

Foreign Acquisition and Firm Performance in Sub-Saharan Africa

“Empirical evidence from Ghana”

Paul Wabiga and Neil Rankin

Abstract

In this paper, we examine the effect of foreign acquisition of hitherto indigenously owned firms, on numerous firm performance outcomes. We use a twelve-year (1991-2002) panel data set of manufacturing firms in Ghana. Taking merit of the availability of feasible pre-acquisition covariates, we utilise both regression and matching methods with Difference-in-Differences techniques to handle possible endogeneity due to selection bias of the acquisition decision. Our findings confirm that indeed foreign investors tend to target (cherry-pick) high performing domestic firms. Consistently, our findings from both regression and matching methods reveal positive and significant effects of acquisition on wages and capital investments. We do not find statistically significant acquisition effects on performance outcomes like productivity, output, and capital intensity. Surprisingly, wages tend to increase without relative improvements in productivity.

Key words: foreign acquisition; firm performance; matching; Difference-in-Differences

1. Introduction

A popular stylized fact in the empirical literature on Foreign Direct Investment (FDI) and firm performance is that firms with foreign ownership tend to outperform indigenously owned firms in host economies. This is partly because of the associated systematic differences between firms with foreign ownership and domestically owned firms (Matthias & Javorcik, 2009: 45). However, knowledge regarding these apparent systematic differences offers little about the direction of causality. Whereas such differences might be less surprising for Greenfield investments, foreign ownership arising out of acquisition of formerly local firms justifies empirical inquiry into the extent to which the resulting performance may be ascribed to the acquisition itself. Whether foreign investors acquire well performing firms in the first place or foreign ownership acquisition in itself positively and significantly affect the performance of acquired firms is an issue not adequately attended to by any examination of the differences above mentioned.

The issue of foreign ownership premium has been widely studied especially in the past decade, providing evidence on the effect of foreign acquisition on several firm performance outcomes. Shrivastav and Kalsie (2018), Bentivogli and Mirinda (2016), Weche Geluebcke (2015), Fabling and Sanderson (2014), Guadalupe et al (2012), Chari et al (2009), Matthias and Javorcik (2009), Aydin et al (2007), Girma and Gorg (2007a), Huttunen (2007), Benfratello & Sembenelli (2006), among others, are some of the available studies in the empirical literature. Most of these empirical studies confirm the existence of a positive effect of foreign ownership for instance on wages, productivity, R&D, among others. Never the less, several other studies provide differing findings, implying that a mixed picture of foreign ownership effect on firm performance still exists. For instance, whereas most of the above-mentioned empirical studies find a positive and significant effect, Benfratello and Sembenelli (2006) using firms in Italy and UK, find that foreign acquisition does not generally lead to improved performance of acquired firms. Navaretti *et al* (2004) stresses that much of the available empirical evidence supports existence of not a causal link but a statistical association between foreign ownership and outcomes like productivity. Navaretti *et al* (2004) further state that in much of the causal studies undertaken, differences between foreign and local firms, along variables like productivity, are lesser than in earlier estimations and are frequently insignificant. Fabling and Sanderson (2014) find positive effects of foreign acquisition on wages and output but no effects on productivity and capital intensity among firms in New Zealand. Weche Geluebcke (2015) finds a negative impact of foreign acquisition on employment and no productivity impact of the same on acquired firms in Germany. It is therefore clear that empirical findings still show little consensus regarding foreign acquisition effects on firm performance.

Besides the so far inconclusive findings in empirical literature, majority of the studies have been conducted in the developed world or at least in the Asian and Latin American economies (for developing economies), to the best of our knowledge. Hardly have such analyses been based on economies in Africa, probably due to data limitations, among other impediments. Yet the continent has (and continues to) witnessed a surge in inflows of foreign direct investments

in the last decade¹. Elsewhere, majority studies have mainly focused on the link between FDI and productivity neglecting analysis of other equally important aspects of firm performance like output growth, capital and skill intensity (Matthias & Javorcik, 2009). These are aspects of greater importance in developing economies like Ghana and Sub-Saharan Africa (SSA) in general, with inadequate domestic capital, higher levels of graduate unemployment, among other socioeconomic problems.

Taking advantage of a twelve-year panel data set on manufacturing firms, this paper provides further empirical evidence on the causal link between foreign acquisition and firm performance. We provide this evidence from a SSA developing economy, Ghana, focusing on not only the usual outcomes of employment, productivity, and wages but also other crucial outcomes like output, and skill and capital intensity. We equally look at how capital levels are affected although it is not a direct firm performance outcome.

This study aims to contribute to the growing literature of foreign ownership and firm performance in the following ways; Other than only looking at how foreign owned firms systematically differ from domestic firms, this data set enables us to examine the direction of causality. In this endeavour, we employ both traditional regression methods and propensity score matching with difference in differences estimation techniques, to tackle carefully possible bias due to selectivity on unobservables. Secondly, this study does not only focus on productivity and wages like many of the previous studies, but also on other outcomes of firm operations like; employment, output growth, capital and skill intensity, among others, which can potentially be influenced by foreign acquisition. We also examine the effect of acquisition on capital, one of the scarcest resource at firm level in the developing world. Finally, the study provides evidence on effects of foreign acquisition in the long run. The effects of foreign acquisition on outcomes like employment and wages may be delayed by costs associated with hiring and firing (Huttunen, 2007: 1). Equally, effects on outcomes like productivity and gross output may be delayed by within-plant structural and/or organizational changes. We cater for such delays in our analysis by examining the effects of foreign acquisition in numerous periods after acquisition.

Besides data availability, the suitability of Ghana is cemented by many other reasons. Ghana is one of the developing economies in SSA that shifted from a development strategy where government takes the lead in the country's economic activities to one where the private sector is at the helm. This was due to World Bank's conditionalities of the late 1980s and the failures of public sector economic management by post-colonial administrations in most countries. Ghana therefore put in place a divestiture programme that saw the sale of government stake in State owned Enterprises (SoEs). The divestiture process although launched way before 1990, it was not successfully implemented until several measures were taken by government. These measures were implemented seriously in the first quarter of 1994 (Adda, 1996: 6), three years after the RPED survey had started. Moreover, the process started with the sale of least attractive SoEs and those, which attracted most investors, were sold in the late 1990s (Potter, 2015: 6). This lends credence to our determination of first acquired firms to be around 1994 as will be

¹ Ghana alone for instance, attracted USD 3.3 billion of FDI in 2017 according to the June 2018 World Investment Report.

seen later. Foreign investors were highly encouraged to bid on SoE assets and many enterprises were bought by foreigners (Potter, 2015: 8). This confirms that this policy change exogenously swayed ownership of some firms from government or local to foreign investors.

The rest of this paper proceeds as follows; In the next section (2) we discuss the theoretical guidelines to the study and highlight the existing empirical literature on acquisition and firm performance. Section 3 describes the empirical strategy and results from regression analysis while section 4 specifically details the matching methods and associated empirical results. Section 5 presents the conclusions and some suggestions for further research.

2. Theoretical and Empirical Literature

2.1 Theoretical basis

This study is guided by two mutually reinforcing theoretical formulations of foreign ownership and firm performance. The first theoretical perspective is that linked to the general hypothesis of ownership advantages for foreign owned firms over locally owned firms (Dunning, 1980; Hymer, 1960; Makoni, 2015). These advantages give the former a competitive edge over the latter in host economies. These proprietary assets usually are in form of; new technologies or patents, managerial expertise, superior access to capital, product differentiation, among others. Once these are transferred to the subsidiary (acquired) firms, a Foreign Ownership Premium (FOP) is generated, manifested in augmented performance of the subsidiary². This hypothesis implies that within a specific industry/sector, the most productive firms are those that are more likely to engage in foreign investment through either setting up new plants or acquiring local firms (Bentivogli & Mirenda, 2016: 2)³. In this study context, testing this theoretical perspective requires us to identify the causal effect of foreign acquisition on the post-acquisition performance of the firm in question.

The second theoretical formulation relates superior performance of foreign owned firms to ex-ante selection bias. This bias comes from differences in micro-level features of firms that are acquired by foreign investors and bias can either be a result of negative or positive selection. In the latter, foreign investors usually target well performing domestic firms for acquisition, making their post-acquisition performance highly attributable to the selection process. Reviewed literature has referred to this as the “cherry-picking” effect (Rodríguez & Tello, 2014: 8). The negative selection perspective has it that flourishing foreign firms may decide to acquire limping domestic firms, get rid of current management and then fully exploit the firm’s potential (Bentivogli & Mirenda, 2016: 2)⁴. Acquisition of underperforming domestic firms can as well be a result of information asymmetry about the firm’s performance. In our study context, test on this theoretical perspective necessitates an examination of the pre-acquisition

² Bentivogli and Mirenda (2016) refer to this as ex-post forward linkages

³ This is comparable to the operating efficiency theory in management literature, where acquisition is said to arise when the acquirer confirms complementarities with the targeted firm in terms of production operations. In this case, acquisition is likely to occur for those firms that are performing well. Post-acquisition performance in this case is contingent on the extent to which assumed complementarities exist in reality.

⁴ This is comparable to “the theory of managerial discipline” in management science which has it that acquisition is a result of natural selection, in which inefficient firms are taken over by new shareholders and undergo restructuring to enhance their efficiency

differences, in the performance and structural features, between the acquired firms and those firms that remained purely domestic.

In order for us to fully understand whether foreign acquisition has a causal effect (FOP) on firm performance, we need to separate performance differences associated with pre-acquisition factors from those related to firm acquisition by foreigners. In this endeavour, we need to control for endogeneity effects likely to arise from the selection process. This is what makes the two theoretical underpinnings conjointly reinforcing in our study context.

2.2 *Highlights in Existing Empirical Literature*

Existing empirical literature on foreign acquisition and firm performance reveals several features. Three of such features are highlighted herein. Most of the empirical studies and findings thereof have been on acquisition effect on employment, productivity, and wages with few studies focused on other firm-level outcomes, which are equally likely to be influenced by foreign ownership. In the available findings, it is noticeable that there is little consensus on the causal effect of foreign acquisition on plant performance. In the context of geographical orientation, to the best of our knowledge, virtually all studies have focused on either East Asian or the more developed western economies. What is generally more glaring, however, the body of empirical literature on the causal nexus between foreign acquisition and firm-level performance has been growing over time and it is now topical.

Among the recent studies on the topic is Wang & Wang (2015a) who employ Propensity Score Matching (PSM) and Difference-in-Differences (DID) to investigate the effect of foreign acquisition on local firms in China with focus on various performance outcomes. Their findings reveal, for acquired firms relative to non-acquired firms, post-acquisition increase in real wages, decrease in capital labour ratio, 10% rise in employment and gains in productivity.

Wang and Wang (2015a)'s wage results uphold those of Girma & Gorg (2007a) who find positive wage effects of acquisition in UK for firms acquired by US foreign investors. Girma & Gorg equally employ a Difference-in-Differences matching approach in their analysis and notably their findings reveal substantial heterogeneity in the acquisition effect on wages, chiefly associated with nationality of acquirers and workers' skill groups. Wage results above-mentioned further corroborate findings by Conyon et al (2002) who utilize panel data on firms in the UK for 1988 – 1994 and finds that acquired firms pay on average 3.4% higher compared to similar domestic firms. They employ a Difference-in-Differences method implemented in a regression framework (Conyon *et al.*, 2002: 7).

Using panel data for 1991 – 1998, Almeida (2007) employs regression and generalized Difference-in-Differences estimation methods to investigate the acquisition effect on wages. Almeida's findings show significant wage increments after takeover among Portuguese firms. Huttunen (2007) employs both regression and PSM with DID on longitudinal data from Finnish firms and finds a significant and positive effect of acquisition on wages in second and third years after takeover. Similarly, in their analysis of foreign acquisition on New Zealand firms, Fabling and Sanderson find significant acquisition effects on wages. Acquired firms experience on average between 6 % to 8% increase in wages compared to non-acquired firms over a three year horizon (Fabling & Sanderson, 2014: 13). The foregone scholarly evidence confirm

acquisition effects on firm wages although still, in line with the inherent inconclusiveness, other studies have found differing results. In attempt to study the effect of foreign acquisition on wages and total factor productivity in years following takeover, Bandick (2011) utilises firm-level data on Swedish firms for the period 1993 – 2002. In this study, probable endogeneity of the acquisition decision is handled using a combination of instrumental variable techniques and propensity score matching with Difference-in-Differences estimation methods. After taking care of firm heterogeneity aspects, the study finds no effects of foreign acquisition on wage growths of acquired firms.

The productivity results from Wang and Wang (2015a) echo findings of Matthias and Javorcik amongst Indonesian firms. Using longitudinal data from “Survei Manufaktur”, Matthias and Javorcik (2009) apply matching methods with Difference-in-Differences techniques and find statistically significant increments in productivity of acquired firms relative to similar non-acquired firms. Specifically, using similar methods to this study’s, their findings indicate that acquired firms on average post between 10 % and 13.5% more on productivity, compared to non-acquired firms that were similar in the pre-acquisition period (Matthias & Javorcik, 2009: 47). Productivity improvements are prevalent in the acquisition year and subsequent years and the findings are robust to different measures of productivity. Elsewhere, using panel data for 1986 – 2008 on Hungarian firms, Earle et al (2012) employ regression, propensity score matching with Difference-in-Differences estimation methods to investigate wage effects of foreign ownership. Matching on pre-acquisition data and controlling for fixed effects for firms and detailed worker groups, these scholars not only find between 12% to 28% effects on average wages but notably also is the finding that these wage effects tend to rise with potential enhancements in productivity (Earle *et al.*, 2012: 16). Their findings specifically indicate a 26.1% productivity premium for firms acquired by foreign investors (Earle *et al.*, 2012: 39).

Scholarly findings above show relatively higher effects compared to some other empirical studies on acquisition and productivity. Indeed some studies have found either comparatively lower or differing effects of acquisition on firm productivity. Bandick (2011: 14) studies Swedish firms using matching methods and instrumental variables and his findings reveal only between 1% and 2% productivity growth between acquired and non-acquired firms five years after takeover. To the contrary, some studies find no effects on productivity after change in firm ownership. Applying a GMM-System estimation method on Italian firms, (Benfratello & Sembenelli, 2006) control for unobserved heterogeneity, measurement errors and input simultaneity but find no productivity effects of foreign ownership. Similarly, Fabling and Sanderson (2014) utilises matching and Difference-in-Differences approaches on New Zealand firms in attempt to estimate the effect of foreign acquisition on firm performance. Their findings indicate that foreign acquisition has no significant effects on firm productivity. Combining matching methods and Difference-in-Differences estimation approach, (Salis, 2008) examines acquisition effects on productivity among Slovenian firms. Utilizing data on firms in manufacturing between 1994 and 1999, study findings do not show convincing evidence of positive effects of foreign acquisition on total factor productivity for acquired firms over the period considered (Salis, 2008: 1031). Findings from Salis’ analysis echo those of Orazem and Vodopivec (2004) who employ regression methods to examine firm level

production efficiency in Slovenia for the period 1994 – 2001. Findings indicate that changes in firm ownership has no impact on growth in total factor productivity (Orazem & Vodopivec, 2004: 24). Acquisition effects on productivity too remain inconclusive despite the fact that it is one of the most investigated outcome at firm level.

Acquisition effects on employment in Wang and Wang (2015a)'s findings converge well with several other empirical studies. Earle et al (2012) uses panel data for Hungary, 1986 – 2008 and finds positive acquisition effects on employment of about 7% for acquired firms relative to non-acquired firms. These findings substantiate those of Lipsey (2008) amongst Indonesian firms. Using a panel of firms in the Indonesian manufacturing sector between 1975 and 1999, Lipsey employs regression and Difference-in-Differences with matching methods to examine employment growth after acquisition. Results indicate an annual 5.6 % growth rate of employment for foreign acquired firms compared to the always-private domestic firms (Lipsey, 2008: 16).

Post-acquisition growth in employment may be dependent on the path taken by new firm owners. If new ownership aims to create new sales opportunities and networks, rise in employment is inevitable. However, if acquisition is guided by managerial purging and restructuring, job losses are likely to occur (Fabling & Sanderson, 2014: 4). Undeniably, several other empirical findings reveal differing effects of foreign acquisition on firm employment. Employing a Difference-in-Differences methodology combined with propensity score matching, (Chari *et al.*, 2009) finds employment declining among acquired firms relative to non-acquired firms. Huttunen (2007) examines the effect of acquisition on employment and wages for employee skill groups among Finnish firms. Employing regression and propensity score matching methods on panel spanning 1988 – 2001, findings indicate a significantly negative effect on employment for highly educated workers. Maioli, Gong and Yundan (2007: 24) examine the effect of foreign acquisition of State owned Enterprises in China using matching methods and Difference-in-Differences techniques. After controlling for growth, they find a contemporaneous negative effect on employment among acquired firms relative to those that did not change ownership. However, post-acquisition effects are found to be positive.

Relatively few studies have examined foreign acquisition effects on capital investments, output, and capital intensity as firm level outcomes. One study that examines acquisition effects on output is the one by Matthias and Javorcik (2009). Their findings reveal positive effects on output. Acquired firms averagely post above 50% log points compared to relatively similar firms that remain un-acquired. Increments in output are chiefly attributable to various restructuring processes that may entail new technologies and production infrastructure, which are usually transferred to the new acquired subsidiary firm from the parent plants abroad. This is buffered by the theoretical formulations of the internalization theory motivated by Dunning and other scholars. Further investigation on acquisition effects on capital investments by Matthias and Javorcik (2009: 51) find positive and significant average treatment effects. Other studies that have investigated effects of foreign ownership on capital intensity.

2.3 *Summary of Empirical Literature Highlights*

The brief review of empirical findings on effects of foreign acquisition on firm performance highlights numerous important issues. Quite conspicuous in the review is the prevalence of no consensus on the effect of acquisition on studied outcomes. Whereas many studies find positive effects, some other empirical findings present differing results. This is for the most part on employment, wages, and productivity. It is also glaring that application of matching methods and Difference-in-Differences estimation techniques is on the upswing in a bid to establish causal effects in the economics field⁵. Foreign acquisition decisions are largely driven firm-level features of targeted firms, evidencing “cheery-picking”, an aspect that has to be carefully handled if causality is to be identified with good certainty. This provides litmus to the suitability of our two theoretical orientations chosen to guide our analysis. Together they cater for pre-acquisition selectivity while meeting the endeavour to unmask post-acquisition causal effects of foreign ownership. Finally firm-level outcomes especially output, capital, skill and capital intensity have received less attention in empirical investigations regarding the causal link between foreign acquisition and firm performance.

3 Empirical strategy

In order to examine the effect of foreign acquisition on firm-level performance outcomes, we, as earlier indicated, utilize a twelve-year panel data set. This panel has firm level information on a sample of 312 firms anchored in Ghana’s manufacturing sector. It covers the period 1991 to 2002. Collected in six rounds by the World Bank and the Oxford Centre for the Study of African Economies, under the RPED project, the sample is stratified along sub-sector, size and location of firms. We identify foreign acquisition through firms’ response to the disclosure statement ‘Is this firm under exactly the same ownership and same legal status as it was when we visited in ... (year)? If no, then describe these changes’. We therefore derive a sub-sample to include only those that were either fully or partially state owned, privately owned by local Ghanaians or owned by both Ghanaians and the state. Foreign acquisition can easily be traced from the time of acquisition during the main sample period for these firms. This gives us a derived sub-sample 138 firms with 8.7% of the firms identified as having been acquired during the sample period. We deem this sample and extent of acquisition (12 firms) feasible for analysis using our proposed methods⁶. The divesture program in Ghana took a slow start and was characterised by very low sell-outs until late 1990s when new measures were put in place as earlier mentioned.

In Table A in the appendix, we see the sample composition of these firms. In terms of sector composition, the garment sub-sector posts the highest contribution at 21.9% followed closely by metal and furniture. The small-scale resource intensive sub-sector (ssrii) is the least contributor with only 0.7%. More than half of the firms are located in Accra followed by Kumasi with 37.7% of the firms in the sample.

⁵ Matching methods have hitherto been a preserve of mostly medical or clinical studies. See studies like Staffa & Zurakowski (2018), Pirracchio et al (2012), Hill (2008), among others

⁶ See studies by Bentivogli & Miranda (2016)-0.17%, Earle et al (2012)-1.78%, Abadie et al (2012) -2.63%, Fabling & Sanderson (2012) – 0.3%, among others

In Figure 1.0, we see the treatment variation plots for the sample⁷. The plots have firm IDs on the vertical axis and the time (in years) on the horizontal axis. The upper panel is treatment variation among large firms⁸ while the lower panel shows treatment variation among small firms. The red patch shows firms, which were acquired by foreign investors according to their response to the statement we specified earlier. The blue patch relates to those firms that did not change ownership during the study period. From the panels, it is noticeable that most of the firms that changed ownership were acquired in 1998 followed by those that changed ownership in 1994 and only two or three firms changed ownership between 1996 and 1997. This is more clearly revealed by the overall sample plot in Figure 3A in the appendix. It is also noticeable from Figure 1.0 that treatment is prevalent in both small and large firms but for the most part among the latter. Prevalence of acquisition more among large firms is yet another pointer to probable selection bias alluded to earlier. All acquired firms categorized as small changed ownership status in 1998. From the plots, it is further evident that we have a bigger pool of control firms to pick from for the matching stage of our analysis.

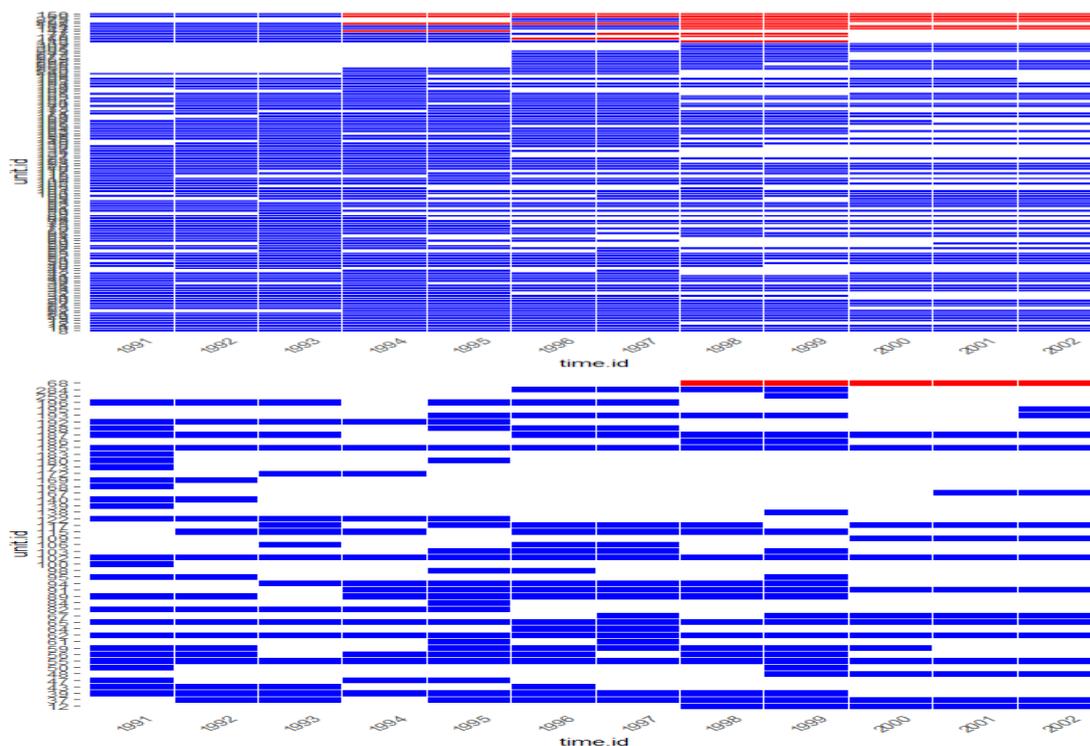


Figure 1.0: Treatment variation plots for firms in the derived sample

In Table 1.0, we see the descriptive panel summary statistics for the sample comparatively for firms, which were acquired by foreigners (A) and those that remained domestic throughout (D). Except for firm age, exports and skill intensity, the rest of the variables are expressed in log form. In the last column are p-values associated with the “raw” differences between the

⁷ Generated using R package PanelMatch
⁸ Firms with log employment ≥ 1.698970

means of the acquired and non-acquired firms in the sample⁹. We notice that the “raw” means between acquired and domestic firms are significantly different for numerous variables.

Table 1.0: Descriptive statistics for key variables for acquired and non-acquired firms

Variable	Mean		Std.Dev		P> t
	A	D	A	D	
Employment	4.27	2.75	1.64	1.20	0.010
Wage	10.21	9.99	0.41	0.45	0.000
Productivity	14.48	13.89	1.47	1.24	0.125
Output	18.75	16.67	2.84	1.88	0.034
Exports dummy	0.36	0.28	0.48	0.45	0.327
Capital Int	9.66	9.60	1.30	1.75	0.945
Skill Int	0.26	0.15	0.22	0.23	0.081
Capital	18.25	15.12	2.83	2.66	0.004
Firm mage	18.98	17.85	13.00	11.69	0.510

Source: Authors' own computations based on sample data

In order to achieve our investigative objective, we employ both regression and matching methods with Difference-in-Differences estimation techniques.

3.1 Regression methods

We notice from Table 1.0, that the descriptive statistics on key observable variables for the acquired firms and the non-acquired firms reveal differences between the two groups in the sample, capital intensity being the only exception. This is an initial pointer to probable selectivity regarding the foreign acquisition decisions of target firms. Foreign investors in most cases select their acquisition targets based not on chance but specific criteria (Weche Geluebcke, 2015: 746). This lack of randomness in acquisition of firms is of great concern in estimating causal effects of the same on firm performance. We try to control for any other observable and unobservable differences by taking merit of the panel structure of the data. In the first stage of regression methodology, we estimate a pooled Ordinary Least Squares regression (POLS), which sets the standard for us to separate causal effects from bias arising from selectivity and possible endogeneity. In the POLS, we regress each key performance outcome against A_{it} , an acquisition dummy equal to 1 from the time a firm is acquired by

⁹ Generated by “*reg outcomevar fdi, vce (cluster firm)*” to sidestep difficulties in conducting t tests on group means in panel data

foreigners and 0 otherwise. This dummy variable is 0 for firms that remain domestic throughout the sample period. We then include various controls and time dummies.

The POLS, however, does not solve problems associated with selection bias and endogeneity. Among its limitations, the POLS disregards the space or individual firm effects. This model assumes that all firms are homogeneous in terms of dependent variables and there is no other firm/industry effects on the regressands. It further assumes that all slope coefficients of the X variables and intercepts are identical for all firms in the data set, which is unrealistic (Puronicid, 2014: 205). Such unrealistic assumptions may bias estimates for instance of the variance for each of the estimated coefficients leading to incorrect statistical tests and confidence intervals (Baltagi, 2005). Therefore, the likelihood is high that the POLS may distort the true picture of the relationship between the regressor and the regressands across firms if the assumptions are not fulfilled.

We therefore conduct a second stage of regression analysis, in which we make our first attempt to sidestep selection and endogeneity¹⁰ issues and any other limitations of POLS above mentioned. We do this using Fixed Effects (FE) regression models. One of the conventional ways of solving endogeneity is by running a fixed effects model (Mummolo & Peterson, 2017). FE regression estimation reduces problems associated with selectivity in estimating causal effects. *In a given panel data set, if units of analysis (like firms in this case) are likely to systematically differ from each other in ways that may not be observable, which differences may affect the outcome of interest, unit effects are often used to eliminate all between-unit variation so as to produce estimates of a variable's average effect within units over time* (Wooldridge, 2010: 304). We therefore estimate a panel regression with fixed effects, which relates firm performance outcomes to acquisition status and controls. We adopt, with slight modification, the following estimation equation as specified in Earle et al (2012: 6);

$$y_{it} = \Psi A_{it} + \xi_t + \gamma_i + u_{it} \quad (1.0)$$

Where y_{it} is the natural log of a specific performance variable for firm i at year t , A_{it} is a dummy that takes of value 1 from the time a firm is acquired by foreigners and 0 otherwise. This dummy variable is 0 for firms that remain domestic throughout the sample period. Ψ is the parameter of interest, which captures the foreign acquisition effect on the outcome variable, while ξ_t denotes the 12 year effects. γ_i captures the firm fixed effects while u_{it} is the error term. We estimate equation (1.0) for each of the outcome variables of interest while excluding any other time varying covariates that can potentially influence both foreign acquisition and the outcome variable. Additionally, we report robust standard errors.

¹⁰ Endogeneity sources are myriad but mainly arise from all observable and unobservable time-invariant variables, which influence both the acquisition decision and the outcome variables of interest in our case. Productivity differentials between foreign and domestic firms partly account for higher wages in foreign owned firms (Davies & Lyons, 1991). Omitted variables are also a realistic source of endogeneity for instance in our case, R&D orientation by foreign owned firms influences both output and productivity yet we do not cater for it in our analysis as no information about it is available not even a proxy variable. Besides, there are possibilities of measurement errors especially on wages and outright concealment on capital levels to avoid tax. Elsewhere, bias caused by simultaneity is equally possible. We note that whereas foreign acquisition can for instance lead to higher levels of productivity among firms, highly productive firms might have a higher likelihood of being acquired by foreigners hence positive selection. Yet negative selection is equally possible.

3.2 Empirical results from Regressions

In Table 1.1, we see the regression results for both the POLS and FE estimations. In the upper section, we see results for the POLS estimations. For all estimates but capital intensity, firm level results show positive and significant coefficients, with some indicating more than 100 log points, after controlling for sub-sectors and year effects. These results are subject to the limitations of the pooled regression mentioned earlier. Indeed when we add firm fixed effects, the estimates are smaller and only significant for wages, productivity, capital, and output as observed in the lower part of the table. Specifically for these variables, results indicate respectively 10%, 36%, 17%, and 43% wage, productivity, capital, and output differentials in favour of acquired firms.

The dissimilarity between the two sets of results is usually an indicator of the degree of selection bias (cherry-picking) in acquisition of firms by foreign investors whose decisions may as well be based on firms' inherent time-invariant heterogeneities (Earle *et al.*, 2012). Except for employment, capital and skill intensity, the variables that remain statistically significant show effects, which are substantial. This is an indicator of the likely average effect of foreign acquisition on these performance variables at firm level. The size of the effects we observe is relatively similar or slightly lower from empirical findings in the literature. Javorcik *et al* (2009) finds a 49 log point foreign output differential while regarding productivity, Waldkirch (2014: 26) finds a 51 log point differential. In Earle *et al* (2012: 10), findings indicate a 16 log point of foreign wage differential using linked employer employee data with a FE regression estimation method.

Table 1.1: Effects of Foreign Acquisition on outcome variables -Estimates with OLS and FE

Full sample - OLS	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	empt	wage	pdvty	output	capital	skill_int	k_int
Fdi	1.37***	0.23***	0.70***	2.06***	2.63***	0.09***	-0.14
	(0.174)	(0.045)	(0.159)	(0.301)	(0.265)	(0.025)	(0.166)
N _o - obs	1323	1500	1295	1297	1343	1210	1317
Sub-sector dum	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y
R ²	0.273	0.300	0.354	0.349	0.334	0.159	0.135
Full sample – FE							
Fdi	0.094	0.099*	0.358*	0.433**	0.174*	0.027	-0.033
	(0.082)	(0.057)	(0.208)	(0.220)	(0.110)	(0.065)	(0.216)
N _o - obs	1338	1536	1310	1312	1358	1225	1332
N _o - firms (N)	134	138	131	138	133	137	138
N _o -firms acquired	12	12	12	12	12	12	12
Year dummies	Y	Y	Y	Y	Y	Y	Y
R ² - within	0.045	0.262	0.026	0.043	0.049	0.035	0.056

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Own results based on final derived sample

4. Matching and Difference-in-Differences Estimation

We earlier noticed from Table 1.0 that firms with foreign acquisition differ from those, which are purely domestic in the sample. On average, differences are noticeable along covariates like employment, productivity, real output, and capital. Elsewhere, empirical evidence has it that firms with foreign ownership usually pay on average higher wages and are also export oriented (Matthias & Javorcik, 2009: 45). Because these differences do not give insights into the direction of causality between foreign acquisition and firm performance, we employed both POLS and FE regression models in our attempt to establish the average effects of foreign acquisition on firm performance. The FE model indicated that foreign acquisition positively influences wages, productivity output employment, capital, and skill intensity but does so, significantly on the first three variables only. FE was employed because of the inherent limitations of the POLS, specifically tackling selectivity and probable endogeneity. However, FE regressions are not a panacea for all endogeneity and selectivity problems (McManus, 2011:

19). FE trades consistency for efficiency since it uses within-firm change, ignoring between-firm variations¹¹. Additionally, from a broader perspective, under the FE estimation model, firms act as their own controls. This implies that firms that change ownership may largely drive the observed coefficient on the fdi dummy¹². The need for further validation of our results motivates us to conduct a Propensity Score Matching with Difference-in-Differences estimation techniques. PSM enables us to create a feasible control sample for estimation purposes by restricting such a control sample to only those firms with relative similarity to acquired firms in terms of observable pre-acquisition features. This enables us to establish a counterfactual scenario for the acquired firms in furtherance of our desire to confirm earlier FE average causal effects of foreign acquisition on firm performance.

4.1 Modelling foreign acquisition of firms

One of the most crucial decisions in performing matching and successfully satisfying the assumptions that underpin this technique concerns the baseline covariates that are used in the matching model. Adequate identification and measurement of these covariates is essential (Tanner-Smith & Lipsey, 2014: 5)¹³. With no control over measurement, we handle identification in the inaugural stage of our matching strategy by empirically modelling the changeover process of potential target firms from local to foreign ownership. In this endeavour, we employ a probit model, specified in (1.0), with a binary outcome variable of a firm being taken over by foreign investors.

$$Pr(A_{it} = 1|X_{it}) = \phi(X'_{it}\beta + \varepsilon_i) \quad (1.1)$$

In (1.1), A_{it} is a dichotomous variable describing the acquisition status of a firm in a specific year. X_{it} is a vector of observable firm characteristics prior to acquisition and ϕ is a standard normal cumulative distribution function. In this model, we use the observable characteristics of prospective firms as predictor variables. Selection of the predictors included in the model is guided by economic theory and earlier studies that have employed PSM with DID¹⁴. We lag these predictors to ensure prediction is based on pre-acquisition performance of prospective firms. According to Matthias and Javorcik (2009: 45), potential foreign investors hugely base their acquisition decisions on basic observable information on targeted firms for instance the size of firms, capital levels, productivity, age, exportation status, among other characteristics.

In Table 1.2, we see the results from the probit model¹⁵. Results indicate that firms, which are relatively larger (measured by lagged employment) are more likely to be acquired by foreign

¹¹ This means we cannot assess the effect of variables that have little within-firm variation. Moreover, parameter estimates may be imprecise with large SEs.

¹² This makes establishing a counterfactual scenario a little more enigmatic

¹³ These covariates should satisfy two main properties according to these very authors (page 6) i.e. (i) the covariate can independently predict any outcome variable of interest either directly or otherwise through a relationship with another covariate. This ensures that baseline differences between the conditions on that covariate would produce differences between the conditions on the outcome variable net of any effect of the acquisition and (ii) The covariate, or one with which it interacts, must differ between the conditions at baseline and measured with a good level of reliability

¹⁴ See studies like; Weche Geluebecke (2015), Fabling & Sanderson (2013), Chari et al (2009), Huttunen (2007), among others

¹⁵ We compute pseudo r^2 from (constant model LL - full model LL)/ constant model LL

investors. The coefficient on the “*lgemployment*” covariate is positive and significant at 10%. Additionally, results indicate that firms that are relatively older, productive, and publically owned are more likely to be acquired by foreign investors. The coefficients on these variables are positive and significant at 5% or 10% level. Regarding public ownership, significance is probably due to the policy shift that the Ghanaian government ushered in shortly after the initial waves of data collection. This saw some hitherto state owned enterprises change ownership or government sold off her stake in some jointly owned enterprises, with such stake going into the control of foreigners. However, export status, although a key predictor of foreign acquisition as indicated in numerous empirical studies is not significant in our data.

Table 1.2: Probit results – Predicting foreign acquisitions

Variables	fdi	Std.Err
Lgemployment	0.525*	0.319
Lwage	1.182**	0.565
Lgproductivity	0.448*	0.244
Lgexports	0.430	0.400
Lgpublic	6.263***	1.601
Firm age	0.220***	0.025
Prob > chi ²	0.000	
Chi ²	223.54	
Pseudo R ²	0.440	

Note: *** p<0.01, ** p<0.05, * p<0.1

Given the results from the probit model, it is clear that use of such covariates at their baseline level will yield credible results from the matching process. As later details will reveal, we use these covariates in the calculation of Mahalanobis distances, which we use in the refinement of our matched sets.

4.2 The Matching Strategy

In this analysis, we replicate a matching procedure for causal inference with Time Series Cross Sectional (TSCS) data recently put forward by Imai et al (2019). We use the words ‘treatment/treated’ interchangeably with ‘acquisition/acquired’. We recall that our data set consists of 138 (N) firms covered for 12 (T) years. For every firm indexed by $i = 1, 2 \dots N$, at year indexed by $t = 1, 2, \dots T$, we have got an outcome variable of interest, y_{it} . This outcome variable in our case may be one of; employment, mean wage, productivity, output etc. We also have a dichotomous acquisition (treatment) variable, A_{it} , which takes on the value 0 for firms that stay domestically owned throughout the 12 years and value 1 for firms that are acquired by foreigners and only from the period of acquisition to T. We also observe a vector of K time-varying covariates, z_{it} . In a specific year, we assume that z_{it} is realized before A_{it} and outcome, y_{it} , is finally realized after z_{it} and A_{it} have been realized. This direction of the assumed causal order ensures that z_{it} is not affected by the acquisition and the covariates

therein take their values prior to the firm being acquired. Importantly z_{it} can include lagged outcomes (Imbens & Wooldridge, 2007: 3)

4.2.1 Defining the Average treatment effect on the acquired firms (ATT)

The average treatment effect on the treated is one of the most commonly studied estimands in causal econometric literature (Imbens & Wooldridge, 2007: 4)¹⁶. ATT in our case is the average effect of foreign acquisition on performance variables of those firms, which were acquired during the study period¹⁷. Defining our ATT starts with specifying non-negative integers F and L. The former represents the outcome of interest measured at F years after foreign acquisition of a firm. Given a firm acquired in 1994, F = 0 if our interest is in the average effect of acquisition on an outcome variable measured in 1994, an effect Imai et al(2019: 9) terms to be contemporaneous. F is set to 1 if our interest is in measuring the ATT on an outcome of acquired firms one year after acquisition. The latter (L) specifies the number of lags to adjust for in the matching process.

We initially define our ATT of foreign acquisition based on the following specifications;

Let potential outcome under (not under) firm acquisition, P_a (P_0), be expressed as;

$$P_a = y_{i,t+F} \left(A_{it} = 1, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) \quad (1.2)$$

$$P_0 = y_{i,t+F} \left(A_{it} = 0, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) \quad (1.3)$$

Then

$$ATT(F, L) = E\{(P_a - P_0) | A_{it} = 1, A_{i,t-1} = 0\} \quad (1.4)$$

In both (1.2) and (1.3), the acquisition history, $\{A_{i,t-l}\}_{l=2}^L = \{A_{i,t-2}, \dots, A_{i,t-L}\}$ is set to the realized pre-acquisition period.

Referring to the above specifications, if a firm for instance was acquired ($A_{it} = 1$) in 1994 (t), and we set F=1 and L=2, (1.1) would express the value of the potential outcome of interest in 1995 (t + F) while (1.2) would give the would be (counterfactual) potential outcome had the firm remained domestic i.e. $A_{it} = A_{i,t-1} = A_{i,t-2} = 0$. From (1.3), ATT (1,2) gives the ATT of foreign acquisition on the outcome of interest, for instance average wage, one year after acquisition while assuming that the possible outcome is dependent on the acquisition history to a probable two years back. In order to be able to estimate ATT where $F > 0$, we re-define our ATT as specified below;

$$E \left[y_{i,t+F} \left(\{A_{i,t+l}\}_{l=1}^F = 1_F, A_{it} = 1, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) - y_{i,t+F} \left(\{A_{i,t+l}\}_{l=1}^F = 0_F, A_{it} = 0, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) \mid \{A_{i,t+l}\}_{l=1}^F = 1_F, A_{it} = 1, A_{i,t-1} = 0 \right] \quad (1.5)$$

¹⁶ See other studies like Heckman & Robb (1984), Rubin (1977), among others

¹⁷ A similar cardinal objective in Weche Geluebcke (2015) on acquisitions in Germany

4.2.2 Key identification assumptions

In this analysis, identification of the effects is based on the following assumptions;

Our choice of the values of F and L is based on the assumption that the potential outcome for firm i at time $t + F$ does not depend on the acquisition status of other firms for example $A_{i't'}$ where for any $t', i' \neq i$. Additionally, the choice of F and L does not depend on the previous acquisition status of the same firm after L years, $\{A_{i,t-l}\}_{l=L+1}^{t-1}$. By implication, except for some carryover effects up to L years, there is no allowance for spill over effects.

Another key assumption in establishing causality using matching methods is that of unconfoundedness in treatment (acquisition) assignment. Specifically in this analysis, given F, L and ATT, we assume that conditional on A_{it} , y_{it} and covariate history up to $t - L$, the acquisition assignment is unconfounded. Basing on notational specifics of conditional independence, $A \perp\!\!\!\perp B|C$ shows that A and B are independent conditional on C (Imbens, 2015: 4). In our context,

$$\left\{ y_{i,t+F} \left(A_{it} = 1, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right), y_{i,t+F} \left(A_{it} = 0, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) \right\} \perp\!\!\!\perp A_{it} | A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L, \{Y_{i,t-l}\}_{l=1}^L, \{Z_{i,t-l}\}_{l=0}^L \quad (1.6)$$

Assumption (1.6) together with another key assumption of overlap form the combined assumption of *strong ignorability*¹⁸. This combined assumption implies that we can estimate the ATT by adjusting for differences in covariates between the acquired and control firms (Imbens, 2015).

Although the believability of the unconfoundedness assumption can be assessed¹⁹, it is not directly testable (Imbens, 2015: 31; Imbens & Wooldridge, 2007: 2). In analytical applications with TSCS data, however, more concern is on unconfoundedness, which is likely to arise from unobserved variables (Imai *et al.*, 2019: 11). In this study therefore, we sidestep (1.5) and employ a Difference in Differences (DID) approach. As proposed by Imai *et al.* (2019), conditioning on the acquisition, covariate histories and outcome, we adopt the parallel trends assumption, which we specify below;

$$\begin{aligned} & E \left[y_{i,t+F} \left(A_{it} = 0, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) - Y_{i,t-1} \mid A_{it} = 1, A_{i,t-1} = \right. \\ & \left. 0, \{A_{i,t-l}, Y_{i,t-l}\}_{l=2}^L, \{Z_{i,t-l}\}_{l=0}^L \right] = E \left[y_{i,t+F} \left(A_{it} = 0, A_{i,t-1} = 0, \{A_{i,t-l}\}_{l=2}^L \right) - Y_{i,t-1} \mid A_{it} = \right. \\ & \left. 0, A_{i,t-1} = 0, \{A_{i,t-l}, Y_{i,t-l}\}_{l=2}^L, \{Z_{i,t-l}\}_{l=0}^L \right] \quad (1.7) \end{aligned}$$

In (1.7), the conditioning set consists of lagged outcomes (but the immediate lag $Y_{i,t-1}$), acquisition history and the covariate history.

4.2.3 Generating the Matched sets

¹⁸ As conceptualized by Rosenbaum and Rubin (1983)

¹⁹ For example using lagged values of the outcome as pseudo outcomes and estimating the causal effect of the treatment on pseudo outcome.

The next step in the matching process is to generate matched sets for acquired firms. We construct a matched set, M_{it} , of control firms for each acquired firm (i,t) . Control firms are those, which are relatively similar to acquired firms in terms of pre-acquisition history from time $t - L$ to $t - 1$. Given any acquired firm, the matched set is defined as;

$$M_{it} = \{i': i' \neq i, A_{i't} = 0, A_{i't'} = A_{it'} \quad \forall t' = t - 1, \dots, t - L\} \quad (1.8)$$

Where;

$A_{i't}$ is the acquisition status of the specific control firm in year t , $A_{i't'}$ is the acquisition status of the control firm in the pre-acquisition period and $A_{it'}$ is the acquisition status of the acquired firm in the pre-acquisition period. For purposes of maintaining internal validity, we exclude from the analysis, those firms with $M_{it} = 0$. After adjusting for the acquisition history of the firms by generating matched sets, we next adjust for other confounders for instance previous outcomes and any additional time-varying covariates. Imai et al (2019) refer to this process as refinement of the matched sets, which when undertaken, partly sets the stage for future confirmation of the parallel trends assumption specified in (1.7). In this analysis, we use the Mahalanobis distance for this purpose²⁰. We describe this refinement next.

Matching each acquired firm with at most ξ of control firms from M_{it} with replacement; thus, $|M_{it}| \leq \xi$, we work out the average Mahalanobis distance between the acquired firm and each control firm over time. For a matched control firm $i' \in M_{it}$,

$$MD_{it}(i') = \frac{1}{L} \sum_{l=1}^L \sqrt{(v_{i,t-l} - v_{i',t-l})^\top \Sigma_{i,t-l}^{-1} (v_{i,t-l} - v_{i',t-l})} \quad (1.9)$$

Where $v_{it'} = (y_{it'}, z_{i,t'+1}^\top)^\top$ and $\Sigma_{it'}$ is the sample covariance matrix of $v_{it'}$. We notice that the composition of $v_{it'}$ is a lagged outcome variable ($y_{it'}$) and covariates ($z_{i,t'+1}^\top$), which we use to compute standardized distances averaged across time periods. Once the matched sets have been refined, we next employ the DID estimator to get the estimated ATT for the outcome variables of interest.

4.2.4 The Difference-in-Differences Estimator

DID involves the estimation of the counterfactual outcome for every firm that was acquired. We computed the counterfactual outcome, $y_{i,t+F}(A_{it} = 0, A_{i,t-1} = 0, A_{i,t-2}, \dots, A_{i,t-L})$, using the weighted mean of the control firms in the refined matched set. We then generate the DID estimate of the ATT for every acquired firm and average it across all acquired firms. This estimate is formally specified as;

²⁰ This metric has similarly been utilized in studies that have used (like in this analysis) a combination of propensity score matching and DID e.g. Matthias & Javorcik (2009), Chari et al (2009), among others.

$$\hat{\lambda}(F, L) = \frac{1}{\sum_{i=1}^N \sum_{t=L+1}^{T-F} D_{it}} \sum_{i=1}^N \sum_{t=L+1}^{T-F} D_{it} \left\{ (y_{i,t+F} - y_{i,t-1}) - \sum_{i' \in M_{it}} w_{it}^{i'} (y_{i',t+F} - y_{i',t-1}) \right\} \quad (2.0)$$

Where; $D_{it} = A_{it}(1 - A_{i,t-1}) \cdot 1\{|M_{it}| > 0\}$, while $w_{it}^{i'}$ is a weighting factor which is non-negative and normalized such that $w_{it}^{i'} \geq 0$ and $\sum_{i' \in M_{it}} w_{it}^{i'} = 1$.

$(y_{i,t+F} - y_{i,t-1})$ expresses the difference in post and pre acquisition outcome variable of interest for an acquired firm while the same difference for a given control firm is indicated by $(y_{i',t+F} - y_{i',t-1})$. $D_{it} = 1$ only if firm (i,t) changes its acquisition status from control at year $t - 1$ to acquired status at year t and at least has a matched control firm.

4.2.5 Covariate balance checks

In a typical evaluation of any treatment/policy/intervention, the key question isn't whether we should compare the treated and the untreated units but rather which units should constitute the comparison such that they represent the treated had they not been treated (Imbens & Wooldridge, 2007: 7). In our case, such a question would be; which un-acquired firms best characterize the acquired firms (essentially in pre-acquisition period) such that a valid counterfactual scenario can be achieved to facilitate the desired comparison. In propensity score matching, a key test of the suitability of the intended comparison between treated and control observations is a balance check on the covariates used in the matching. In this framework, we examine the resulting covariate balance between the acquired and the matched control firms to get insights into whether the two sets of firms are indeed comparable with respect to observable confounding variables. We examine the Standardized Mean Difference (SMD) of each covariate between the acquired and control firms in the pre-acquisition period. The mean difference is standardised at a given pre-acquisition period using the standard deviation of each covariate across all acquired firms in the data.

Given an acquired firm (i,t) with $D_{it} = 1$, the covariate balance for variable k at the pre-acquisition period $t - l$ is defined as;

$$B_{it}(k, l) = \frac{v_{i,t-l,k} - \sum_{i' \in M_{it}} w_{it}^{i'} v_{i',t-l,k}}{\sqrt{\frac{1}{N_1-1} \sum_{i'=1}^N \sum_{t'=L+1}^{T-F} D_{it'} [v_{i',t'-l,k} - \bar{v}_{t'-l,k}]^2}} \quad (2.1)$$

Where $N_1 = \sum_{i'=1}^N \sum_{t'=L+1}^{T-F} D_{i't'}$ is the total number of the acquired firms. This covariate balance measure is then further aggregated across all the acquired firms for every covariate and pre-acquisition period.

$$\bar{B}_{it}(k, l) = \frac{1}{N_1} \sum_{i=1}^N \sum_{t=L+1}^{T-F} D_{it} B_{it}(k, l) \quad (2.2)$$

4.2.6 Results from the Matching.

Matching on two ($L = 2$) lags, using Mahalanobis distance to refine our matched sets, we estimate the ATT of foreign acquisition on firm performance for three ($F = 3$) years. The choice of F is crucial in this analysis. There are numerous explanations as to why foreign acquisition may not affect firm performance outcomes as soon as acquisition takes place²¹. It is for example realistic that changes in firms' mean wages are usually linked to changes in the composition of the workforce (Huttunen, 2007: 500). Such changes in workforce composition come with costs of adjustment (Hamermesh, 1988). This implies the changes may not be immediate and wages as well. Therefore even after foreign acquisition, effects of the same on wages and employment may take some time²². However, employment adjustment in foreign owned firms is usually faster than in purely domestic ones (Barba Navaretti, Checchi & Turrini, 2002: 4).

Additionally, any firm acquisition be it foreign or domestic is associated with post-acquisition within-firm re-organization²³. This might entail introduction of new work practises, on-job training, new technologies and production processes. This further implies that changes in variables like mean wages, output, employment, and other performance outcomes may not be immediate after acquisition²⁴. Based on the above, we decide to set our F equal to at least three years after foreign acquisition of firms. The effect may as well be contemporaneous. Immediately after acquisition, new management may for instance; increase wages, stop some production processes leading to reduced output etc.

In Table 3B in the Appendix, we see the matched sets before refinement. In the first column are the firm Ids for the firms that were identified as having switched ownership while the second column shows the respective years of switch. In the third column, we see the number of control firms in the matched sets. The variation in number of control firms between 1998 switchers and 1994 switchers is because 1994 switchers can as well use 1998 switchers as controls in the years before 1998. Overall, we notice that the size of the matched sets is good enough to permit comparison.

In Table 1.3 we see the weighted DID estimates of the ATT effect of foreign acquisition using Mahalanobis distance in the matching. We notice that a year after acquisition, acquired firms realize increments in employment, wages, and capital on average compared to relatively similar domestic firms. Considering all the outcome years, acquired firms experience on average gradual rise in employment, wages, productivity, capital and output relative to similar domestic firms. This overall positive result is clearly visible in Figure 1.1, in which we plot the ATT over time for the various outcome variables of interest. These average treatment effects are statistically significant in terms of average wages and capital outlay.

²¹ A reason why considering $F \geq 0$ was deemed suitable in our analysis

²² Huttunen (2007: page 507) actually confirms that the effect might not be immediate

²³ See Gbettor et al (2013: page 2442) in their study on a Ghanaian telecom firm acquired by Vodafone

²⁴ Moreover, due to measurement errors, the exact time of acquisition might be uncertain

Regarding specific outcome effects, findings show that acquired firms realize statistically significant increases in wages by averagely over 25% points compared to parallel non-acquired firms especially in the first two years after acquisition. In the year of acquisition, the increase (contemporaneous effect) is 31.8% and statistically significant. Similarly, compared to similar non-acquired firms, acquired firms post over 17% increments in capital levels, which is statistically significant in year one and year two after acquisition. The result on wages corroborate the findings of Potter (2015: 8) in which workers at specifically former SoEs but now privatized earn considerably more than their counterparts at similar SoEs that were not privatized in Ghana.

We notice further that foreign acquisition has a positive ATT effect on productivity. On average, acquired firms post over 10% increase in productivity relative to similar firms that remain domestically owned over the study period. Compared to ATT effects on wages and capital, the effect of productivity is not as significant. Empirical studies like Wang & Wang (2015b), employing methods of analysis similar to this study's, find similar results regarding foreign acquisition and productivity. Never the less, statistically significant ATT on wages not accompanied by relatively similar effects on productivity poses an empirical puzzle regarding conventional firm production literature.

In the context of specifically wage increments at firm level, given that, these are average wages measured as total wage bill relative to employment; numerous mechanisms can be cited through which such wage increments may occur. Two of such mechanisms are; when same people remain employed but their wages go up, and when a firm alters the mix of workers leading to "few low paid" workers and "more higher than average" paid workers. In Table 1.3, findings indicate that employment increases and in later years productivity too takes a positive trend. This is suggestive of the fact that firms could be adding highly skilled/productive workers who are equally well remunerated but it takes some time for all this to translate into increased output and productivity.

In the context of purely firm ownership, Fabling and Sanderson (2014: 12) attempts to motivate why foreign owned firms may pay higher wages even when productivity stays put. Explanations given include but may not be limited to; foreign owners may get workers from outside the country in question (Ghana) who might actually demand for higher remuneration than indigenous workers. Additionally, new firm owners may want to avoid spill over of their superior technologies and vital information to rival firms. One of the conduits for such spill overs is through workers who leave the firm in question for a rival. Therefore, to prevent such turn over, workers may be given higher wages for the same level or less than proportionate increase in productivity. As hinted on earlier, foreign acquisition may come with within-firm re-organization in terms of production and work practices, which might draw worker resistance and breed disputes. Managers might use increased wages to lessen such firm disputes regardless of the level of productivity (Conyon *et al.*, 2002). Foreign owned firms have equally been known to offer more productive on-job-training to workers. And if this turns out to be the case after acquisition, then workers in acquired firms are likely to have a steeper wage profile and thus acquire a premium with time (Görg, Strobl & Walsh, 2007). This premium is empirically echoed by Konings & Vanormelingen (2015) who examine the impact of training

on wages among Belgian firms. Using an unbalanced panel for 1997-2006, Konings & Vanormelingen (2015) estimate firm-level wage equations based on Mincer (1974) framework and find a 12% wage premium for trained workers relative to untrained employees.

Taking the puzzle as a probable specific data issue, we can as well explain it by the less significant increments in both output and employment, the two variables used in constructing productivity. In our results, both output and employment do not increase significantly and so will productivity. More so, measurement of labour productivity may be equally a solid explanation of the paradox²⁵. Elsewhere, rent sharing across borders can account for the paradox above. Wages in the acquired firm may to a great extent be linked to profits in the parent company abroad (Girma & Görg, 2007b: 100). This means that at the same productivity level, wages in the newly acquired plant may significantly increase after acquisition.

Turning to acquisition effects on output, we notice a smaller rise in this outcome variable compared to wages and capital. The mild increase in output appears to be more driven by similar gradual increases in employment and capital as opposed to gains in productivity. The positive result on output also upholds results of earlier studies like; Wang & Wang (2015b), W. Wang (2014) Matthias & Javorcik (2009), among others.

Table 1.3: Weighted Difference-in-Differences estimates of ATT with Mahalanobis Distance

Variables	$t = 0$	$t = 1$	$t = 2$	$t = 3$
Employment	-0.019 (0.115)	0.094 (0.100)	0.114 (0.146)	0.135 (0.160)
Wage	0.318*** (0.116)	0.310*** (0.119)	0.263* (0.170)	0.141 (0.170)
Productivity	0.138 (0.391)	-0.045 (0.408)	0.102 (0.362)	0.108 (0.318)
Capital	0.048 (0.059)	0.174* (0.112)	0.198* (0.126)	0.170 (0.127)
Output	0.043 (0.339)	-0.030 (0.371)	0.103 (0.354)	0.207 (0.336)
K_int	0.086 (0.212)	-0.014 (0.222)	-0.029 (0.299)	-0.100 (0.353)

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

It is also noticeable that employment positively increases in acquired firms compared to relatively similar non-acquired firms. After acquisition, it is evident that for acquired firms relative to similar but not acquired firms, the increase in employment is on average above 10%. The acquisition effect on employment is also not significant statistically compared to ATT on

²⁵ Foreign owners may practice transfer pricing by say reporting lower values of manufactured output going to parent firms outside Ghana, thereby reducing the measured value added. Under such circumstances, productivity will be low, ceteris paribus

wages and capital investments. A probable explanation for this result may be foreigners' inclination to acquiring already large domestic firms. Large firms generally grow more slowly on average compared to smaller firms (Karlsson, Lundin, Sjöholm & He, 2009: 188; Lipsey, 2008: 11) and hence it may not be surprising that growth in employment due to foreign takeover isn't significant. In Ghana during the divestiture program nearly all the largest state owned enterprises put up for sale were acquired by foreign investors (Potter, 2015: 6).

Another key finding from our results regards the decline in capital intensity (real capital per worker) after foreign acquisition for all the years considered. Both employment and capital (the two variables used in generating capital per worker) increase but the increase in capital is significantly more than increases in employment. It probably is that due to sample size issues, employment does not increase significantly, which yields no positive ATT for capital intensity. Wang and Wang (2015b: 333) using data on Chinese firms, find a similar result although the factors put forward to motivate the puzzle may not hold for our study scope.

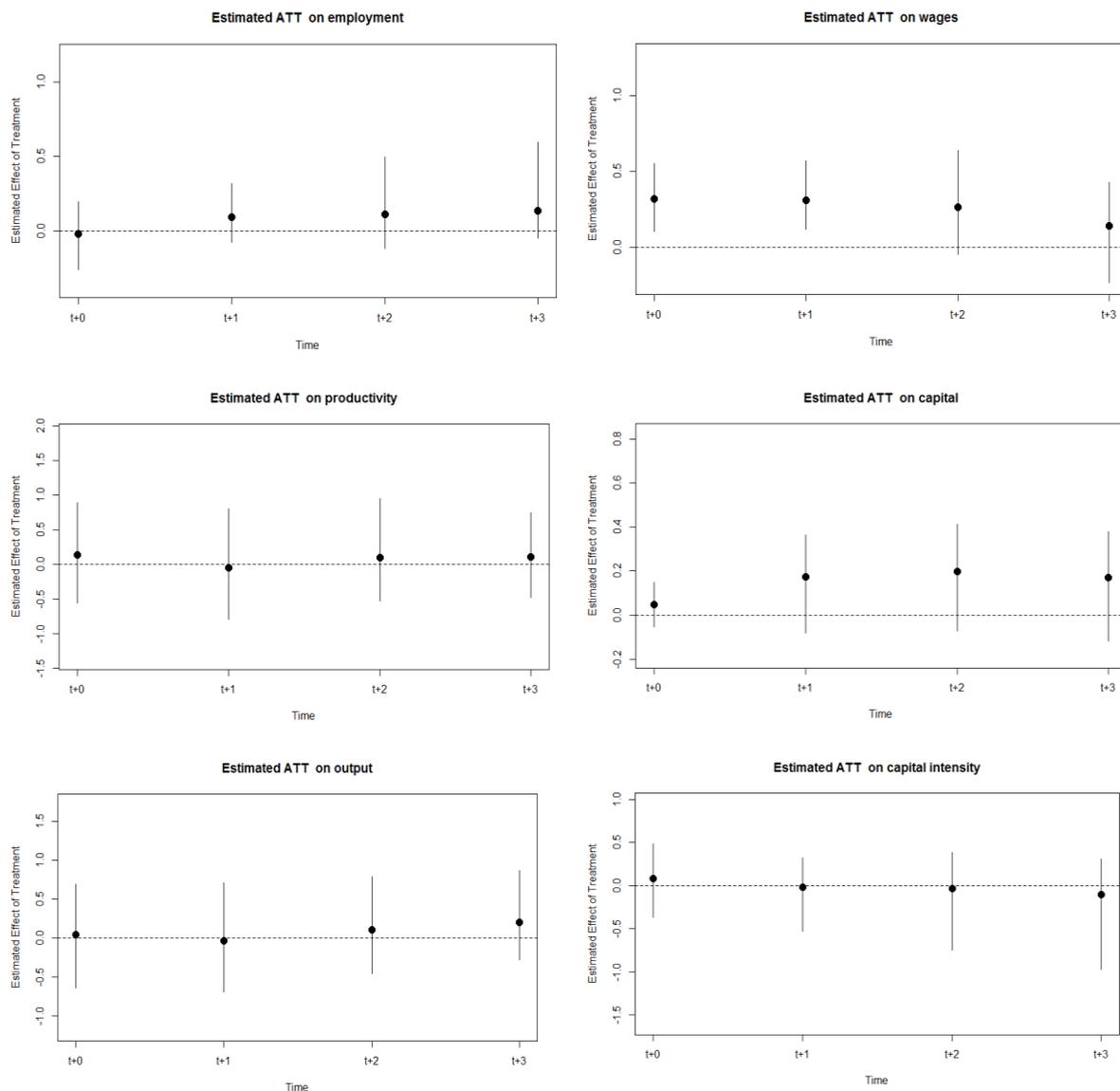


Figure 1.1: Plots of Difference-in-Differences ATT for the outcomes under consideration

In addition to the previous matching results, we visually display the ATT results using the plots in Figure 1.1. In each panel, the solid circles show the point estimates of ownership change (acquisition) where we assume the acquired firms remains foreign owned throughout the study period. The vertical bars denote 95 percent confidence intervals based on 1000 block bootstrap repeats. Referring to the plots, we notice that the point estimates for the panel on wage are far away from zero especially in the acquisition year to the third year after acquisition. In addition, for capital the distance between the point estimates and the horizontal dotted line widens from the acquisition year onwards. Regarding the rest of the outcome variables, these point estimates are close to zero, a direct communicate similar to the results in Table 1.3. Irrespective of the nature of the effect, we notice that generally variance tends to increase regarding each outcome variable. This is a probable indicator that firms tend to follow a heterogeneous path.

Covariate balance results

Results from PSM analysis are merited when the baseline (pre-treatment) covariates used in the matching are balanced between the treated and untreated units. One of the most popular statistics used in assessing covariate balance in PSM analysis is the Standardized Mean Difference (SMD). This is because it is easy to compute and understand (Zhang, Kim, Lonjon & Zhu, 2019: 3). Utilizing our specification in (2.0) and (2.1), we conduct balance checks for our covariates in the pre-acquisition period.

In figure 1.2, we see plots of covariate balance due to matching over the pre-acquisition period. We plot, for each outcome variable, the SMD on the vertical axis over the pre-acquisition period of two years on the horizontal axis. The panels in rows indicate, in order, the balance for outcome variables; employment, wage, productivity, output, capital and capital intensity. The columns correspond to the refinement methods used. Results indicate a good balance of majority variables on the two-year period. However, there are variations in the extent of the balance for specific outcome variables and with specific refinement methods. For instance, for employment as the outcome, propensity weighing (1:3) shows better balance compared to the rest while for wage, propensity score refinement seems to provide better balancing on covariates. Yet on capital and capital intensity, seemingly better balance is with Mahalanobis distance refinement. However, despite these slight variations, estimates of ATT based on the three refinement methods yield similar results as will be seen later. We also notice that, before the two period mark, our pre-treatment period, for panel (1:1) and (3:1) employment and productivity (outcome variables) remain constant by fair standards although with some imbalance. This is a positive litmus for the parallel trends assumption alluded to in (1.6), a fundamental assumption that authenticates our choice of the DID estimator. Other outcome variables like output, capital, among others are not part of the probit model and so cannot be directly investigated regarding this assumption. Overall, the balance checks lend credence to the matching results discussed earlier.

Mahalanobis distance

Propensity score

Propensity weighting

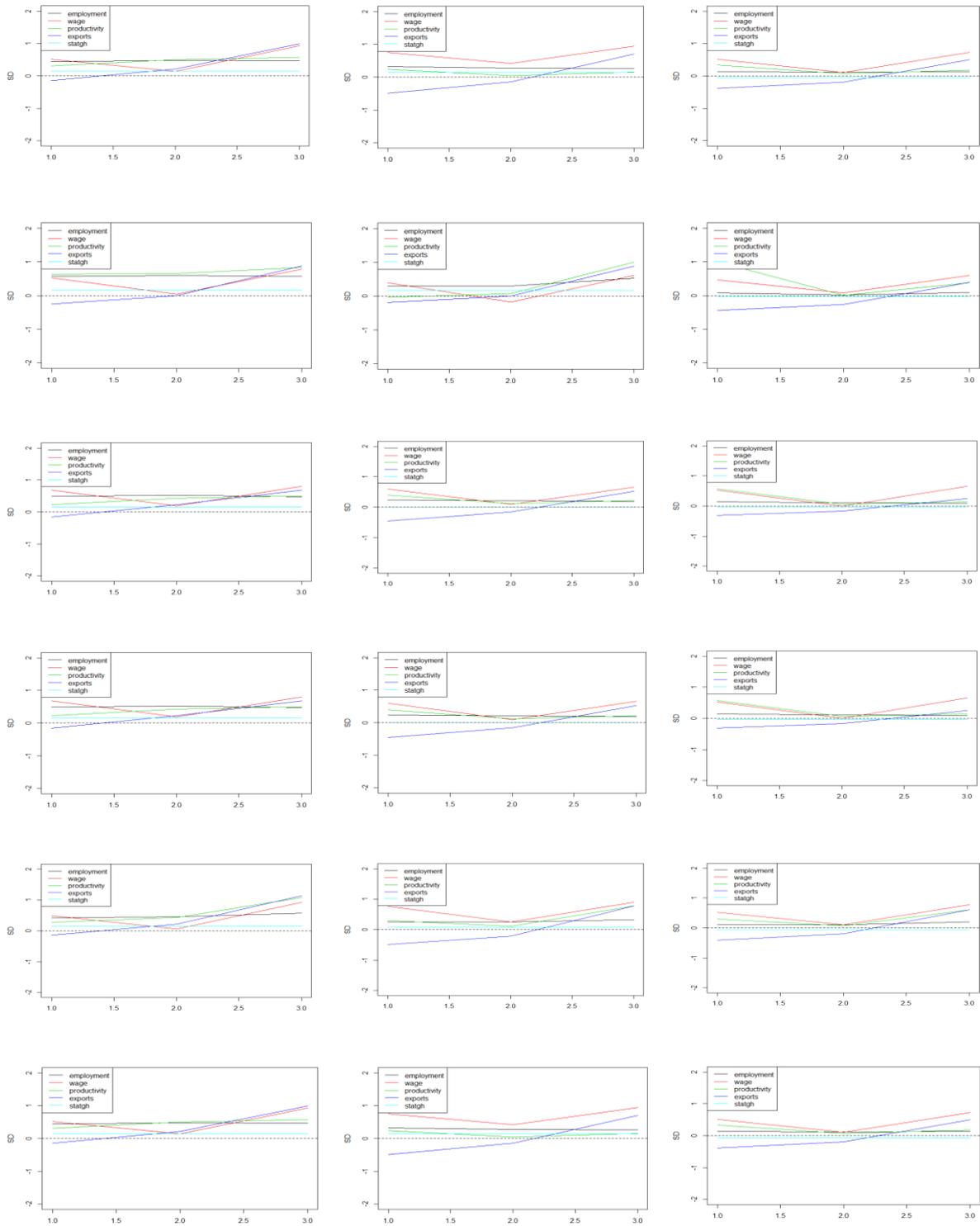


Figure 1.2: Plots of covariate balance after matching

In our next and last step of the analysis, we perform some robust checks on the foregone empirical results from matching by using other alternative matching and refinement methods. We specifically employ propensity scores and propensity weighting as refinement methods and re-estimate the average acquisition effect on the acquired firms. The results based on these two methods are indicated in Table 3C in the appendix. These results are comparable to those generated using Mahalanobis distance methods in magnitude and statistical significance. This shows that our preferred refinement method in the study is suitable.

5. Conclusion

A large body of research examines the link between FDI and economic growth. Investigation has been both at macro and micro levels with tangible contributions pointed out over and above mere capital investments. As pointed out by Matthias & Javorcik (2009: 51), empirical focus has been largely guided by the assumption that foreign ownership solely is associated with tangible benefits both at macro level and at firm level for mostly domestic firms. Whereas this assumption may hold for Greenfield investments, it may not be the case where foreign ownership arises out of acquisition of a domestic firm. This is due to likely selection bias, which more often than not, drives the acquisition decision of most foreign investors. In our study, we focus on ownership arising out of acquisition and identify the effect while taking care of endogeneity effects by applying matching and Difference-in-Differences in addition to conventional regression methods.

Our study differs from majority studies because in addition to the usual outcomes, focus is extended to other outcomes thought to be influenced by foreign ownership. The study further looks at the effect on capital, one of the key impediments to investment and growth in developing countries. The country of focus is also worth noting as few causal studies on foreign ownership effects have been conducted in SSA.

The results from matching, to a recognizable level, mirror those of the FE regression estimation with few and negligible differences. These minor differences may be reflective of data available or probably the right censoring of outcome years. Evidence from our findings indicate that foreign acquisition tends to cause significant rises in wages and capital levels of acquired firms. Positively significant changes in wages are visible in the acquisition year and one after acquisition while similar changes for capital are visible in early years after acquisition. We do not see significant improvements in productivity and the other outcomes yet capital intensity experiences a decline. However, except for capital intensity, acquired firms on average attain positive changes in all the outcomes considered compared to relatively similar non-acquired firms.

Currently, numerous developing economies, more so in SSA are in pursuit of policies aimed at attracting inward foreign direct investments. Such policies have been motivated by economic benefits believed to be associated with these investments, evidence of which has mainly been from the developed world and East Asian economies. Our study cements the view that actually foreign acquisition (and consequent ownership) of domestic firms is to a recognizable extent

responsible for improvements in firm performance and therefore our study findings lend credence to current policy orientation in most SSA economies. Although this evidence is observed in Ghana, its applicability to SSA is undoubtable given the structural similarities amongst African economies and generally the developing world.

Arrears for future research

Our study does not take into account heterogeneity at firm level in attempt to investigate the acquisition effect on performance outcomes. Yet heterogeneity is very important in analyses of this nature (Almeida, 2007). The data and the way we identify foreign acquisition cannot enable the analyst cater for heterogeneity aspects. Our recommendation therefore is that updated datasets be developed and further investigation undertaken while incorporating firm level heterogeneity to provide further insights.

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Appendix

Table 3A: Sample composition

<i>Sub-sector</i>	<i>Frequency</i>	<i>Percentage</i>	<i>cum-frequency</i>
Bakery	180	10.9	10.9
Garment	360	21.9	32.8
Textile	36	2.2	35.0
Wood	72	4.4	39.4
Furniture	312	19.0	58.4
Metal	324	19.7	78.1
Machines	48	2.9	83.9
Chemical	48	2.9	83.9
SSRII	12	0.7	84.7
Food	216	13.1	97.8
Drink	36	2.2	100
Total	1644	100	---
Location			
Accra	876	52.9	52.9
Cape coast	36	2.2	55.1
Kumasi	624	37.7	92.8

Takoradi	120	7.2	100
Total	1656	100	---

Standard errors in parentheses *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

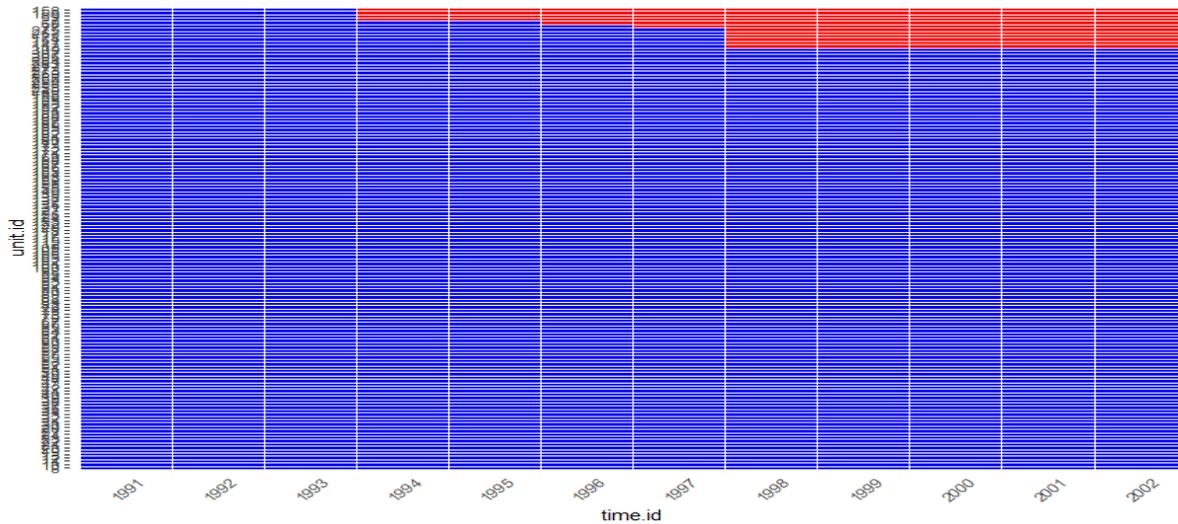


Figure 3A: Treatment variation plot for all firms in the derived sample

Table 3B: Matched sets before refinement

Firm ID	Year	Matched set size
7	1994	134
68	1996	133
69	1994	134
77	1997	132
113	1998	126
147	1998	126
150	1994	134
178	1998	126
158	1994	134
267	1998	126
275	1998	126
161	1998	126

Table 3C: Weighted Difference-in-Differences estimates of ATT with ps.weight & ps.match

<i>Variables</i>	<i>t = 0</i>	<i>t = 1</i>	<i>t = 2</i>	<i>t = 3</i>
Employment	0.015 (0.094)	0.051 (0.072)	0.095 (0.110)	0.037 (0.115)
Wage	0.222** (0.106)	0.228** (0.098)	0.179 (0.203)	0.021 (0.238)
Productivity	0.159 (0.416)	-0.002 (0.418)	-0.032 (0.324)	-0.089 (0.288)
Capital	0.043 (0.058)	0.160* (0.100)	0.180* (0.116)	0.161 (0.126)
Output	0.132 (0.328)	0.028 (0.336)	0.002 (0.325)	0.110 (0.304)
K_int	0.009 (0.188)	-0.050 (0.151)	-0.020 (0.209)	0.075 (0.231)
<i>Using ps.match</i>				
Employment	0.040 (0.137)	0.005 (0.091)	0.066 (0.126)	0.063 (0.149)
Wage	0.334*** (0.122)	0.343*** (0.133)	0.465** (0.216)	0.285 (0.189)
Productivity	0.148 (0.406)	0.037 (0.404)	-0.034 (0.344)	-0.019 (0.314)
Capital	0.061 (0.055)	0.187* (0.109)	0.201* (0.119)	0.127 (0.132)
Output	0.093 (0.341)	0.025 (0.339)	-0.024 (0.322)	0.009 (0.301)
K_int	0.125 (0.206)	0.112 (0.180)	0.208 (0.180)	0.220 (0.215)

*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*