Foreign Direct Investment, structural transformation and employment: evidence from Ghana

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Abstract

In spite of a fast growth, many African countries still largely rely on low productivity agriculture. Foreign direct investments (FDI) could enable structural change by creating new employment opportunities in higher value-added sectors, leading the transition of mostly rural economies to manufacturing- and service-based systems. Very little of the literature on structural change focuses on African countries and even less is known about the role of FDI in bringing and shaping these transformations. Looking at the interesting case of Ghana, in this paper we match data on greenfield FDI with individual-level information on workers employed in different sectors. Our results show a positive effect on the share of workers employed in the service sector, while no significant impact emerges in manufacturing. This effect emerges across all service industries, and it is stronger for retail trade. Furthermore, it is more pronounced for educated workers, particularly women, pointing at education as a key factor to match the labour demand of foreign firms.

Keywords: Foreign Direct Investment; Structural transformation; Employment; Female workers; Africa.

1 Introduction

Structural change, the transition from rural to manufacturing- and service-based economic systems, has been a key driver of growth for several developed and developing economies (McMillan et al., 2014; Rodrik, 2016). In Africa, where many countries still heavily rely on low productivity agriculture (McMillan and Headey, 2014), the transition from mostly rural to more productive economic systems is a crucial condition for development and calls for a deep understanding of what are the factors that lead to structural change. At the same time, in several developing countries, including many African ones, this transition seems to be entailing a rapid overtaking of the industrialization stage to directly turn to services, which brought some economists to start discussing about the possible drawbacks of a "premature deindustrialization" (Rodrik, 2016).

In this framework, disentangling the role of foreign direct investment is of central importance. FDI flows have increased dramatically in the last decades, especially in developing countries, where almost half of total inflows is currently located. In Africa, where they increased by almost 15 times from 1990 to 2019 (UNCTAD, 2021), FDI may be especially helpful in filling the lack of capital left by low levels of domestic investment and, establishing linkages with domestic actors, may bring productivity gains and movement of workers attracted by higher wages and employment opportunities in more productive sectors (Amendolagine et al., 2013, 2017; Pineli et al., 2021; Fu et al., 2021).

However, labour-saving technologies brought in by foreign firms together with the crowding out of the worse-performing domestic competitors could cause a contraction of employment in the industries in which foreign MNEs enter, especially in the short run (Meyer and Sinani, 2009; Farole and Winkler, 2014). This could end up pulling workers back to agriculture or into low pay services, most often in informal settings. Female workers may be especially vulnerable, since they are often employed in less secure low skill jobs (Braunstein, 2006; Aguayo-Tellez, 2012); on the other hand, the increasing importance of services and the decreasing request for physically demanding labour may have a positive effect on female labour participation and wages (Rendall, 2013; Ngai and Petrongolo, 2017).

Despite the centrality of these issues for African countries, very little of the literature on structural change focuses on Africa and even less is known about the role of FDI in bringing and shaping these transformations. This paper contributes

to the understanding of the role of FDI on structural change and employment in African economies by focusing on the interesting case of a prominent African country, namely Ghana. In fact, in spite of its considerable economic performance, which led the country to be one of the major FDI destinations in Africa, the decline in agricultural employment started in the country in the 1990s was counterbalanced by an increase in services more than in manufacturing (Osei and Jedwab, 2016; Diao et al., 2019; Alagidede et al., 2013; Geiger et al., 2019), making Ghana the perfect ground to study the role of FDI in premature deindustrialization processes.

To understand whether FDI in medium or high value-added industries induce a shift in employment to those sectors, we match individual-level information on workers employed in different industries in Ghana obtained from the Ghana Living Standard Surveys with data on greenfield FDI from the *fDi market* database. Along with the sectoral analysis, we shed light on the differentiated impact that FDI may have on specific categories of workers, namely female and more educated workers, thus addressing the important but under-investigated issue, especially for African countries, of the inequality-reducing potential of FDI.

Our results suggest that FDI have an employment-enhancing effect in all the service industries in which they enter, especially strong for retail trade. This effect is amplified for more educated workers, indicating a reallocation of labour especially for this category, and interests also female workers, although in this case the effect is less precisely estimated.

The rest of the paper is structured as follows: Section 2 reports the evidence available on FDI and structural change, Section 3 discusses methodologies and data sources and provides some descriptive statistics, Section 4 reports the results of the analysis and the robustness checks, and Section 5 draws some conclusions.

2 Literature on FDI and structural change

Structural change refers to the increase in productivity deriving from the reallocation of labour across sectors and is identified as a key factor for economic growth and development (McMillan et al., 2014; De Vries et al., 2015; Rodrik, 2016). As detailed by McMillan et al. (2014), when labour reallocation is positively correlated with productivity levels, that is, when labour moves from lower to higher productive sectors, structural change will positively contribute to economy-wide productivity

growth.

Manufacturing and services can both be associated to higher productivity, although both these sectors include different industries varying substantially in terms of value-added (Kucera and Jiang, 2019). Nonetheless, a substantial number of studies looks with concern to the patterns of premature deindustrialization followed by many developing and African countries and stress the importance of manufacturing for the growth of these economies (McMillan et al., 2014; McMillan and Headey, 2014; ACET, 2014; De Vries et al., 2015; Rodrik, 2016).

Few studies consider the contribution of FDI to structural transformation although, according to Rodrik (2016), globalization processes may be especially helpful in explaining structural transformation patterns in developing countries. In their literature review, Fu et al. (2021) show that FDI have a strong potential for structural change via knowledge transfer and upgrading, productivity and export growth and industrial diversification, and that their effect varies according to a number of characteristics of investing MNEs and destination countries, including their technological and cultural proximity. Mühlen and Escobar (2020) analyze the effect of FDI on structural transformation in Mexico and find a positive effect of FDI in manufacturing with a four-year time lag. The authors also find that FDI positively affect structural change through the reallocation of labour towards more productive sectors. On the contrary, Pineli (2022) finds a negative relationship between FDI and employment growth in high productivity industries in European post-communist economies. As he also finds productivity growth in these same industries to be positively associated to FDI, he suggests that investing MNEs introduce labour-saving technologies in host countries. Analyzing the role of FDI on the reallocation of labour towards more productive sectors is especially important for African countries, where jobless growth and low value-added are compelling problems (Léautier and Hanson, 2017; Aryeetey and Baah-Boateng, 2015; Baah-Boateng, 2015).

While some empirical analyses find evidence of a crowding out effect of FDI in manufacturing in African countries (Brautigam et al., 2013; Edwards and Jenkins, 2015), only few studies address the role of FDI in increasing the weight of productive sectors in host countries employment. Pineli et al. (2021) analyze the impact of FDI on the share of modern sector employment according to the development stage of developing host countries and find that structural change is brought by FDI in manufacturing in countries at initial stages of development, whereas the FDI-

structural change nexus is stronger in the non-manufacturing modern sector for more advanced destinations. Mensah (2020) finds an overall positive effect of FDI on the share of manufacturing employment in Sub-Saharan Africa, which negatively interacts with the host country level of human capital. However, the author includes FDI among a variety of determinants of structural change and does not address endogeneity issues affecting the FDI-employment relationship.

The aim of this paper is twofold. First, we investigate the effect of FDI on structural change in Africa looking at the reallocation of labour towards more value-added industries. In doing so, we focus on the intra-industry impact of FDI on employment shares in Ghana, which, beyond being a prominent FDI destination and one of the richest countries in Africa, is among the few African countries to collect data on employment and occupations consistently over time and at a high level of industrial disaggregation. Although previous evidence on intra-industry spillovers on domestic firms generally identifies a null or a negative impact of FDI (Havranek and Irsova, 2011; Fu et al., 2021; Crescenzi and Limodio, 2021), an analysis linking FDI to the movement of labour towards more productive industries at such a high level of disaggregation is currently missing and highly needed for African countries to go beyond the mere manufacturing/non-manufacturing dichotomy and understand which industries are worth to be prioritized when designing a strategy to attract FDI. At the same time, this kind of analysis also allows us to assess the role of FDI in the premature deindustrialization of African countries that, as discussed above, raises the concerns of some economists since manufacturing is generally associated with higher value-added and value chain upgrading. Again, Ghana is an emblematic case to analyse since the considerable economic growth experienced by the country in the last decades has not been accompanied by substantial movements of labour from agriculture to the industrial sector (Alagidede et al., 2013; Osei and Jedwab, 2016; Diao et al., 2019; Geiger et al., 2019).

A second aim of this paper is to contribute to shed light on the potential effect of FDI in terms of amplifying or reducing inequalities, by investigating the differentiated impacts on female and most educated workers. If MNEs introduce new technologies and more productive processes in host countries they will also need better skilled labour force. Therefore, FDI-induced employment is likely to benefit this category of workers in the first place, sometimes at the expense of the least educated (Lipsey and Sjöholm, 2004; Slaughter, 2004; Hijzen et al., 2013; Hale and

Xu, 2016; Nguyen et al., 2020; Narula and Van der Straaten, 2020; Ibarra-Olivo and Rodríguez-Pose, 2022). According to Narula and Van der Straaten (2020), skill-biased technology transfer in developing countries is related to the deindustrialization of efficiency-seeking investments, which demands increasingly high shares of administrative jobs requiring a better skilled labour force. Since many among the least educated workers are female, a number of studies have pointed at the so-called "defeminisation" of FDI (Braunstein, 2006; Aguayo-Tellez, 2012), due to the declining demand in least educated labour. On the other hand, the increasing importance of services decreases the request for physically demanding labour and may therefore have a positive effect on female labour participation and wages (Rendall, 2013; Ngai and Petrongolo, 2017). The relationship between FDI and female employment has not been widely investigated and the scant results available are not univocal (Braunstein, 2006; Vacaflores, 2011; Aguayo-Tellez, 2012; Kodama et al., 2018). Braunstein (2006)'s review shows that FDI significantly increase female employment in semi-industrialized countries, where FDI are mainly in labour-intensive and export-oriented industries. Conversely, as the industrial structure upgrades, women seem to be substituted by more skilled men and to be relegated to subcontracted and often informal work when firms are forced to cut costs to avoid being crowded out from the market. Exploiting the individual-level information available on workers in Ghana, which includes indication of the gender and the education level, our analysis is going to shed light on whether and how FDI differently affect labour and structural change outcomes for female and more educated workers.

In the next section, we provide more details on the data, we present the model and outline our empirical strategy, which is discussed in detail in the Appendix, before providing some descriptive statistics and moving to the discussion of results.

3 Empirical Application

3.1 Model and variables

To estimate the effect of FDI on employment and structural change in Ghana, we rely on two main sources of data. We derive our dependent variable from the 2005/06, 2012/13 and 2016/17 Ghana Living Standards Surveys (GLSS 5, GLSS

6 and GLSS 7)[1]. These surveys provide individual-level information on workers employed in different industries in Ghana, reporting the corresponding ISIC code. We retrieved information on the main occupation carried on in the seven days before the interview and aggregated it at the ISIC industry level using the weights provided in the survey. We built our dependent variable as the difference between the industry shares of employment at time t and $t-1$ in the three years of survey (2006, 2013, 2017), ending up with two different time periods.[2] We use the change in the industry shares of employment, and not in the absolute number of employees in each industry, since we believe that this is a better measure of the weight of the industry and, ultimately, of structural change.[3]

Since the GLSS do not provide information on firm ownership, we rely on the Financial Times *fDi markets* database to get investment-level information on greenfield FDI projects in Ghana. Since *fDi markets* does not provide the ISIC nor any code for which a conversion table is available, we had to carefully match the information on activities, sectors and sub-sectors of investment available in the dataset with the ISIC codes in the GLSS. We provide a detailed explanation of the database construction, including the harmonization of the information contained in the different datasets, in the Data appendix. Our resulting database includes 72 sectors, largely corresponding to the "division" column of the ISIC Rev.4. The list of codes with the corresponding description is reported in Table 12 in the Appendix.

The estimated equation for our model is the following:

$$\Delta Emp_{ist} = \alpha + \beta \Delta FDI_{ist} + \gamma \Delta firms_{ist} + \eta_s + \delta_t + \mu_{st} + \epsilon_{ist} \qquad (1)$$

where t=2006, 2013, 2017

ΔEmp_{ist} is the difference between the share of employment in industry i, macro-sector s, at time t and $t-1$. The measure includes all the respondents to the surveys independently of the amount of hours worked. As alternative dependent variables, we built $\Delta Emp20_{ist}$ and $\Delta Emp40_{ist}$ to include only the individuals who declared

[1]The datasets are available at the Ghana Statistical Service website: url-https://www2.statsghana.gov.gh/nada/index.php/catalog/central

[2]In each wave, the interviews lasted several months at the turn of two different years. We associated all the responses to the second years of survey, i.e. 2006, 2013, 2017, since the majority of the interviews were realized in those months.

[3]The GLSS also reports information on wages. Unfortunately, this information is unavailable for a substantial fraction of the sample. Furthermore, its use is hampered by the different time units (e.g hourly, daily, weekly) employed within the same survey.

to work for at least 20 or 40 hours per week. To measure the impact of FDI specifically on female and on more educated workforce, we created the same three variables considering, respectively, only female workers and workers with at least secondary education. Table 1 provides a description of all the variables used in the analysis.

Table 1: Variable description

Code	Description	Data source
ΔEmp_{ist}	Difference between the share of workers in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp\_f}_{ist}$	Difference between the share of female workers in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp\_edu}_{ist}$	Difference between the share of educated workers in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp\_f\_edu}_{ist}$	Difference between the share of female educated workers in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
ΔEmp20_{ist}	Difference between the share of workers working at least 20 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp20\_f}_{ist}$	Difference between the share of female workers working at least 20 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp20\_edu}_{ist}$	Difference between the share of educated workers working at least 20 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp20\_f\_edu}_{ist}$	Difference between the share of female educated workers working at least 20 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
ΔEmp40_{ist}	Difference between the share of workers working at least 40 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp40\_f}_{ist}$	Difference between the share of female workers working at least 40 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp40\_edu}_{ist}$	Difference between the share of educated workers working at least 40 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
$\Delta\text{Emp40\_f\_edu}_{ist}$	Difference between the share of female educated workers working at least 40 hrs/week in industry i, macrosector s, at time t and $t-1$ (%)	GLSS 5, 6, 7
ΔFDI_{ist}	Difference between the cumulated sum of greenfield FDI in Ghana in industry i, macrosector s, at time t and $t-1$	*fDi markets*
$\Delta\text{FDI\_west}_{ist}$	Difference between the cumulated sum of greenfield FDI in West Africa (excluding Ghana) in industry i, macrosector s, at time t and $t-1$	*fDi markets*
$\Delta\text{tariff\_west}_{ist}$	Difference between the import weighted tariff in West Africa (excluding Ghana) in industry i, macrosector s, at time t and $t-1$ (%)	WITS
Δfirms_{ist}	Difference between the total number of firms in Ghana in industry i, macrosector s, at time t and $t-1$ (%)	Orbis

ΔFDI_{ist} is the difference between the cumulated sum of FDI projects in Ghana in industry i, macrosector s, at time t and $t-1$, 2003 being the first year available in the *fDi markets* database. The total number of projects is 438. We are aware of the potential endogeneity characterizing the relationship between our dependent

variable and our regressor of interest. In particular, some concerns may exist about simultaneous causality since substantial increases in the employment shares of a given industry may derive from FDI flows in the same industry, but at the same time FDI can be attracted by the employment growth in that industry. To assess the causal effect of FDI on our dependent variable, we rely on an IV estimation strategy. We exploit the exogenous variation in FDI inflows in Ghana generated by changes of two different instruments, which affect the dependent variable only through the endogenous regressor. The first one is the number of FDI in the whole West African region, excluding Ghana, built exactly as our regressor of interest. Regional FDI trends are likely to affect industry employment shares in Ghana only through FDI inflows and have been used as instruments for FDI by the empirical industrial organization literature. The other instrument uses the import tariffs in the West African region, excluding Ghana, disaggregated at the same industry level as FDI. Tariffs and taxes have been used as instruments for FDI (see for example Crescenzi and Limodio, 2021) since they can directly affect trade and investment – high barriers to imports can induce tariff-jumping FDI – whereas an effect on employment through other channels is unlikely.

To account for industry dynamics, we include information on the total number of firms operating in Ghana in the different industries and years considered. The data, retrieved from the Bureau van Dijk's Orbis database, include all firms regardless of their ownership, and we built the variable $\Delta firms_{ist}$ as the difference between the share of firms in industry i, macrosector s, at time t and $t-1$.[4] Furthermore, we include fixed effects at the macrosector (η_s), year (δ_t) and macrosector-year (μ_{st}) level to further catch changes that possibly occurred over the considered period at the macroeconomic level and that may affect both FDI inflows and the performance of domestic firms.[5]

3.2 Descriptive statistics

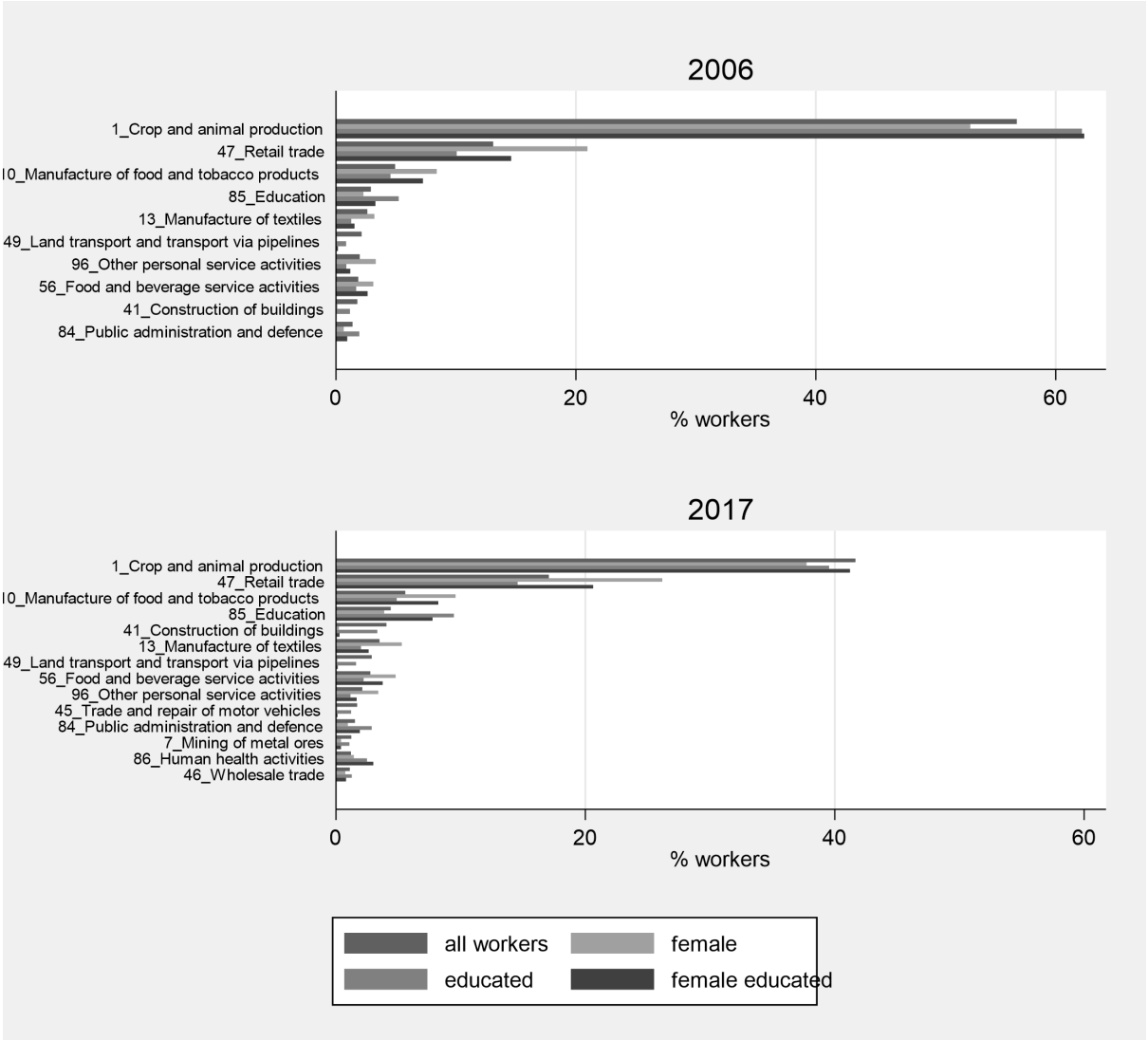
Figure 1 shows the distribution of Ghanaian workers across sectors at the beginning and at the end of the period for all the workers in the sample, for female and more educated workers. Few industries account for substantial shares of employment in

[4] As explained in the Data Appendix, this variable presents some limitations, i.e. it includes formally registered firms only; it does not allow to account for firm mortality; most firms' last update is dated 2014.

[5] We use macrosectors following the 12-sector classification of the Groningen Growth and Development Centre (GGDC). See Table 12 in the Appendix for the list and the composition of these macrosectors.

Ghana, whereas the majority employ less than 1% of workers. For better readability, we do not include these minor industries in the figure. The agricultural sector still absorbs the great majority of workers, although its share has considerably decreased over the years, passing from 57% in 2005 to 42% in 2017. The greatest decrease is recorded for educated workers: while 62% of individuals with at least secondary education was working in agriculture in 2006, this percentage was less than 40% twelve years later. The second industry in terms of employment is retail trade, absorbing 17% of the workforce in 2017, 4 percentage points more than in 2013.

Figure 1: Distribution of employment across ISIC sectors (main sectors)



Source: own elaboration on GLSS data

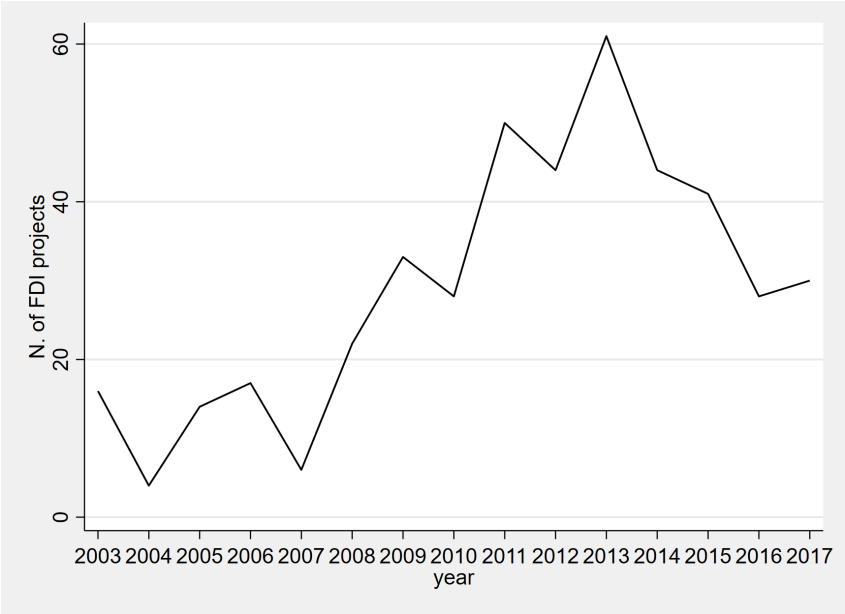
Employment shares increased in retail trade for all categories of workers and are

especially high for female ones, more than one quarter of which was employed in this industry in 2017. Instead, fewer individuals with at least secondary education work in retail trade. This is unsurprising considering that retail trade entails high levels of informality in African countries and that most street vendors and traders are uneducated women, although also 20% of educated female workers are employed in this industry. Food and tobacco and textiles are the industries employing the highest shares of workers among manufacturing activities, and they did not register substantial increases over the period and end up attracting around 5% and 3% of workers in 2017, respectively. Again, the share of female workers in these industries is higher compared to the overall share. This is true for both more and less educated women in the case of food and tobacco products, whereas educated workers are comparatively less present in textiles. Compared to the overall share, slightly fewer women are employed in education, although their share is higher than average when only more educated women are considered, and the employment share of educated female workers in education activities has more than doubled over the years.

Turning to our regressor of interest, greenfield FDI directed to Ghana have increased significantly until 2013, when they reached the peak of 61 projects before dropping considerably until the end of the period (see Figure 2). FDI in Ghana are quite concentrated in terms of investment activity: one third of the 438 projects included in our sample is in Business services, followed by Manufacturing and Sales, Marketing & Support, with around 19% of the projects each. The picture is more heterogeneous in terms of origin countries. More than half of the projects come either from other major African FDI destinations, i.e. Nigeria (14.4 %) and South Africa (11.9 %), or from Western countries (United States and UK, with 12.3 and 11.4 %, respectively). Emerging non-African investors such as India and China are, respectively, in fifth and eighth position, although their presence in the country has increased in more recent years. The post-2013 drop in FDI appears to have characterized all the main activities of investment, although 2017 shows an upward trend for FDI in Manufacturing and Sales, Marketing & Support (see Figure 3).

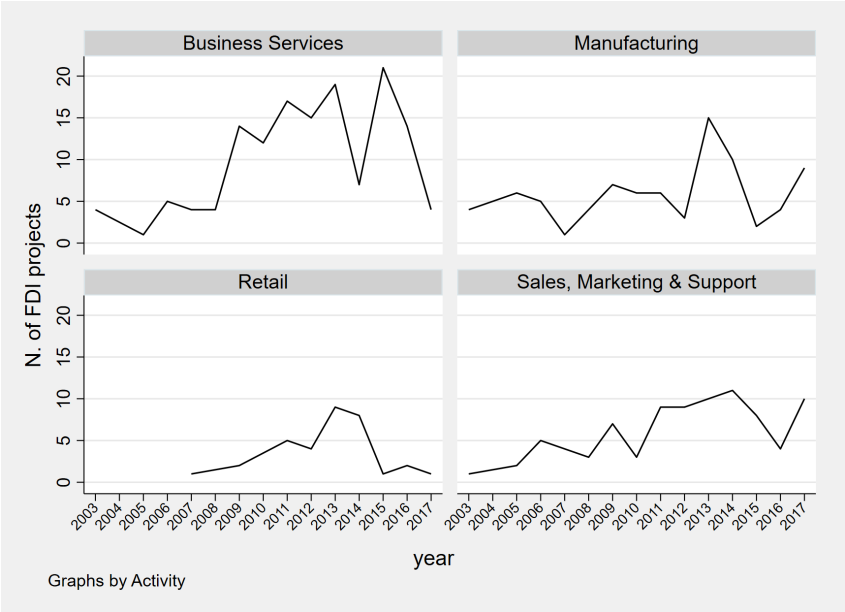
Figure 4 shows the distribution of FDI across industries (we include only the top 20 ones for sake of intelligibility). The vertical axis reports the cumulated sum of FDI projects in 2006 and 2017, starting from 2003 that is the first available year in *fDi Markets* database. Almost one quarter of the greenfield FDI occurs in financial services, the following two industries in terms of FDI number being retail trade

Figure 2: Greenfield FDI in Ghana, 2003-2017 inflows



Source: own elaboration on *fDi markets* data

Figure 3: Greenfield FDI in Ghana, 2003-2017 inflows - top 4 sectors

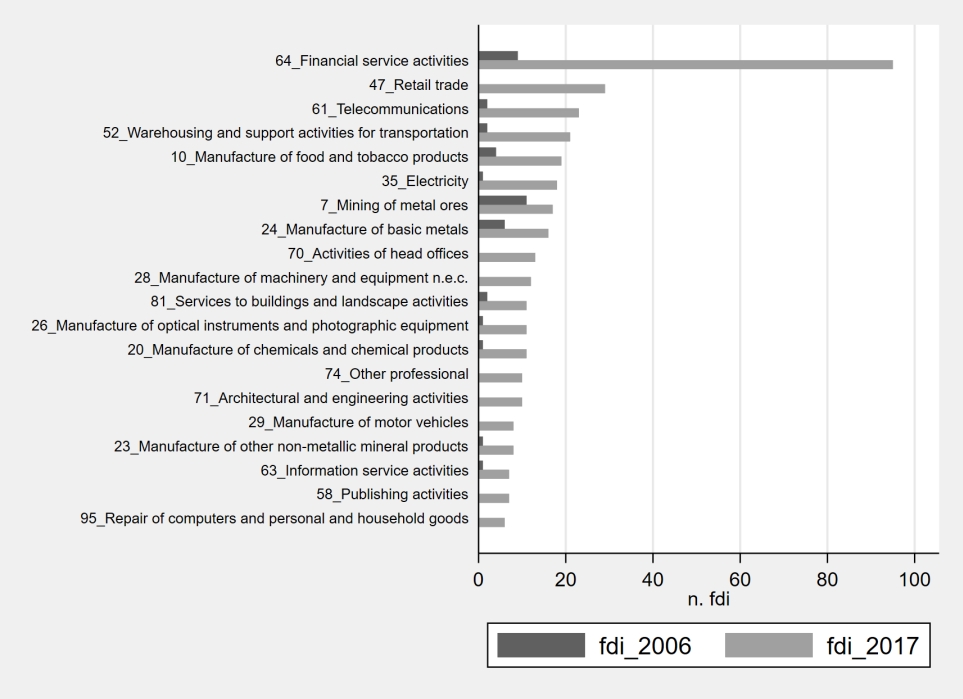


Source: own elaboration on *fDi markets* data

and telecommunications. Within manufacturing, the most attractive industries are related to the processing of food and tobacco products and basic metals, which is unsurprising given the large presence of natural resources in the country. Only few investments targeted Ghana up to 2006, the majority of which being in the mining

of metal ores.

Figure 4: Distribution of FDI across ISIC sectors (2006 and 2017 stock)

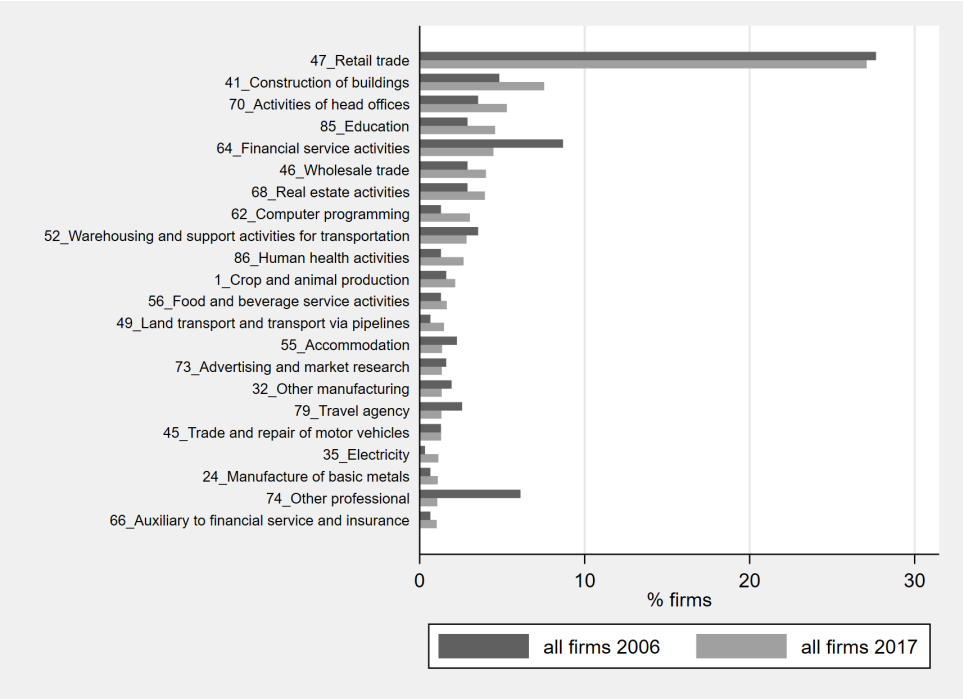


Source: own elaboration on *fDi markets* data

The situation is quite different looking at the whole set of firms active in Ghana, including both domestic and foreign ones, as Fig. 5. More than a quarter of the sample indicate retail trade as their main activity across the whole period, while financial service activities, which were in second position in 2006, backed down to the fourth position, despite the large inflow of foreign firms in the industry.

Table 2 reports the summary statistics for all the variables included in our analysis. All our variables have 144 observations, given by 72 sectors for 2 years. Our alternative dependent variables display a wide range, as we also know from Figure 1. Also the number of FDI displays high variability, with an increase of 51 investments in financial services coexisting with the very small or null increases of the majority of the other industries. Specifically, 21 out of 72 industries did not record any change in FDI over the entire period.

Figure 5: Distribution of firms across ISIC industries (2006 and 2017 %)



Source: own elaboration on *fDi markets* data

4 Results

In Table 3, our baseline results show the average effect of FDI on the employment share for all industries. Column 1 shows the estimate for the whole sample of workers, while in Column 2 and 3, the dependent variable is computed using only the individuals who declared to work for more than 20 and more than 40 hours per week, respectively. The F statistics of the relevance of the instruments obtained from the first stage and the Hansen J p-values are reported at the bottom of the table and show that our instruments are highly relevant and exogenous. The coefficient of FDI is positive across the three specifications, although in no case it gets to be statistically significant.

A similar picture emerges when looking at female employment in Columns 4-6. In all these cases, the number of hours worked does not seem to be relevant in influencing the impact of FDI. Quite interestingly, the situation changes when looking at more educated workers in Columns 7-9 (all educated workers) and 11-13 (female educated workers). FDI show to significantly increase the employment of educated workers in the industries in which they enter, and this effect increases with the number of hours worked. Whereas a positive effect is recorded for both the whole

Table 2: Summary Statistics

Variable	Mean	Std.Dev.	Min	p25	p50	p75	Max
ΔEmp_{ist}	-0.0005	1.031	-8.191	-0.030	0.010	0.100	3.537
$\Delta\text{Emp\_f}_{ist}$	-0.0017	1.182	-8.117	-0.020	0.000	0.040	4.994
$\Delta\text{Emp\_edu}_{ist}$	-0.0008	1.525	-14.923	-0.040	0.020	0.140	4.366
$\Delta\text{Emp\_f\_edu}_{ist}$	-0.0018	1.530	-14.022	-0.020	0.000	0.060	5.827
ΔEmp20_{ist}	-0.0006	1.311	-12.274	-0.040	0.010	0.100	4.107
$\Delta\text{Emp20\_f}_{ist}$	-0.0012	1.442	-11.692	-0.020	0.000	0.040	5.803
$\Delta\text{Emp20\_edu}_{ist}$	0.0002	1.738	-16.676	-0.050	0.020	0.170	4.332
$\Delta\text{Emp20\_f\_edu}_{ist}$	0.0002	1.773	-15.778	-0.030	0.000	0.080	5.607
ΔEmp20_{ist}	-0.0003	1.237	-9.542	-0.080	0.010	0.140	2.958
$\Delta\text{Emp20\_f}_{ist}$	-0.0016	1.296	-10.784	-0.040	0.000	0.050	5.351
$\Delta\text{Emp20\_edu}_{ist}$	0.0006	1.724	-14.023	-0.090	0.040	0.230	4.254
$\Delta\text{Emp20\_f\_edu}_{ist}$	0.0003	1.727	-14.341	-0.060	0.000	0.110	4.323
ΔFDI_{ist}	2.6875	5.838	0	0	1	3	51
$\Delta\text{FDI\_west}_{ist}$	7.2431	11.924	0	0	3	9.500	88
$\Delta\text{tariff\_west}_{ist}$	0.1254	1.199	-3.800	0.000	0.000	0.000	6.798
Δfirms_{ist}	0.0000	0.760	-4.926	-0.110	0.030	0.210	3.536

Note: The number of observations for all variables is 144, corresponding to 72 (the number of sectors) times 2 (the available time periods).

sample of educated workers and the sample subsample, the effect appears to be larger for the female educated category. Our estimates suggest that approximately 25 to 32 new investments bring a 1 percentage point increase in educated workers employment, 22 to 29 for female ones. On the contrary, $\Delta firms$, which controls for industry dynamics by measuring the change in the share of firms operating in the country in each industry, does not show to have any influence on employment shares conditional on the large set of fixed effects that we include. The sluggish response of our employment measures to changes in $\Delta firms$ may be attributable to the fact that the former include a high share of informal workers, while $\Delta firms$ includes only formally registered firms, whose different features may hinder the impact on total employment. We restrict our analysis to formal paid employees in a robustness check in Section 4.1.

Results from a sectoral disaggregated analysis show quite a variegated picture (Tables 4 to 7).

Table 4 refers to all workers and reports the estimates obtained considering

Table 3: Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All workers			Female			Educated			Educated female		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.017	0.022	0.021	0.017	0.024	0.017	0.031*	0.036**	0.039**	0.034	0.041*	0.045**
	(0.013)	(0.016)	(0.013)	(0.019)	(0.023)	(0.015)	(0.016)	(0.018)	(0.017)	(0.021)	(0.024)	(0.022)
$\Delta firms_{ist}$	0.028	0.070	-0.023	0.016	0.033	-0.118	0.126	0.110	0.009	0.106	0.084	-0.061
	(0.068)	(0.080)	(0.068)	(0.094)	(0.103)	(0.083)	(0.098)	(0.091)	(0.080)	(0.111)	(0.103)	(0.097)
N	144	144	144	144	144	144	144	144	144	144	144	144
F stat	46.798	46.798	46.798	46.798	46.798	46.798	46.798	46.798	46.798	46.798	46.798	46.798
J (p-value)	0.500	0.565	0.597	0.350	0.374	0.343	0.745	0.775	0.984	0.478	0.522	0.568

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

All the regressions include macrosector, year and macrosector-year fixed effects

all sectors except agriculture (Columns 1-3), manufacturing only (Columns 4-6), and services only (Columns 7-9).[6] Within each category, the first column refers to the full sample of workers, while the other two–as before–reduce the sample to individuals working more than 20 and 40 hours per week, respectively. Although we are not able to isolate the effect of FDI in the agricultural sector as it includes only two industries resulting in a too limited number of observations, Columns 1-3 show that removing agriculture from the sample substantially increases the magnitude of the coefficients across all the specifications and especially for individuals working more hours per week. This is probably due to the very low number of FDI in agriculture, which, instead, absorbs great part of the labour force throughout the years, as previously shown in Fig. 1. The insignificant average effects found in Table 3 for all workers seem to be therefore driven by the agricultural sector. Columns 4 to 9 show that the positive effect found once removing agriculture is driven by FDI in services, showing similar coefficients as the baseline results and increasing in significance along with the number of hours worked. On the contrary, no effect emerges for manufacturing employment shares. This might be partly due to the

[6]Specifically, Columns 1-3 include all our adjusted ISIC codes except from 1 and 2, Columns 4-6 codes from 10 to 33, Columns 7-9 codes equal or greater than 45. The average of these coefficients does not coincide with the ones in Table 3, since not all industries fall into the manufacturing or service sectors. Since we could not run separate regressions for secondary industries other than manufacturing, namely construction, mining and quarrying, and electricity, gas and water supply, due to sample size limitations, we have re-estimated the model including these sectors within manufacturing. We have also re-estimated the model excluding the industries that are mainly public services (codes 84 and above). In both cases, results remain virtually unaffected and are available upon request.

Table 4: Sector heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.022*	0.028*	0.028**	-0.007	-0.005	0.008	0.026*	0.033*	0.030**
	(0.013)	(0.016)	(0.013)	(0.015)	(0.021)	(0.025)	(0.015)	(0.019)	(0.015)
$\Delta firms_{ist}$	0.063	0.074	0.031	0.413**	0.373**	0.313***	0.053	0.072	0.022
	(0.071)	(0.082)	(0.068)	(0.171)	(0.146)	(0.121)	(0.077)	(0.091)	(0.073)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.289	0.306	0.294	0.243	0.254	0.245	0.328	0.491	0.770

Table 5: Sector heterogeneity - female workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.022	0.030	0.025*	-0.024	-0.021	0.003	0.031	0.040	0.030*
	(0.018)	(0.022)	(0.014)	(0.021)	(0.030)	(0.034)	(0.022)	(0.027)	(0.017)
$\Delta firms_{ist}$	0.053	0.048	-0.026	0.597	0.545	0.450	0.038	0.040	-0.049
	(0.098)	(0.106)	(0.072)	(0.376)	(0.350)	(0.291)	(0.102)	(0.115)	(0.065)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.259	0.265	0.235	0.234	0.237	0.216	0.404	0.571	0.957

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

All the regressions include macrosector, year and macrosector-year fixed effects

very small number of FDI in most manufacturing industries as shown in Figure 4.

The coefficient of $\Delta firms$ is significantly positive only for manufacturing, thereby suggesting that industry dynamics and not foreign investments affect manufacturing employment, while employment in services appear more dependent on the localization of foreign MNEs.

Our results do not feed the concerns about a "defeminisation" of work (Braunstein, 2006; Aguayo-Tellez, 2012), since also female employment in services is positively affected by FDI in these industries, although the effect is less precisely estimated than the one detected for the whole sample (Table 5).

Consistently with the aggregate findings, educated workers are those who gain

Table 6: Sector heterogeneity - educated workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.038**	0.044***	0.049***	-0.018	-0.011	-0.007	0.046**	0.053**	0.056***
	(0.016)	(0.017)	(0.015)	(0.013)	(0.016)	(0.020)	(0.019)	(0.021)	(0.018)
$\Delta firms_{ist}$	0.122	0.117	0.078	0.365**	0.316**	0.241***	0.137	0.137	0.100
	(0.097)	(0.093)	(0.079)	(0.145)	(0.136)	(0.088)	(0.114)	(0.111)	(0.096)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.313	0.325	0.342	0.222	0.230	0.211	0.260	0.261	0.311

Table 7: Sector heterogeneity - female educated workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.040*	0.049**	0.056***	-0.017	-0.009	0.015	0.051**	0.061**	0.065**
	(0.021)	(0.024)	(0.021)	(0.018)	(0.022)	(0.026)	(0.026)	(0.030)	(0.026)
$\Delta firms_{ist}$	0.104	0.101	0.044	0.422	0.405	0.303	0.115	0.116	0.054
	(0.112)	(0.107)	(0.080)	(0.277)	(0.290)	(0.221)	(0.128)	(0.122)	(0.090)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.294	0.317	0.315	0.244	0.263	0.257	0.321	0.313	0.408

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
All the regressions include macrosector, year and macrosector-year fixed effects

more from FDI in services (Tables 6 and 7). Interestingly, this is even more true for female ones: around 20 foreign investments lead to a 1 percentage point increase in employment in this sector for educated workers (Table 6, Columns 7-9), 15 for female educated ones (Table 7, Columns 7-9). This compelling result shows that, in line with previous literature, education can be a tool to match the labour demand of foreign firms, higher skill demanding than domestic firms.

Instead, FDI in manufacturing do not appear to positively affect employment in these industries neither for more educated workers (Table 6 and Table 7, Columns 4-6). We interpret this result pointing at the low performance and high informality of domestic firms in Ghana that make foreign MNEs in manufacturing primarily compete with better performing domestic firms, which are those employing the highest shares of educated workers and the most likely to be crowded out (Tables 10 and 11 in relation to formal employment confirm this interpretation and are reported in the next section). This is also in line with the analysis from Baah-Boateng (2015) showing that unemployment in Ghana increases with the education

level due to the mismatch between educated workers' skills and firms' requirements.

4.1 Robustness checks

In this section, we assess the stability of our results using two different robustness checks.

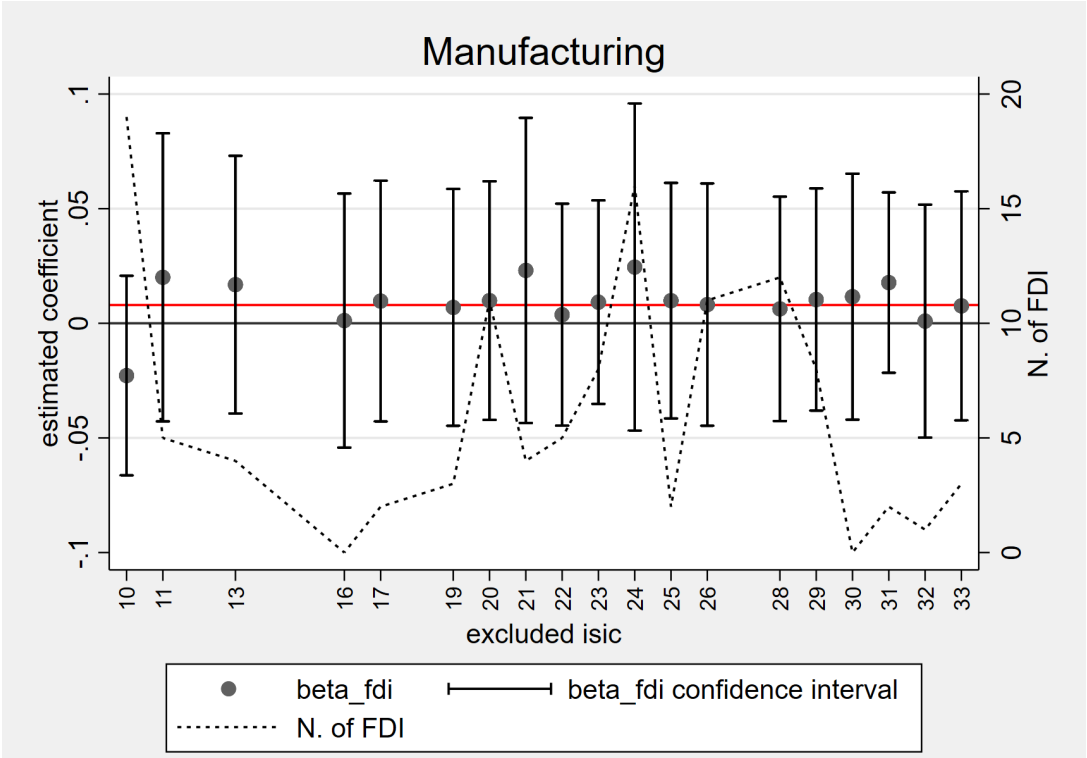
We first check the stability of our parameter of interest, ΔFDI, by removing one code at a time from our sample of manufacturing and service industries. To this end, we plot in Figure 6 the estimated coefficients for individuals working at least 40 hours per week respectively in manufacturing and services (analogous to Columns 5 and 8 of Table 4).[7] The red lines indicate the value of the coefficients when no industry is excluded. For a matter of space, we report only the codes in the graph, while the sector descriptions are reported in Table 12.

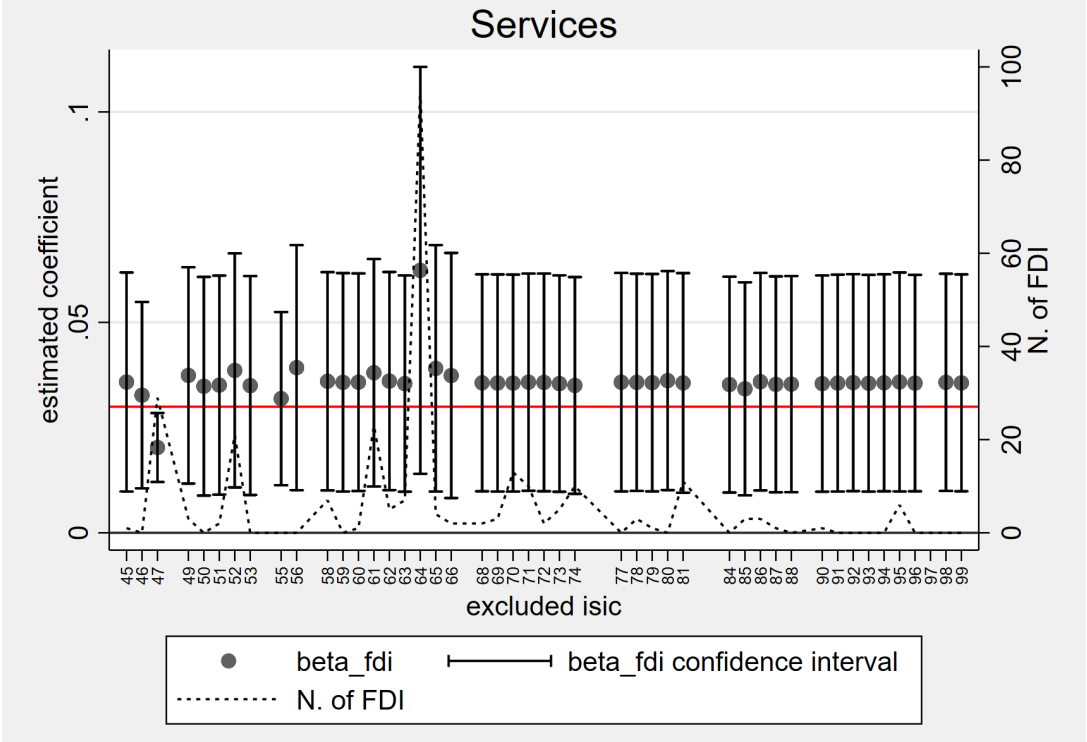
Both the upper and the lower graphs show that results are stable across specifications, although some heterogeneity emerges especially in relation to services and allow for some interesting considerations. In fact, the bottom graph shows that coefficients for services are largely stable across specifications except for two industries moving in opposite directions. The effect of FDI decreases markedly when removing retail trade activities (ISIC code 47), indicating that these play a significant role in driving the results. On the opposite side, the large amount of FDI in financial services (ISIC code 64), which is the main industry of investment attracting more than 20% of FDI in our sample, is not associated with an equally large share of employment: removing this industry drives the estimated coefficient up. Yet, the coefficients remain significantly different from zero across all the specifications. Many industries, especially those on the right side of the graph, show very little variability in the coefficients. This is likely due to the very small number of FDI in these sectors, which, from 84 to 99, are related to the public sector and receive very few foreign investments.

The upper graph shows that the coefficient of ΔFDI turns negative, although still not significant, when excluding FDI in food processing from manufacturing, among which it attracts the greatest number of FDI, as indicated by the dotted line. This would suggest that possible negative spillovers from FDI are lower in this industry.

[7] We have also conducted the analysis looking at the different categories of workers (female, educated and female educated) as well as different number of hours worked. Results are very similar to the ones we show here and are available upon request.

Figure 6: Robustness: Coefficient of FDI for manufacturing and services when removing one ISIC at a time (Y=ΔEmp40)





As a second robustness check, we restrict our analysis to formal employment. Since the questions that could identify formal workers in the GLSS have very low rates of response, we remove self- and presumably precarious employment from the sample and include only paid employees in the analysis, similar to what done by Aryeetey et al. (2007) and Baah-Boateng (2015). The distribution of paid employees across ISIC sectors is shown in Figure 7 in the Appendix. Tables 8 and 9 largely confirm our previous findings. The main difference in results relates to female educated workers in manufacturing, who are negatively affected by FDI (Table 11). A negative coefficient for manufacturing is also there for the overall sample of educated workers, although it does not get to be statistically significant. As mentioned above, our interpretation of this result is that foreign MNEs entering the manufacturing industries in Ghana primarily compete with, and crowd out, better performing, formally operating, domestic firms, causing the release of more educated employees and female ones in the first place. As for the other industry categories, results are similar to those in Table 4 except that the coefficients for the no-agriculture and the service samples are much more significant (Table 8). Positive effects emerge for all categories of workers in services, including women, and especially the most educated (Tables 9, 10 and 11)[8]. The industry dynamics seem to follow the same pattern found in the main results, with the coefficients of $\Delta firms$ being positive and significant only for manufacturing and, looking at the different categories of workers, only for the more educated. In this case, however, the same coefficients turn negative and weakly significant for female workers in services. Along with the positive effect found for FDI in this sector, this result seems to suggest that the transition to formal work for women in Ghana is more likely to take place through the entry of foreign MNEs.

5 Concluding remarks

In this paper, we aimed at investigating the role of FDI on structural change and employment in developing economies by focusing on the interesting case of Ghana. Ghana has been among the fastest growing countries in Africa, one of the few to have attained the lower middle-income status, and a major FDI destination. As other

[8]We have conducted the analysis both including and excluding public services (ISIC codes from 84) and results remain unvaried.

Table 8: Paid employees

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.036***	0.035***	0.042***	0.003	0.013	0.016	0.036***	0.035***	0.040***
	(0.008)	(0.007)	(0.008)	(0.019)	(0.021)	(0.024)	(0.008)	(0.007)	(0.008)
$\Delta firms_{ist}$	0.047	0.039	0.021	0.288**	0.270**	0.261*	0.051	0.036	0.016
	(0.065)	(0.067)	(0.077)	(0.118)	(0.136)	(0.153)	(0.074)	(0.073)	(0.084)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.688	0.740	0.620	0.276	0.265	0.867	0.764	0.666	0.730

Table 9: Paid employees - female workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.023*	0.025**	0.040***	-0.024	-0.003	0.011	0.028**	0.027**	0.038**
	(0.012)	(0.012)	(0.014)	(0.016)	(0.014)	(0.024)	(0.013)	(0.014)	(0.016)
$\Delta firms_{ist}$	-0.139	-0.147*	-0.175**	0.016	-0.017	-0.117	-0.131	-0.152*	-0.171*
	(0.087)	(0.081)	(0.080)	(0.068)	(0.065)	(0.187)	(0.097)	(0.091)	(0.088)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.287	0.310	0.150	0.207	0.350	0.238	0.740	0.674	0.669

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

All the regressions include macrosector, year and macrosector-year fixed effects

African countries, to make this growth sustainable Ghana needs to exit the trap of low productivity agriculture and unprocessed commodities trade, undertaking a stable path of structural change by shifting its economy towards higher value-added activities.

Foreign investments may be a key ally in this transition, as long as they contribute to the host country economic growth by introducing better processes and technologies that raise up the productivity and create job opportunities in more productive industries. At the same time, better performing foreign MNEs may push domestic competitors out of the market, causing a contraction in employment and a displacement of workers, who may end up back into low paid activities in informal settings.

Our analysis shows that FDI cause an increase in the employment shares of the service industries in which they enter, whereas no effect is detected for manufacturing. Quite interestingly, we find that this effect is especially strong for educated workers, particularly women.

In this sense, FDI seem to contribute to the premature deindustrialization that characterizes Ghana as well as other sub-Saharan African countries (Rodrik, 2016). In turn, the implications of this phenomenon strongly depend on the specific industries that are interested by the relative growth of employment. Our results show

Table 10: Paid employees - educated workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.039***	0.039***	0.052***	-0.026	-0.020	-0.036	0.047***	0.047***	0.062***
	(0.009)	(0.009)	(0.010)	(0.024)	(0.023)	(0.027)	(0.008)	(0.008)	(0.009)
$\Delta firms_{ist}$	0.042	0.016	0.035	0.330***	0.305**	0.336**	0.055	0.026	0.058
	(0.062)	(0.054)	(0.068)	(0.108)	(0.120)	(0.145)	(0.071)	(0.061)	(0.079)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.938	0.775	0.288	0.089	0.094	0.588	0.294	0.193	0.237

Table 11: Paid employees - female educated workers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No agriculture			Manufacturing			Services		
	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40	ΔEmp	ΔEmp20	ΔEmp40
ΔFDI_{ist}	0.039***	0.039***	0.063***	-0.051**	-0.035**	-0.051**	0.050***	0.049***	0.075***
	(0.014)	(0.015)	(0.018)	(0.022)	(0.016)	(0.024)	(0.013)	(0.014)	(0.019)
$\Delta firms_{ist}$	-0.069	-0.078	-0.037	0.123	0.069	0.187	-0.043	-0.058	-0.000
	(0.073)	(0.071)	(0.094)	(0.107)	(0.085)	(0.149)	(0.079)	(0.076)	(0.107)
N	140	140	140	38	38	38	90	90	90
F stat	47.159	47.159	47.159	32.212	32.212	32.212	103.393	103.393	103.393
J (p-value)	0.109	0.052	0.013	0.962	0.301	0.325	0.237	0.164	0.169

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

All the regressions include macrosector, year and macrosector-year fixed effects

that the positive effect is there for all service industries and it is stronger for retail trade, which is the second activity of investment in the country. The expansion of retail trade may have positive implications especially for female workers that, in several African countries, are prevalently, although often informally, employed in this industry (Baah-Boateng and Vanek, 2020). While the effect on the overall sample of female workers in services is quite weak, we detect an especially strong effect on educated women and, to a slightly lesser extent, on educated workers in general.

On the one hand, these results support some of the previous literature looking at the increasing global importance of less physically demanding activities as an opportunity to improve female labour participation (Rendall, 2013; Ngai and Petrongolo, 2017), conditioning this effect on a certain level of education. Furthermore, the positive effect is even more evident when narrowing the focus to formal employment only, for all categories of workers in services and educated women in the first place. Our results are in line with previous literature assessing the role of foreign MNEs in introducing skill-biased technological change in developing host countries (Lipsey and Sjöholm, 2004; Narula and Van der Straaten, 2020) and point at the importance of human capital, especially after automation made low-skilled labour less important. This suggests that African governments seeking to attract

more FDI and, at the same time, reap the maximum benefit from it in terms of employment and growth should substantially invest in the education of its labour force.

On the other hand, the stronger effect on retail trade among the service industries does not support the idea of a key role of FDI in the structural transformation of the country. While the presence of foreign MNEs increases the job offer in the industry and may entail a formalization process of these activities, which would substantially improve working conditions, investments in such low-skill services do not necessarily contribute to the transition towards higher value-added activities and value chain upgrading.

Considering the weight of retail services in our results, the stronger effect found for more educated people seems to point at the existence of a skill mismatch given by the lack of adequate opportunities for educated individuals, as testified by the fact that a very high proportion of highly skilled Africans migrate towards OECD countries to find jobs that match their skills and salary expectations (Carrington and Detragiache, 1998; Baah-Boateng, 2013) while those who stay in their origin countries engage in relatively low productivity-low salary jobs. At the same time, foreign MNEs investing in African countries struggle to find the highly skilled labour force that would be necessary to engage in higher value-added activities and sustain structural transformation processes (Baah-Boateng, 2015).

In spite of the relatively heavy weight of retail trade, our results show that FDI increase the employment shares of all the service industries in which they enter, including higher value-added ones as those related to finance and ICT. This is consistent with what observed by McMillan et al. (2014), showing that, after experiencing a shift towards low productivity and highly informal industries in the 1990s, structural change in Africa led to productivity growth since 2000. Besides being more skill-intensive, ICT- and finance-related services are also highly tradable. Considering that one-half of global trade is currently in services, this carries a high development potential for African countries in terms of global value chain integration and upgrading and may counterbalance the weak growth of manufacturing in these countries (Africa Growth Initiative, 2018; Eckert et al., 2019). As pointed out by (Africa Growth Initiative, 2018), ICT-based services present some of the desirable characteristics of manufacturing, i.e. tradability, high value-added per worker and the capacity to absorb large numbers of medium-skilled workers.

These considerations assume even more importance looking at our results for the manufacturing sector, which show null effects on employment shares in all manufacturing industries in Ghana. This is not surprising considering the very small number of greenfield FDI in most of these industries, as shown in Figure 4. Differently from what experienced by East Asian countries, whose growth was largely manufacturing-led, most sub-Saharan African countries struggle to attract FDI in manufacturing and this has several concurrent explanations.

First, as already mentioned, the introduction of labour-saving technologies associated with automation, robotics and Industry 4.0 reduces the importance of low-cost labour, which was a key comparative advantage for many African countries. As several analyses show, foreign investors in manufacturing in developing countries are instead more and more attracted by an adequately educated, and still relatively cheap, workforce (Jaumotte, 2004; Asiedu, 2006; Rodriguez-Pose and Cols, 2017; Benfratello et al., 2023), equipped with the necessary skills required to absorb the new processes and technologies introduced and face the challenges that technological change may raise. Therefore, as human capital acquires increasing importance, African governments should invest in raising the level of education to increase absorptive capacities and attract more FDI in manufacturing, as well as in higher value-added services as suggested above. While attracting more FDI, human capital improvements are also crucial to increase the productivity of domestic manufacturing firms and thus reduce crowding out effects. Our results suggest that also better performing domestic firms in Ghana are likely to be crowded out, as indicated by the fact that FDI in manufacturing do not positively affect employment in these industries neither for more educated workers. When looking at formal paid employees only, the coefficient of FDI turns even negative for women, suggesting, one the one hand, that foreign MNEs in manufacturing primarily compete with better performing domestic firms, which are formal and employ the highest shares of educated workers, and, on the other hand, that female workers are often the first to be cut out from this competition, in line with what observed by Braunstein (2006) and Aguayo-Tellez (2012). While designing their strategies to effectively increase workers skills and domestic firms capabilities, African governments should therefore pay special attention towards female workers education, inclusion and protection.

Another reason why sub-Saharan African countries receive limited amounts of manufacturing FDI refers to the very low economic complexity of their systems

(Bhorat et al., 2019). On the one hand, less complex commodity-based manufactures such as basic metals, non-metallic mineral products, wood and paper and food processing products, all industries in which Ghana has a comparative advantage given its richness in commodities and agricultural resources, are relatively less affected by the displacement effect brought in by labour-saving technologies since they entail less tradable goods and are therefore less subject to international competition (Africa Growth Initiative, 2018). Increasing product complexity, capital tends to gain over labour, reducing employment opportunities. On the other hand, more economic complexity entails the ability to accumulate productive capabilities and diversify into more complex activities, increasing investment opportunities and facilitating structural transformation processes (Bhorat et al., 2019). Given that most African countries start from very low complexity levels, there is room for them to increase productive capabilities developing relatively less capital-intensive industries, attracting more and more productive investments and generating new employment opportunities. In Ghana, the development of activities related to agribusiness, such as agro-processing and horticulture, have a great potential for growth and structural change, since they would increase the value-added per worker while still absorbing large numbers of mid-skill workers (Byerlee et al., 2013; Africa Growth Initiative, 2018). FDI may play a crucial role in transferring the know-how needed to upgrade the productive capabilities of the agricultural sector in Ghana and ensure that the products meet the standards required to export to developed countries markets. To be able to attract this kind of FDI, African countries need to improve their infrastructure systems as well as their regulatory and business environments, which are among the major factors preventing foreign MNEs to localize their manufacturing investments in Africa (Asiedu, 2006; Kinda, 2010; Moran, 2014).

In summary, FDI seem to have brought some benefits in terms of employment in Ghana. Beyond creating new jobs, these investments have a great potential to accompany the country through the necessary process of structural change. To engage in a stable and sustainable path of development, sub-Saharan African countries should attract FDI in productive industries, be they in manufacturing or in services, to be able to benefit from technological change by creating new occupations and increase economic complexity. To do so, it is crucial that they invest in human capital, along with developing infrastructure and business climate. As stressed by Borensztein et al. (1998), FDI can contribute to economic growth only

when the host country has sufficiently developed human resources and absorptive capacity to, indeed, absorb the advanced technologies introduced along with the investment.

One limitation of this study is that it so far only considered the "horizontal" effect of FDI, that is, the impact on the employment share in the same industry of the investment. In turn, FDI may create new job opportunities in connected industries in upstream and downstream sectors, creating linkages with local suppliers and buyers (Farole and Winkler, 2014). A development of the present analysis will therefore integrate the effects of FDI in vertically connected industries. Furthermore, further research is needed to assess whether local firms in Ghana actually benefited from productivity spillovers deriving from competition with foreign firms in the same industries (horizontal productivity spillovers) and whether these have led to a beneficial restructuring of the manufacturing industries in the longer run, through the creation of new opportunities for better-performing domestic companies in Ghana.

Data availability statement Part of the data that support the findings of this study are available upon purchase from the *fDi markets* database, a service from The Financial Times Ltd.. Restrictions apply to the availability of these data, which were used under license for this study. Data are available at `https://www.fdimarkets.com` with the permission of The Financial Times Ltd. The remaining data are publicly available.

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Appendix

I Data appendix

The dataset we use originate from the linkage of two main data sources, namely the Financial Times *fDi Markets* database for information on FDI and different waves of the Ghana Living Standards Survey for data on employment.

The Ghana Living Standards Survey, whose data and documentation are freely available on the Ghana Statistical Service website[9], provide information on several aspects of the living conditions of the population in Ghana and include questions on the individuals' occupation. The surveys are repeated cross-sections available for the years 1987/88, 1988/89, 1991/92, 1998/99, 2005/06, 2012/13 and 2016/17. Since the first year available in *fDi Markets* is 2003, we derived our dependent variable from the 2005/06, 2012/13 and 2016/17 Ghana Living Standards Survey (GLSS 5, GLSS 6 and GLSS 7). To get the number of individuals working in each sector, we aggregated at the industry level the answers to the question *"During the past 7 days what kind of goods and services or industry is this work connected with?"*, for which 4-digit ISIC codes were available, in relation to the main occupation. To aggregate correctly, we used the weights provided in the survey. Using correspondence tables from Eurostat[10], we converted the answers in the GLSS 5, originally using the ISIC rev.3.1, to the rev.4 used in GLSS 6 and 7. The total number of respondents to the question was 15,952 in 2005/06, 38,164 in 2012/13 and 28,333 in 2016/17. In each wave, the interviews lasted several months at the turn of two different years. We associated all the responses to the second years of survey, i.e. 2006, 2013, 2017, since the majority of the interviews were realized in those months. For each wave of survey, we also retrieved information on the gender, education level and hours worked by the individuals and conducted different aggregations to get information specifically on female and more educated workers and for individuals declaring to work at least 20 and 40 hours per week. We did this latter aggregations since the surveys also include individuals working extremely low or extremely high amounts of hours per week, even few declaring an amount of hours that is higher than the total number of hours in a week. We therefore created the ΔEmp20 and ΔEmp40 variables excluding those declaring to work more than 90

[9] https://www2.statsghana.gov.gh/nada/index.php/catalog/central

[10] https://ec.europa.eu/eurostat/ramon/relations/index.cfm?TargetUrl=LST_REL

hours/week, to avoid possible misleading effects of outliers and have more representative categories of workers. As for educated workers, we included in this category those having attained at least a secondary education qualification, which cover 33 to 38 % of workers across the waves. Female educated individuals are around 20% of the sample, women representing approximately half of the total sample in each wave.

FDI data are drawn from the *fDi Markets* database, a comprehensive and regularly updated online database of announced cross-border greenfield investments constructed by the Financial Times Intelligence Unit.[11] It covers all countries and sectors worldwide from 2003. We extracted from this repository the data relating to inward FDI in Ghana and in other West African countries over the 2003-2017 period. These correspond to almost 438 projects in Ghana and 1,533 projects in the other West African countries. To match this information with the one from the GLSS, we summed the projects to obtain the cumulated number of FDI in 2006, 2013 and 2017 in each sector. The most complicated part was to find a correspondence between sectors and industries in our FDI and employment data, since *fDi Markets* does not associate any code to its sectoral classification. Therefore, we manually created a correspondence table between the *fDi Markets* classification of industries, sectors and sub-sectors and the 2-digit ISIC sectors, ending up with 72 sectors largely corresponding to the "division" column of the ISIC rev.4. These "adjusted" ISIC sectors for 2006, 2013 and 2017 are the observation units in our analysis. The nature of the information available in *fDi Markets* does not allow a perfect match with the ISIC codes nor a deeper disaggregation.

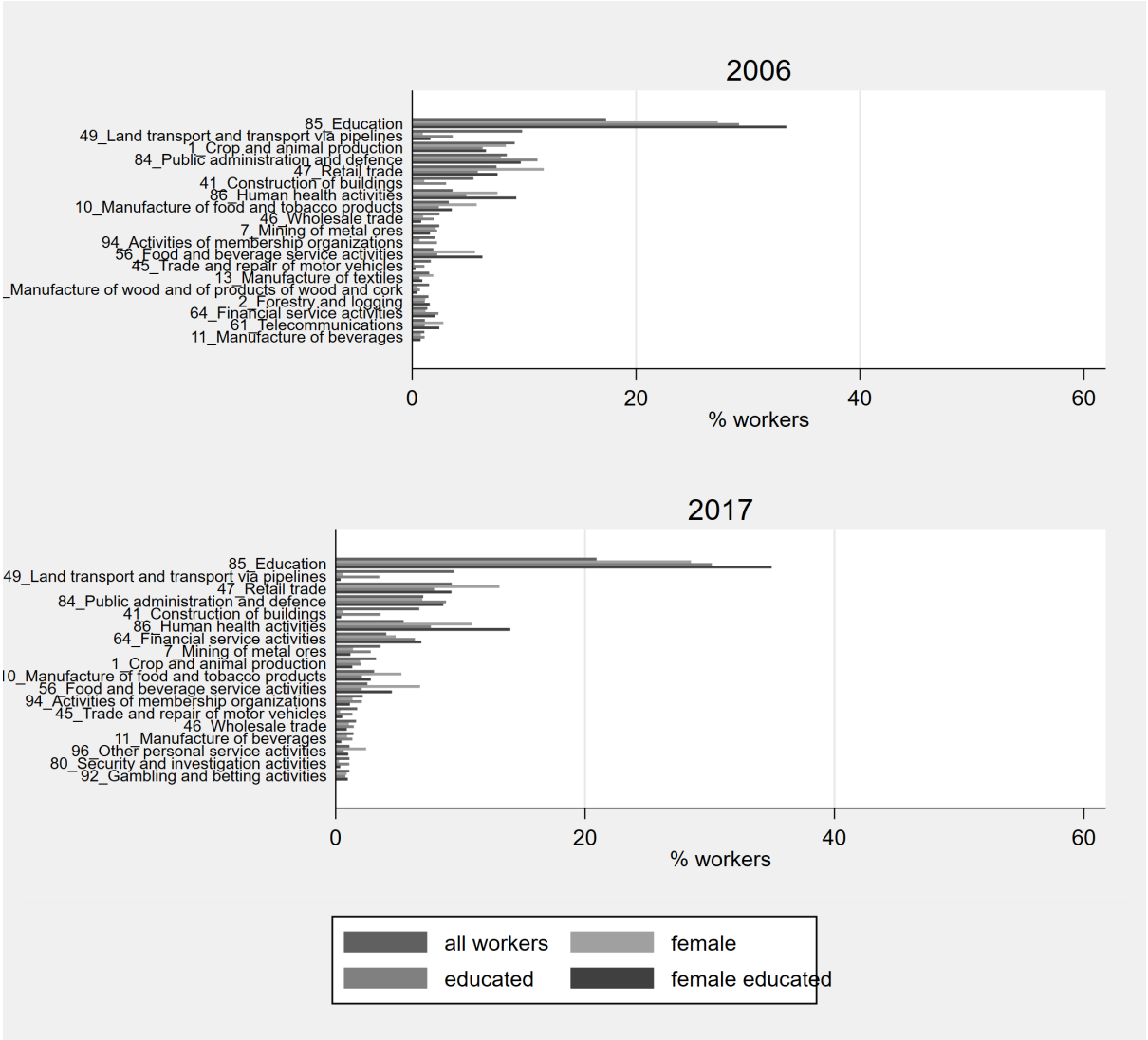
Along with data on employment and FDI, we also included information on import tariffs in the West African region and on the total number of firms in each sector and year in Ghana. We retrieved data on import weighted tariffs in West Africa from the World Bank-UNCTAD World Integrated Trade Solution platform (WITS), which we used to instrument FDI in Ghana after excluding the country. Data on the total number of firms per sector and year in Ghana is taken from the Bureau Van Dyke's Orbis database. In this case, we calculated the stock of firms in each sector and year using the information on the date of constitution of the firm. A few limitations affect the Orbis database. The most important is that it does not allow to take into account firm mortality since the database only reports the date of

[11] https://www.fdimarkets.com/

constitution of the firm, and the status of activity is unknown for most of the firms. Furthermore, only formally registered firms are included, differently from the GLSS which considers all types of workers including those working in informal settings. Finally, the last update of the information is dated 2014 for almost the totality of firms. However, the Orbis database is, to our knowledge, the most comprehensive source of data on firms operating in Ghana and using its information is the only way to account for industry dynamics in our analysis. We could easily match both WITS and Orbis data with those on employment and FDI since import tariffs data included indication of the ISIC sector, while we used Eurostat correspondence tables to convert the NACE codes in Orbis to ISIC.

With the data thus retrieved, we built all the variables we use in the analysis, which are listed in Table 1, as the difference between the value at t and $t-1$, in each sector. For all the employment variables and for the data on the total firms, the difference refers to the share of workers/firms in each sector, since we are interested in having a measure of the weight of each sector and not of the absolute numbers. Only ΔFDI (and $\Delta FDI\ west$) refers to the difference in absolute number of firms, since we are interested in assessing the effect of one additional investment.

Figure 7: Distribution of formal employment (paid employees) across ISIC sectors (main sectors)



Source: own elaboration on GLSS data

Table 12: ISIC sectors

Code	Description	Macrosector
1	Crop and animal production, hunting and related service activities; Fishing and aquaculture	Agriculture
2	Forestry and logging	Agriculture
5	Mining of coal and lignite; Extraction of crude petroleum and natural gas; Support activities for petroleum and natural gas extraction	
7	Mining of metal ores	Mining
8	Other mining and quarrying; Support activities for other mining and quarrying	Mining
10	Manufacture of food and tobacco products	Manufacturing
11	Manufacture of beverages	Manufacturing
13	Manufacture of textiles, wearing apparel and leather products	Manufacturing
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Manufacturing
17	Manufacture of paper and paper products; Printing and reproduction of recorded media	Manufacturing
19	Manufacture of coke and refined petroleum products	Manufacturing
20	Manufacture of chemicals and chemical products	Manufacturing
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	Manufacturing
22	Manufacture of rubber and plastics products	Manufacturing
23	Manufacture of other non-metallic mineral products	Manufacturing
24	Manufacture of basic metals	Manufacturing
25	Manufacture of fabricated metal products, except machinery and equipment	Manufacturing
26	Manufacture of optical instruments and photographic equipment; Manufacture of electrical equipment	Manufacturing
28	Manufacture of machinery and equipment n.e.c.	Manufacturing
29	Manufacture of motor vehicles, trailers and semi-trailers	Manufacturing
30	Manufacture of other transport equipment	Manufacturing
31	Manufacture of furniture	Manufacturing
32	Other manufacturing	Manufacturing
33	Repair and installation of machinery and equipment	Manufacturing
35	Electricity, gas, steam and air conditioning supply	Utilities
36	Water collection, treatment and supply; Sewerage; Waste collection, treatment and disposal activities; materials recovery; Remediation activities and other waste management services	Utilities
41	Construction of buildings; Civil engineering; Specialized construction activities	Construction
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Trade
46	Wholesale trade, except of motor vehicles and motorcycles	Trade
47	Retail trade, except of motor vehicles and motorcycles	Trade
49	Land transport and transport via pipelines	Trade
50	Water transport	Transport
51	Air transport	Transport
52	Warehousing and support activities for transportation	Transport
53	Postal and courier activities	Transport
55	Accommodation	Trade
56	Food and beverage service activities	Trade
58	Publishing activities	Business
59	Motion picture, video and television programme production, sound recording and music publishing activities	Business
60	Programming and broadcasting activities	Business
61	Telecommunications	Business
62	Computer programming, consultancy and related activities	Business
63	Information service activities	Business
64	Financial service activities, except insurance and pension funding	Finance
65	Insurance, reinsurance and pension funding, except compulsory social security	Finance
66	Activities auxiliary to financial service and insurance activities	Finance
68	Real estate activities	Real estate
69	Legal and accounting activities	Business
70	Activities of head offices; management consultancy activities	Business
71	Architectural and engineering activities; technical testing and analysis	Business
72	Scientific research and development	Business
73	Advertising and market research	Business
74	Other professional, scientific and technical activities; Veterinary activities	Business
77	Rental and leasing activities	Business
78	Employment activities	Business
79	Travel agency, tour operator, reservation service and related activities	Business
80	Security and investigation activities	Business
81	Services to buildings and landscape activities; Office administrative, office support and other business support activities	Business
84	Public administration and defence; compulsory social security	Government
85	Education	Government
86	Human health activities	Government
87	Residential care activities	Government
88	Social work activities without accommodation	Government
90	Creative, arts and entertainment activities	Other
91	Libraries, archives, museums and other cultural activities	Other
92	Gambling and betting activities	Other
93	Sports activities and amusement and recreation activities	Other
94	Activities of membership organizations	Other
95	Repair of computers and personal and household goods	Other
96	Other personal service activities	Other
98	Undifferentiated goods- and services-producing activities of private households for own use	Other
99	Activities of extraterritorial organizations and bodies	Other