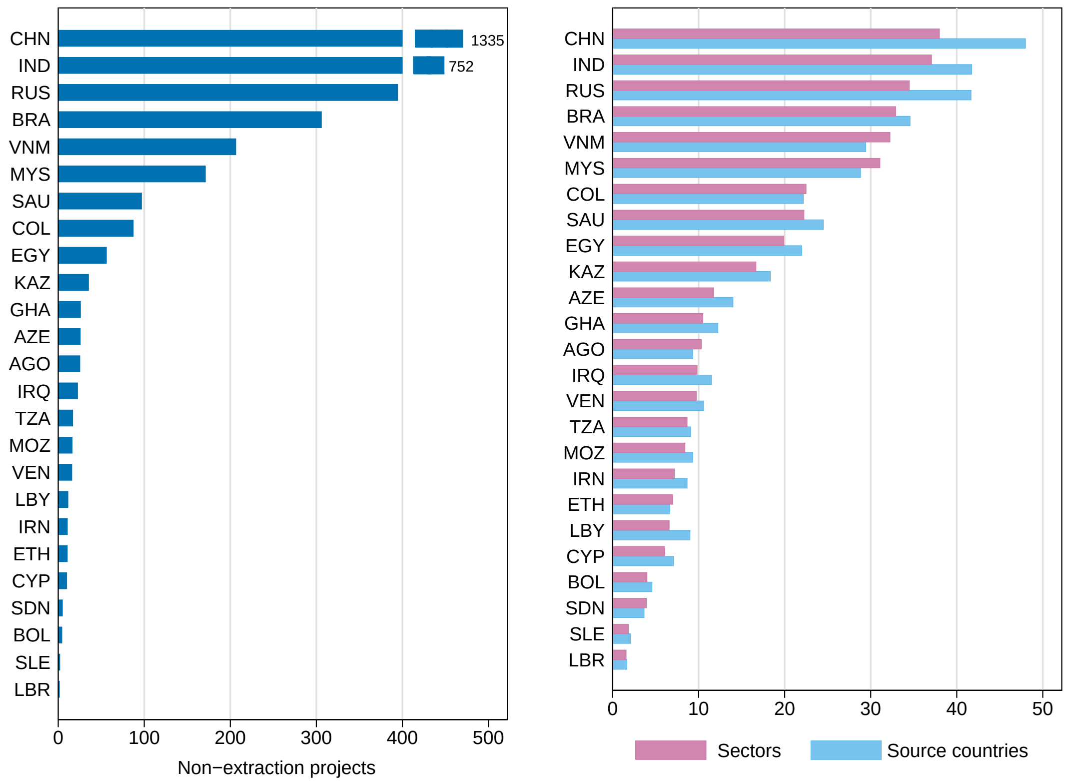
Table 8: Summary statistics

Variable	N	Mean	SD	Min	Max
Total FDI (USD million)	1992	3046	9781	0	1.28e+05
Non-extraction FDI (USD million)	1992	2713	9446	0	1.25e+05
FDI projects	1992	43	135	0	1624
Non-extraction FDI projects	1992	42	134	0	1613
Jobs created	1992	9538	35492	0	4.50e+05
Jobs created (non-extraction)	1992	9219	35267	0	4.49e+05
Avg project size	1992	92	211	0	4000
Avg non-extraction project size	1992	68	173	0	4000
Nb source countries	1992	8.50	10.30	0	55
Nb sub-sectors	1992	16.33	27.70	0	186
Nb sectors	1992	8.30	9.57	0	39
FDI (USD Million, UNCTAD)	1992	3283	11263	0	1.29e+05
Discovery in past 2 years	1992	0.07	0.25	0	1

In Figure 16 we summarize the number of FDI projects, source countries and target sectors in discovery countries. China and India received more than 500 FDI projects per year during 2003-2014 while smaller countries such as Colombia and Egypt received between 50 and 100 projects. The right panel shows that larger countries receive FDI from a larger number of countries and in more sectors. For example, Brazil and Vietnam received FDI from around 30 source countries and in 30 target sectors out of 39 possible sectors.

FIGURE 16

The extensive margins of FDI in discovery countries

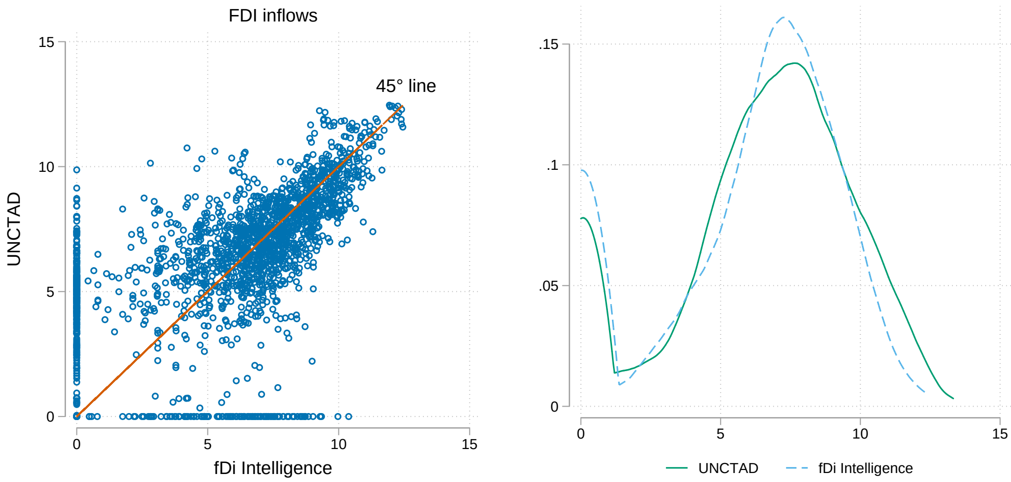


Note: The bars show the average number of projects, source countries and target sectors in discovery countries in the period 2003-2014. There are a total of 39 sectors in the fDiMarkets data.

A.2 fDiMarkets vs. UNCTAD FDI data

As an additional robustness test we employ UNCTAD data in our analysis. While UNCTAD is the most commonly used source of FDI across countries, it does not allow us to isolate non-extraction FDI nor to disaggregate FDI into margins. It does however allow us to expand the sample period to 1970-2014 and, thus, increase the external validity of our results. Comparing fDiMarkets data to UNCTAD data in Figure 17 we find a high correlation of 0.6 between the two series. Their distributions suggest that none is systematically larger and plotting them against each other reveals that most data points are around the 45 degree line, suggesting the difference between the two is zero on average. We continue by re-estimating our main specification 2 using the UNCTAD data. The results in Table 9 confirm our baseline. We find that, irrespective of the counterfactual sample of countries, discoveries lead to a 55% increase in Total FDI. We find similar results if we constrain the data to our main study period (2003-2014) even though the standard errors become larger.

FIGURE 17
FDI: UNCTAD vs fDiMarkets



Note: FDI data from UNCTAD and from fDiMarkets for our sample period (2003-2014). Observations are around the 45 degree line suggest there is no systematic difference between the two series. The right panel shows the similar distributions of the two variables.

Table 9: Robustness to UNCTAD data and longer time period

Period 1970-2014			
	(1)	(2)	(3)
	FDI	FDI	FDI
Discovery in past 2 years	0.484**	0.486**	0.434**
	(0.185)	(0.185)	(0.166)
N	8731	7523	6527
R-sq	0.73	0.74	0.75
Sample countries	Non-OECD	Exploration	Discovery
Period 2003-2014			
	(1)	(2)	(3)
	FDI	FDI	FDI
Discovery in past 2 years	0.488	0.460	0.525
	(0.301)	(0.299)	(0.307)
N	1992	1080	300
R-sq	0.81	0.74	0.65
Sample countries	Non-OECD	Exploration	Discovery

Note: FDI is from UNCTAD and is in current USD. Country and year fixed effects included in all regressions. Standard errors in parenthesis clustered by country and year.

A.3 Additional descriptive statistics - Mozambique

Some descriptive statistics and a precise definition of the key variables are provided in Table 11 and Table 10, respectively. Focusing on the first five rows of Table 11 there are two things to note. First, the discrepancies in the data on FDI jobs and FDI projects from fDiMarkets and CEMPRE in 2002 and 2014. In 2002 the discrepancy arises because fDiMarkets started collecting data in 2003 such that the reported values are equal to zero. In 2014, the discrepancy is partly because FDI projects before 2003 are not taken into account and partly due to the fact that fDiMarkets only collects information on greenfield FDI. We discuss the discrepancies in greater detail below. Second, notice that the total number of jobs created by FDI more than doubled (when accounting for the increased number of cross sections), while the number of projects more than quadrupled. While the increase in FDI projects and employment has been substantial in absolute terms the number of FDI jobs remained small in relative terms. Comparing the total number of FDI jobs to the total number of jobs suggests that in 2002 only 1 out of 100 workers was employed by a multinational. In 2014, the total number of FDI jobs added up to slightly more than 1%. Interestingly, our calculations suggest that the size of the informal economy is particularly large and adds up to around 95% of total employment in both years. In the subsequent four rows of Table 11 we provide descriptives on the characteristics of workers by focusing on gender and education. The data suggests that women are a substantial part of the labor force. In fact, women make up more than 50% of the active labor force in both years. Comparing the number of skilled and unskilled workers in the active labor force suggests that Mozambique experienced an educational boom since the share of skilled workers increased from less than 5% to around 25% in 12 years. Finally, the last four rows suggest that the labor force participation increased from 83% to 86%, and that it was accompanied by a doubling of the unemployment rate from 3.5% to 6.5%.

A.4 fDiMarkets vs. CEMPRE FDI data

We compare our two sources of FDI data in Figure 18. The FDI stock in 2014 is much larger in the census data than in fDiMarkets. As mentioned above, this is partly because fDi markets started collecting data on FDI projects in 2003 and partly because they do not collect information on brownfield FDI. On the other hand, the firms census of 2014 includes information on each firm's share of foreign ownership, and the registration year of the surveyed firm. This allows us to estimate the number of FDI firms, as well as the number of employees in those firms in 2014 and 2002 by assuming that surviving foreign-owned firms in 2014 were foreign-owned since their registration year, i.e. not brownfield FDI. Thus, the number of FDI projects recorded by fDiMarkets is most likely an underestimate of the true number of FDI projects, while the FDI numbers based on the firm census may be an overestimate or an underestimate. Keeping these issues in

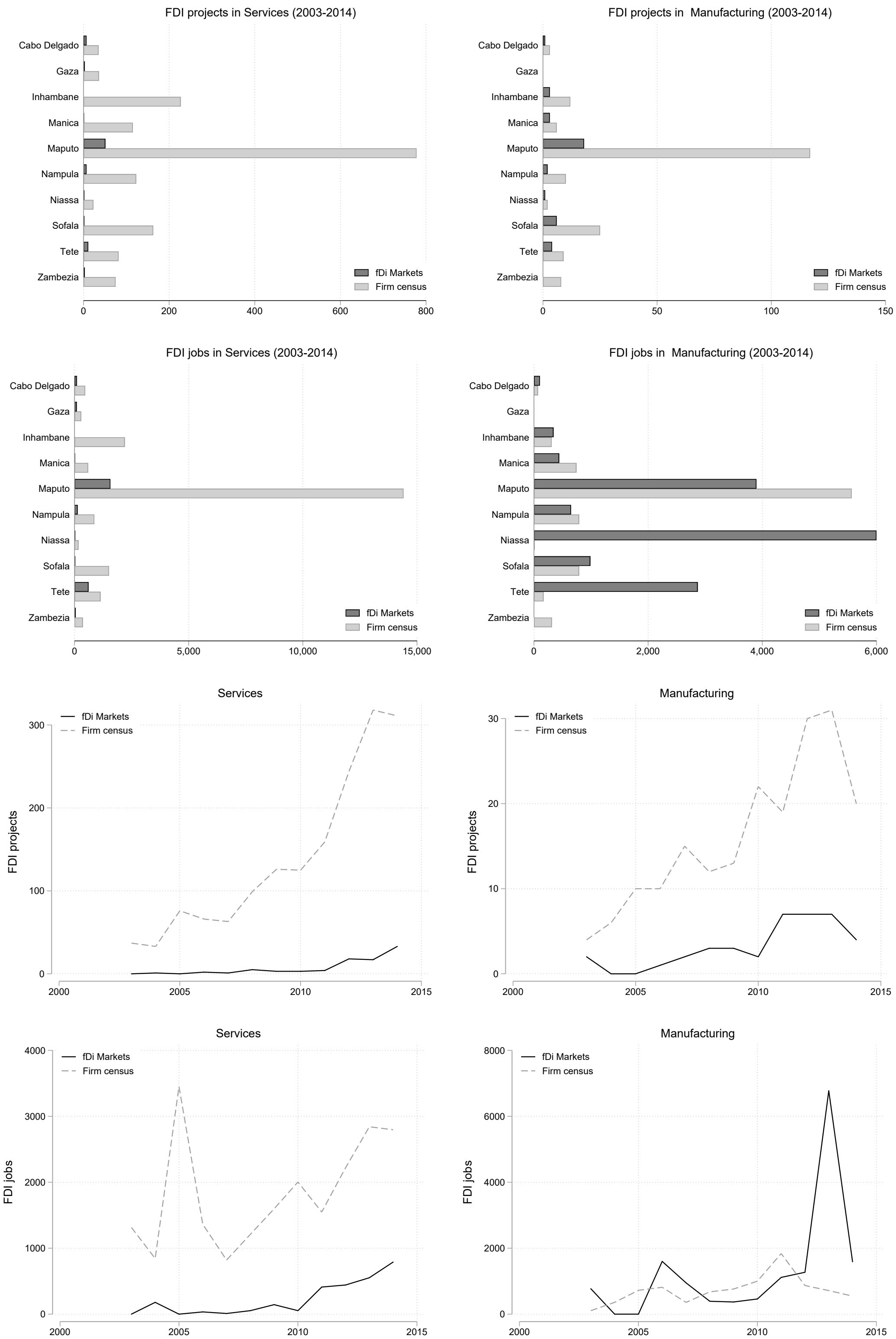
Table 10: Variables

Variable	Notes
FDI projects (CEMPRE)	Sum of FDI projects in district i in sector j in period t according to firm census (CEMPRE).
FDI jobs (CEMPRE)	Sum of FDI jobs in district i in sector j in period t according to firm census (CEMPRE).
FDI projects (FT)	Sum of FDI projects in district i in sector j in period t according to fDiMarkets.
FDI jobs (FT)	Sum of FDI jobs in district i in sector j in period t according to fDiMarkets.
Instrument	Product of the average FDI job shares by sector and by ranked cities (biggest 15 cities) based on FDI bonanzas in Ghana, Ethiopia, and Tanzania following a resource discovery.
Total jobs	Sum of individuals between 15 and 59 employed according to the Household Survey in district i in sector j in period t.
Non-FDI jobs	Sum of individuals between 15 and 59 employed according to the Household Survey minus the sum of FDI jobs according to the census in district i in sector j in period t.
Formal Jobs	Sum of total jobs minus the sum of FDI jobs according to the census in district i in sector j in period t.
Informal Jobs	Sum of individuals between 15 and 59 employed according to the Household Survey minus sum of jobs according to the census in district i in sector j in period t.
Men employed	Sum of men employed in district i in sector j in period t according to the Household Survey.
Women employed	Sum of women employed in district i in sector j in period t according to the Household Survey.
Unskilled employed	Sum of total individuals with no or a primary education employed in district i in sector j in period t according to the Household Survey.
Skilled employed	Sum of total individuals with a secondary or tertiary education employed in district i in sector j in period t according to the Household Survey.
Population (15-59)	Sum of individuals between 15 and 59 in location i in period t according to the Household Survey.
Unemployed	Sum of individuals between 15 and 59 reporting to be available for work but not having a job in location i in period t according to the Household Survey.
Inactive	Sum of total individuals between 15 and 59 reporting to be *not* available for work location i in period t according to the Household Survey. Individuals report to be not available for work due to studies, domestic responsibilities, permanent sickness, disabilities or age.

Table 11: Summary statistics for 2002 and 2014

	2002			2014		
	N	Mean	SD	N	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
FDI measure						
FDI projects (CEMPRE)	721	0.8	8.01	979	3.7	33.1
FDI jobs (CEMPRE)	721	88.8	898.7	979	149.2	1249.8
FDI projects (FT)	721	0	0	979	0.2	1.6
FDI jobs (FT)	721	0	0	979	19	166.6
Instrument	721	0	0	979	8.6	100.9
Jobs Measure						
Total jobs	721	11190.5	23034.3	979	10568.8	25770.4
Non-FDI jobs	721	11107.4	22793.1	979	10439.1	25342.8
Formal Jobs	721	348.1	2436.6	979	385.8	3304.5
Informal Jobs	721	10789.5	22182.6	979	10063.1	24395.8
Workers Characteristics						
Women	721	6174.10	15213.92	979	6065.49	15893.14
Men	721	5196.01	10492.63	979	5284.96	11230.43
Skilled	721	471.31	2137.58	979	2857.57	10083.75
Unskilled	721	10898.80	24038.56	979	8492.87	21208.42
City Level						
Population	135	60724.79	70813.13	135	82311.78	86494.22
Total Jobs	135	49072.45	44080.63	135	66152.53	59177.10
Unemployed	135	1775.60	9213.01	135	4654.45	12601.06
Inactive	135	9876.75	23955.87	135	11504.79	19583.24

FIGURE 18
Comparing the FDI datasets



mind we proceed by comparing the total number of FDI projects and FDI jobs created between 2003 and 2014. As expected, the results in Figure 18 suggest that in most cases fDiMarkets seem to underestimate the inflow of FDI, except in the case of manufacturing where fDiMarkets data suggests that more than 6,000 jobs were created in 2013. Thus, while it is apparent from Figure 18 that the FDI numbers are correlated across sectors, across cities and across time, we need to keep in mind that fDiMarkets systematically underestimates the total number of FDI projects and FDI jobs when interpreting the results.

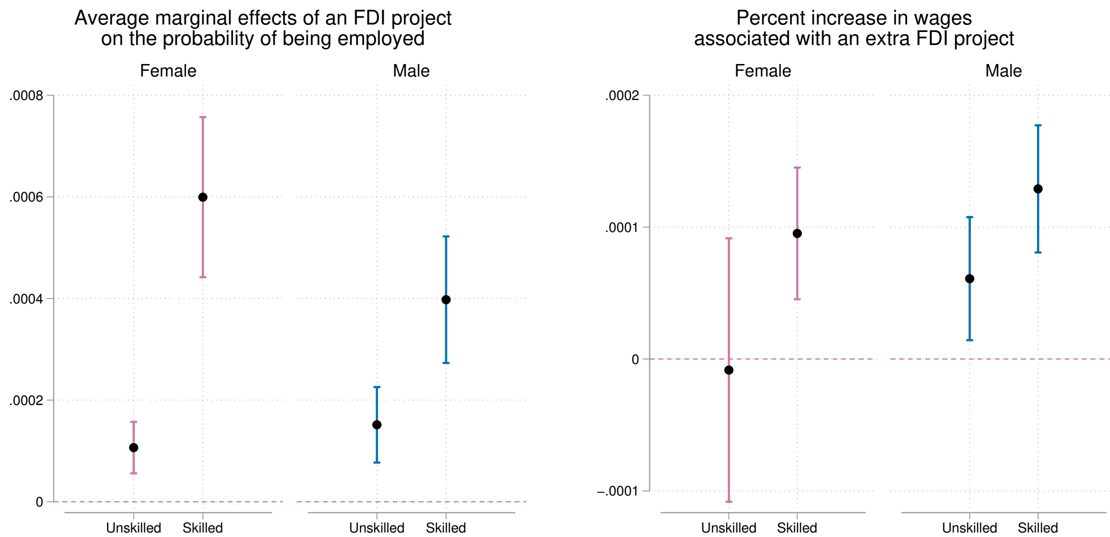
A.5 Additional results: The effect of FDI on wages

To investigate this gender and skill bias further we adjust our estimation strategy by focusing on the individual level rather than aggregated by sector. In particular, we estimate the following specification:

$$y_{il} = c + FDI_l + E_i + G_i + \alpha(E_i \times G_i) + \beta(FDI_l \times G_i) + \gamma(FDI_l \times E_i) + \mathbf{X}'\lambda_{\mathbf{il}} + \epsilon_{\mathbf{il}}$$

y_{il} is a placeholder for the logged wage of individual i in location l or a dummy which is equal to 1 if individual i reports to be employed and 0 otherwise. FDI_l is our usual measure for FDI in location l, while G and E are gender and post-primary education dummies, respectively. Depending on the specification X just contains age and age squared of individual i or additionally includes sector fixed effects, which are not used in the employment specification. This specification allows us to estimate how the probability of an individual being employed in 2014, as well as how its wage, depend on its gender, skills, and on how much FDI flowed to its district and sector since 2002. These estimates confirm the gender and skill bias of the FDI multiplier. Not only are skilled individuals more likely to be employed when there are more FDI projects in their district, but they also see their wages rise more. This is true for both men and women and points to FDI increasing wage inequality between the skilled and unskilled. The marginal effects suggest that 10 extra FDI projects in a district-sector increase the probability of skilled women to be employed by 0.6 percentage points, while it increases the probability for unskilled men by less than 0.2 (the average probability of being employed is 73%, whether formally or informally). The wage regression on the other hand suggest that 100 extra FDI projects in your district and sector is associated with 0.01% higher wages.

FIGURE 19
The role of education and gender - 2014 individual level regressions



Note: The left figure shows the estimated marginal effects based on an individual-level linear probability model. The left-hand side variable is a dummy equal to one if the individual is employed, and zero otherwise. The right hand side includes interactions between the individual's education and skills with FDI in its district controlling for its age and age squared. We use the provided survey weights and cluster standard errors by district. The right figure shows the semi-elasticities of a similar regression with ln(wage) on the left-hand side and where district and sector fixed effects are included.