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Preferential trade agreements, employment and productivity: evaluating the impacts of AGOA and its apparel provisions on African firms

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Abstract

We evaluate the impacts of general African Growth and Opportunities Act (AGOA) eligibility and eligibility for its apparel provision on firm-level employment and productivity. Based on the Stolper-Samuelson theorem, we hypothesized that AGOA would positively affect firm employment and productivity. In order to unbiasedly evaluate the impact of the policies and address both the limitations associated with non-experimental data and potential spillover effects, we used a difference-in-difference-in-differences specification to specifically account for both country-level and industry-level confounders in our empirical analysis. Results show that while AGOA and its apparel provision's impacts on employment are weak, they exerted a positive impact on firm productivity. This productivity growth was due to a reallocation of economic activities from less productive to more productive firms. As sub-Saharan African countries consider new trade agreements, such as Economic Partnership Agreements (EPAs), our paper recommends a review of important factors, such as customs efficiency, business licensing and permit delays, and regulation burden, as they will influence the extent to which firms can benefit from these agreements.

Keywords: *Preferential trade agreements, employment, productivity, firms, Africa*
JEL Classifications: *L25, F63, F61, F53*

1. Introduction

The African Growth and Opportunity Act (AGOA) offers preferential access to U.S. markets for selected sub-Saharan African (SSA) products. It allows duty- and quota-free market access for almost all products as long as they are produced in and/or imported from approved SSA countries. AGOA was initially signed by U.S. President Bill Clinton in 2000 and renewed and expanded in 2002, 2004,

and 2015. The commodities included in the provision are agricultural products, minerals, manufactured goods and apparel and footwear. The apparel provision has been the most popular component of AGOA; it allows duty-free access to apparel imported from approved African countries and has proven successful in creating or resuscitating the textile industry in many SSA countries (see anecdotal evidence at Cling et al, 2005; Lall, 2005; Ancharaz, 2008).

The concept that formed the basis for AGOA rests in the view that one of the many factors inhibiting the development of low-income countries in general, and SSA countries in particular, has been the trade barriers imposed by high-income countries on imports of commodities for which poor countries are likely to have a comparative advantage (Frazer and Van Biesebroeck, 2010). By providing a duty-free trade opportunity for SSA countries to export the commodities that they can produce at relatively low cost, AGOA could allow SSA countries to emulate the East Asian economic growth model and promote effective export-led growth in Africa.

The first-order effect of preferential trade agreements such as AGOA will be on prices (Olarreaga and Ozden, 2005). In the presence of competitive markets, AGOA should increase the prices that exporters receive from the trade by at least the same amount as the tariff that was previously collected by the importing country's custom authorities. This price increase will later translate into firm-level second-order effects on factors such as productivity and labor demand. Evidence has shown that increases in firm productivity because of high export prices will trigger a reallocation of economic activity from less productive firms to more productive ones (Bernard et al, 2007a).

Thus far, abundant evidence suggests that AGOA has had positive effects on unilateral exports from SSA to the U.S.[1] Depending on the sector, AGOA has increased SSA exports to the U.S. by between 8% and 42%, with petroleum oil exports increasing by more than 100%; it has also increased the price that textile exporters receive by up to one-third of the pre-AGOA tariff price (Olarreaga and Ozden, 2005). However, less is known about its second-order effects, its impact on firm-level covariates. This paper contributes to the trade literature by providing empirical evidence of the impact of AGOA and its apparel provision on firm-level productivity and employment. Given that we are interested in capturing the impact of a country-level policy on firm-level outcomes, it is important to introduce within country heterogeneities. We use a difference-in-difference-in-differences (DDD) approach to address this concern and capture other spillovers that could have bias the results. The results indicate that while AGOA and the apparel provision positively impacted productivity, their impacts on employment were inconclusive. In addition, after observing the distributional impact of AGOA, we found evidence that the productivity impacts of AGOA are due to a reallocation of resources from less productive to more productive firms, as hypothesized by Bernard et al (2007a).

The rest of the article is organized as follows: A brief literature review of AGOA and general trade impacts is presented in section 2. In section 3, we present a background discussion about AGOA and the textile industry in SSA. A theoretical model describing the relationship between AGOA, employment, and productivity is presented in section 4. In section 5, we discuss both the data and the empirical specifications. We discuss the results in section 6 and conclude the article in section 7.

2. AGOA and trade in Africa

Much of sub-Saharan Africa's trade with the world, and the U.S. specifically, is still largely reliant on primary product exports, such as oil and other mineral fuels (68% of its exports to the world by value in 2008), ores and ash (about 14% by value), and precious stones (about 4% by value)[1]. As a result, many sub-Saharan African countries remain vulnerable to the rise and fall of international commodity prices. In 2009, sub-Saharan Africa accounted for slightly more than 1.4% of U.S. merchandise exports and 3% of U.S. merchandise imports, of which nearly 81% were petroleum products. Between 2001 and 2009, U.S. imports from sub-Saharan Africa grew by an average annual rate of 16%; between 1995 and 2000, they grew by an average annual rate of only 4.6%[2]. Some of this added growth could be attributed to AGOA. In fact, since 2001, the U.S. has been granting exclusive reduced trade tariffs to African countries that have adopted certain market-based policies. As a consequence, unilateral trade from SSA to the U.S. has increased. From increased trade, we can also anticipate an increase in employment and/or productivity; however, no evidence has supported this hypothesis in the case of AGOA.

Most, if not all, empirical analysis of the impact of AGOA has focused on measuring its impact on African trade, specifically export volumes from SSA to the U.S. Nouve and Staatz (2003) estimated the impact of AGOA on SSA's agricultural exports to the U.S. using a gravity trade model. Although AGOA was found to have a positive relationship to agricultural exports, the statistically insignificant coefficients could not confirm the existence of an uncontested relationship. One reason for these inconclusive results was associated with premature analysis, as AGOA became effective in 2000. However, the marginal effect of AGOA on SSA's agricultural exports to the U.S. suggests that efforts are required to reinvigorate the initiative and make it responsive to the need for agricultural export expansion and diversification in Africa.

Mattoo et al (2003) sought to predict the impacts of AGOA using information on pre-AGOA tariffs and assumptions on supply response. They predicted that AGOA

[1] *http://comtrade.un.org/db/*
[2] *http://comtrade.un.org/db/*

would provide real opportunities to SSA. Even under conservative estimates about SSA's supply response, they predicted that SSA's non-oil exports could be increased by about 8–11%. However, the medium-term gains could have been much greater if AGOA had not imposed certain conditions and not excluded certain items. The most important condition is the stringent rule of origin, which is the requirement that exporters source certain inputs from within SSA or the U.S. Mattoo et al (2003) suggest that without these conditions, the impact would have been magnified nearly fivefold, resulting in an overall increase in non-oil exports of $540 million, compared with the $100–140 million increase that is expected under these restrictions. The restrictions, especially when applied to apparel exports, came at a particularly inopportune time, as SSA became exposed to competition from other developing countries after the elimination of quotas on the latter's exports under the Multi Fibre Arrangement (MFA).[2] In that regard, Matoo et al (2003) predicted that the dismantling of the MFA would lead to a more than 30% reduction in SSA's apparel exports; if, on the other hand, AGOA had provided unrestricted access, they argue that the negative impact of the dismantling could be nearly fully offset.

Frazer and Van Biesebroeck (2010) also estimated the impact of AGOA on trade volume. Unlike in previous analysis, the authors' approach was able to control for bias related to both country- and product-level import surges that may not have been related to AGOA. Their results state that AGOA led to an increase in U.S. imports from SSA, especially for the apparel products sector, where imports grew by 42%. In addition, the authors noted that AGOA led to an increase in the number of products exported to the U.S. This effect was larger in the agricultural and manufacturing sectors. AGOA had a disproportionate impact on products that enjoyed the largest tariff reductions, particularly apparel products. Moreover, contrary to suspicions held by many, the authors found that the increased exports to the U.S. did not represent the redirection of exports away from Europe or Africa's other major export destinations. This further implies that AGOA has created new production opportunities in SSA.

However, improving SSA exports is not the ultimate goal of AGOA. Its goal is to improve the well-being of Africans and African businesses by providing growth opportunities through trade. The present article seeks to contribute to the AGOA assessment literature by evaluating its impacts on firm-level employment and productivity. AGOA's apparel provision is its most popular component. Significant evidence has shown that it has helped many SSA countries by attracting foreign direct investment (FDI) and has raised the prices exporters receive from their U.S. buyers. Therefore, before addressing the purpose of this article, in the next section we will first contextualize the apparel industry and AGOA in SSA.

3. The African apparel industry and AGOA

SSA has a very small spinning industry (only 0.01% of global spinning capacity)[3]. Cotton yarn (including cotton/man-made fiber blends) is mostly produced for export to the U.S. and the EU, as well as for use in downstream production of apparel for export to these markets. In 2009, Nigeria was the largest exporter of cotton yarn ($21 million), followed by Zimbabwe ($7.6 million) and Tanzania ($7 million) [4]. However, the total value of SSA cotton yarn exports in 2009 was $50 million, compared to $1.3 billion value of cotton yarn from India.

Table 1: Cotton yarn exports

Country	Cotton yarn exports (2009), USD
Nigeria	21 million
Zimbabwe	7.6 million
Tanzania	7 million
SSA	50 million
India	1.3 billion

Source: COMTRADE

The African textile/apparel industry appears to have gained from the U.S. market access opportunities permitted by AGOA. Apparel exports from all SSA countries to the U.S. increased from $584 million in 1999 (before AGOA) to nearly $1.8 billion in 2004 ($1.5 billion of which qualified for AGOA benefits). Several countries, including Kenya, Lesotho, Namibia, Madagascar, South Africa, and Swaziland, experienced a pronounced rise in apparel exports. The act appears to have resuscitated Kenya's languishing export processing zones (Rolfe et al, 2004). Notably, Kenya's clothing exports to the U.S. increased 607% between 1999 and 2004. Another significant success case is Lesotho, which saw exports rise by 311% after AGOA, making this small, land-locked country the largest African garment exporter to the U.S. By attracting FDI from Asia to its industrial estates, Lesotho saw its garment exports surpass those of many other developing nations in the 1990s, including neighboring South Africa. AGOA then led to even more impressive growth. By 2003, the country's apparel exports to the U.S. surpassed exports by Mauritius, which is often celebrated as the most successful export model in SSA.

Some countries developed garment export industries that had not existed before AGOA's enactment. For example, Namibia exported no apparel to the U.S. prior to 2000, even though it had an active export processing zones program and an excellent port. Four years after the enactment of AGOA, its garment exports to the U.S. exceeded $78 million. Notably, in 2003, the Malaysian corporation Ramatex built a

garment-manufacturing plant employing over 7,000 workers (Rolfe and Woodward, 2005).

Despite these encouraging improvements, many will argue that the apparel provision did not live up to initial expectations. As a result of AGOA, and given perfectly competitive markets, through higher prices on their products exporters should capture the tariff revenue that once went to the U.S. Treasury. Olarreaga and Ozden (2005) sought to measure the magnitude of this higher price using the case of apparel exporters and found that AGOA exporters captured only around one-third of the potential benefit. They found a wide variance among the beneficiaries, with smaller and newer exporters capturing less tariff rent than larger and more established ones. This sub-optimal impact is due mostly to the market power of large U.S. importers in the world market.

The survival of the present-day African textile and clothing industry was closely linked to the expiration of the Agreement on Textiles and Clothing (ATC), which occurred on January 1, 2005. The expiration of the ATC marked the end of a period of some 40 years, during which much of the global textile and clothing trade was subject to a special regime centered on a politically motivated quota system. With the end of the quota system, the textile trade moved inside the World Trade Organization (WTO) agreements, becoming an integral part of the multilateral WTO system, governed by its general rules and principles. Consequently, SSA-made textiles have lost exclusive access to the U.S. market since the expiration of the ATC. Between 1995 and 2004, exports of textiles from SSA to the U.S. grew by an average annual rate of 13%. After the expiration of the ATC, between 2005 and 2010, they shrank by an average annual rate of 11%. In other words, between 2005 and 2010, the value of textile exports from SSA to the U.S. decreased by nearly 50%, more than the conservative estimate of 30% made by Mattoo et al (2003), which is discussed in section 2.

4. A conceptual model of trade openness, employment, and productivity

Although discriminatory policies such as those promoted by AGOA violate the most-favored-nation (MFN) principle of the WTO, preferential trade agreements (PTAs) are admitted as an exception. The main conditions for qualification are as follows: (i) Trade barriers against non-members must not be higher than pre-PTA levels on the whole; (ii) members must eliminate trade barriers among members on "substantially all trade"; and (iii) interim agreements to schedule the process of internal trade liberalization must be completed within a reasonable time (Mukunoki, 2005).

PTAs are supported by long-established theoretical justifications. Viner (1950) shows that if the partner countries are less efficient than those outside the PTA, the formation of a PTA causes members' welfare to deteriorate if their respective exter-

nal tariffs are maintained. In addition, Meade (1955) and Lipsey (1957) generalize Viner's result and show that even if PTAs are trade-diverting, they may still improve members' welfare, since the benefit from less distorted consumption can outweigh the loss of production efficiency.

Using an adaptation of the standard Stolper-Samuelson model, we illustrate below the mechanism by which PTAs such as AGOA can impact employment and productivity.

Consider an economy that produces a single final good and two intermediate goods. The final good is denoted Z, and the two intermediate goods are denoted X and Y. Further, the prices of X and Y are denoted in terms of the final good as p_x and p_y, respectively. The production function for the final good is such that:

$$Z=\delta A X^{1-\alpha} Y^{\alpha} \tag{1}$$

$$\text{where} \quad 0 < \alpha < 1 \;\; \& \;\; \delta = \frac{1}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}} \tag{2}$$

The unit cost for producing Z is such that:

$$C(p_x, p_y) = \frac{1}{A} p_x^{1-\alpha} \; p \frac{\alpha}{y} = 1 \tag{3}$$

The unit cost function is equated to 1 because Z is chosen here as the numéraire. The production function for Z implies a relative demand for the two intermediate goods, such that:

$$\frac{X^d}{Y^d} = \frac{(1-\alpha) P_y}{\alpha P_x} \tag{4}$$

On the other hand, the production functions in the two intermediate goods' sectors are given by:

$$x = h_x k \frac{\varnothing_x}{x} \text{ and } y = h_y k \frac{\varnothing_y}{y}, where \; 0 \leq \varnothing_i \leq 1 \tag{5}$$

Here, K_i is the amount of capital used in a firm in sector $i = x,y$; $\varnothing_i$ is a parameter of capital intensity; and h_i is a sector technology parameter, capturing total factor productivity.

If L_i is the number of workers in sector i and u_i is the unemployment rate in sector i, then the number of employees in sector i is $(1 - u_i)L_i$.

Letting $L_x + L_y = L$, the aggregate production in each sector is given by:

$$x = h_x\,(1 - u_x)\,L_x k\ \ \frac{\varnothing_x}{x} \tag{6}$$

$$y = h_y\,(1 - u_y)\,L_y k\ \ \frac{\varnothing_y}{y} \tag{7}$$

The relative supply of the two intermediate goods is:

$$\frac{X^s}{Y^s} = \frac{h_x(1 - u_x)\,L_x k\,\frac{\varnothing_x}{x}}{h_y(1 - u_y)\,L_y k\,\frac{\varnothing_y}{y}} \tag{8}$$

Given the conditions in equations (4) and (8), the equilibrium conditions $\frac{X^d}{Y^d} = \frac{X^s}{Y^s}$ will occur at the relative market clearing price where $\frac{p_x}{p_y} = \frac{h_y}{h_x}$

This means that the relative price is determined by exogenous productivity difference between the two sectors (Dutt et al, 2009).

Suppose this economy has been granted AGOA eligibility to export product *X*. This is also a small, open economy with a comparative advantage in *X*. Therefore, the relationship between the autarky relative price and the world relative price (denoted with superscripts *A* and *W*, respectively) is such that:

$$\left(\frac{p_x}{p_y}\right)\ \mathrm{A} = \frac{h_y}{h_x} < \left(\frac{p_x}{p_y}\right)^{\mathrm{W}} \tag{9}$$

As a result of trade, $\frac{p_x}{p_y}$ will increase, thus causing an increase in p_x and a reduction in p_y because of the condition imposed in equation (2). An increase in p_x leads to more job creation in the *X* sector and a reduction in job creation in the *Y* sector.

As AGOA reduces tariffs on goods from sectors in which SSA countries have a comparative advantage, the above illustration suggests that more jobs should be created in these sectors. Further, an increase in p_x also increases the value of the marginal product of capital in the *X* sector, which will lead to a movement of capital away from the *Y* sector into the *X* sector. An increase in capital per worker in the *X* sector will improve the average worker's productivity by reducing productivity in the *Y* sector and improving it in the *X* sector.

5. Descriptive statistics and methodology

a) *Descriptive statistics*

We analyzed the impacts of AGOA using the World Bank's Enterprise Surveys (WBES). The WBES collect information about firms' characteristics, the nature of the business environment, how it is perceived by individual firms, how it changes over time, and the various constraints to firm performance and growth. The surveys cover more than 100 indicators from 110 countries and have been conducted since 2002. The dataset is appropriate for our analysis because the firms are heterogeneous; they are divided according to sector, size, and proximity to the capital city. The details on the dates of countries became eligible for AGOA and its special apparel provisions were taken from the AGOA website.

Based on the information presented in Table A1 in the appendix, the analysis was carried out as follows: For the impact of AGOA eligibility on firm employment and productivity, there were three countries in the control group and two in the treatment group. For the impact of AGOA's apparel provision, there were nine control countries and three treatment countries. The base year observations are recollections. However, we believe that firm-recollected information is reliable because it is taken from accounting books. Due to data limitations, countries such as Madagascar, Kenya, Namibia, Lesotho, and Mauritius, which have had clear success with the AGOA apparel provision, are not included in the analysis. We anticipated that their exclusion would affect the robustness of some of the results.

The descriptive statistical results suggest that 52% of the firms are located in the capital city. The average number of permanent employees per firm is 34, with a maximum of 690. Average annual revenue of the firms is about $500,000, with a maximum of about $700 million, as more than 8% of all the firms are multinational. Although many industries are represented in our sample, 9% of all the firms are textile firms. We estimated productivity here as the ratio between revenue and number of permanent employees. The results show that average productivity is about $19,768 per worker per year, with a maximum of $10 million per worker per year.[5] On average, the first year of operation for the firms is 1996; the oldest firm is recorded to have opened in 1905, and the newest one in 2008. The average number of years of experience of the highest-ranked manager is 10.9 years, with a maximum of 55 years. Last, there are three types of firms, namely small (< 20 employees), medium (20–99 employees), and large (100 or more employees). Of the total number of firms used, 76.79% are small, 19.86% are medium, and 3.92% are large.

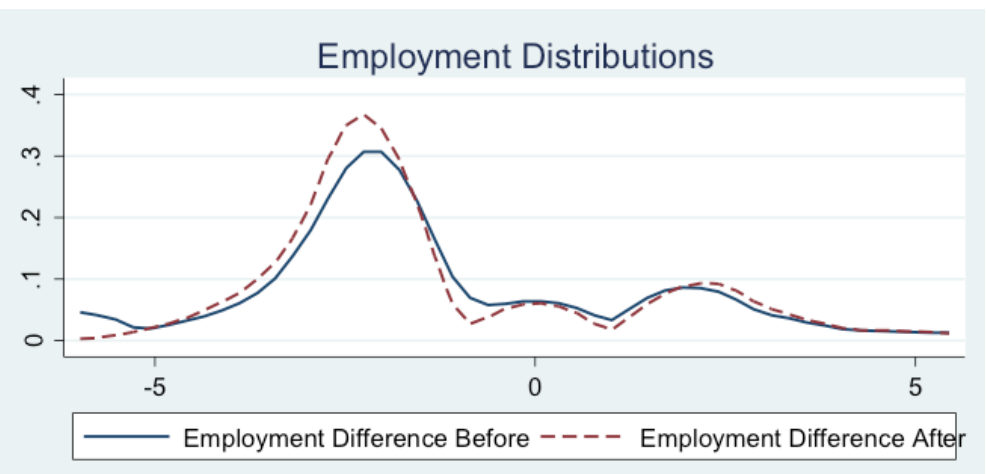
Table 2: Descriptive statistics

Variable	Obs	Mean	S. D.	Min	Max
Capital city	4311	0.52	0.50	0	1
No. of permanent employees	4311	34.44	97.91	0	690
Revenue ($)	3872	531963.4	8945193.0	0	7.37E+08
Textile	3781	0.09	0.28	0	1
Multinational	3533	0.08	0.27	0	1
Productivity	3532	19768.88	208190.20	0	1.11E+07
First year	4310	1996.64	8.69	1905	2008
Years of experience	4302	10.86	7.91	0	55
Firm size	3665	1.26	0.51	1	3
Small (< 20 employees) = 1	76.79%				
Medium (20–99 employees) = 2	19.29%				
Large (100 or more employees) = 3	3.92%				

Source: Author's calculations

Using kernel density function, we estimated the distribution of the natural log of the difference between employment in the base year and employment in the follow-up year, and compared the distribution between AGOA countries firms and non-AGOA countries firms to draw preliminary inferences about the impact of AGOA, as shown in Figure 1. The graph shows that the tails of the distributions are more or less similar, but the kurtosis of the difference in employment distribution is higher for AGOA countries firms.

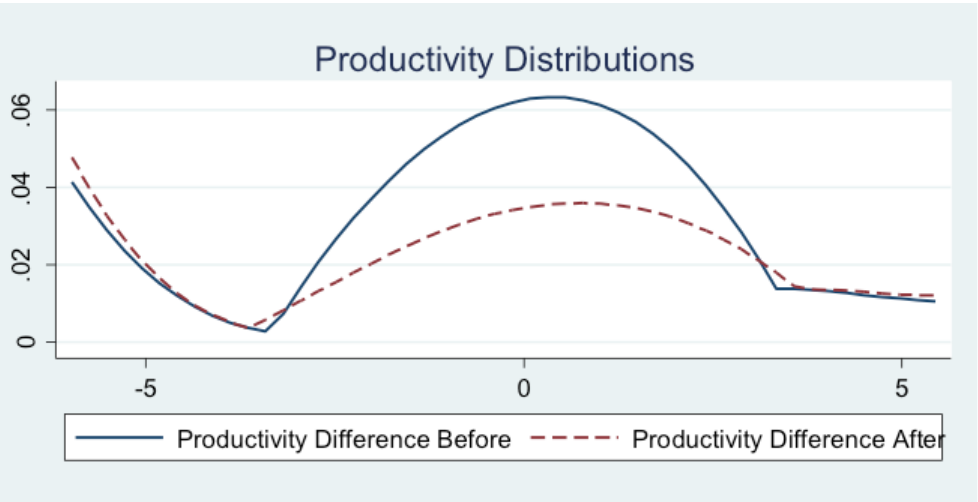
Figure 1: Employment distributions for AGOA countries



Similar results are also found when comparing the distributions of the natural log of the difference between productivity in the base year and productivity in the fol-

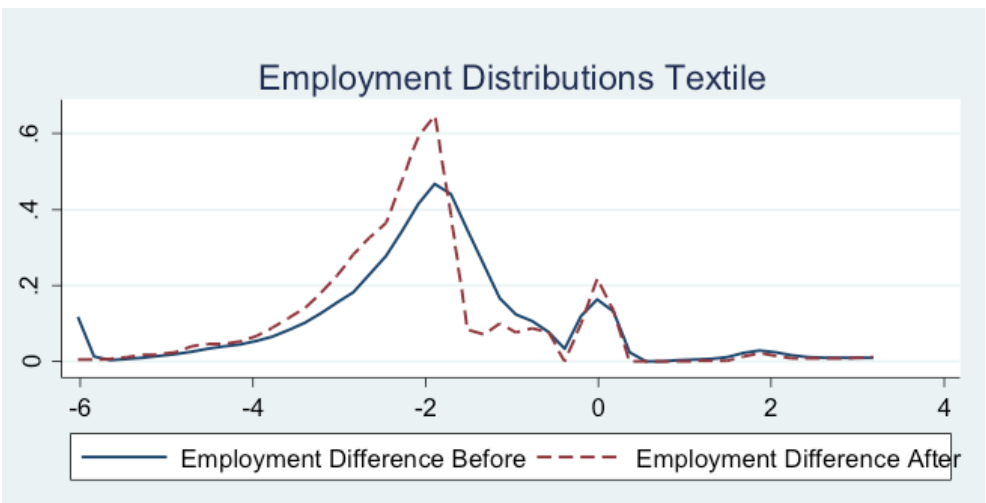
low-up year for the AGOA countries firms and the non-AGOA countries firms, as depicted in Figure 2. The tails of the two distributions are similar, but the kurtosis of the productivity distribution of the AGOA countries firms is slightly larger.

Figure 2: Productivity distributions for AGOA countries



We estimated similar distributions in the case of textile firms and found that the distribution of the difference in employment for firms in the AGOA countries was slightly to the right. This implies that the apparel provision increased employment. In the case of productivity, the distribution of the difference in productivity for firms in the AGOA countries has a higher kurtosis than the distribution for firms in the non-AGOA countries.

Figure 3: Employment distributions difference, textile firms



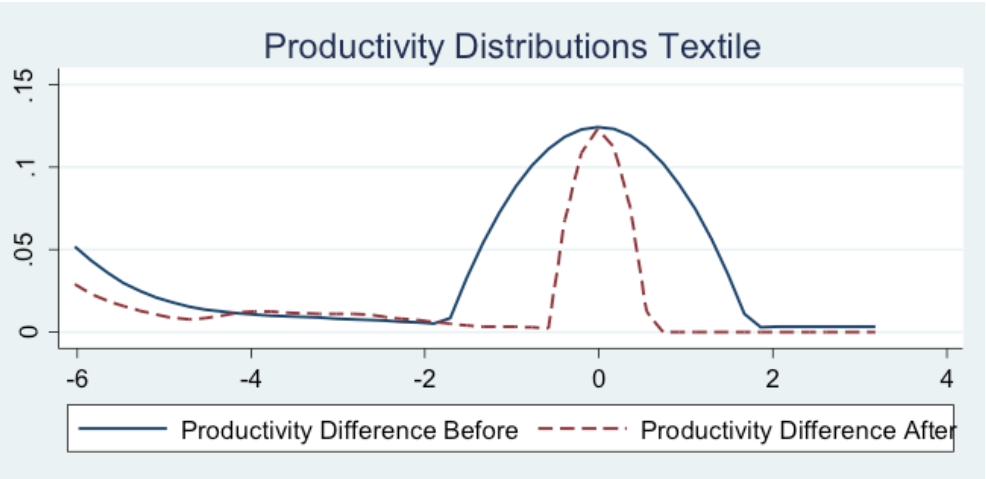


Figure 4: Productivity distributions difference, textile firms

These preliminary comparisons demonstrate that AGOA and the apparel provision are correlated with changes in the distributions of employment and productivity. However, further analysis is necessary to control for spillovers and the possibility that the policies may be endogenous.

b) *Empirical model specification*

We sought to estimate the impact of AGOA and its apparel provision by comparing the outcomes before and after the implementation of the policies, and further compared the outcomes between a control group and a treatment group, a difference-in-differences approach. The conventional difference-in-differences specification is presented in equation (10) below:

$$Y=\beta_0 + \beta_1 *D + \beta_2 *T + \beta_3 *(D * T) + \beta_4 *X + \varepsilon \quad (10)$$

The variable Y represents firm outcome, and D is a dummy variable, such that D = 0 in the base year and D = 1 in the follow-up year. is the treatment variable, such that T = 1 if a firm is in the treatment group and T = 0 otherwise, and X is a vector of control covariates. The impact of the policy is captured by the coefficient of the interaction term β_3.

Difference-in-difference-in-differences (DDD) estimator

Since AGOA is a country-level policy and we are interested in evaluating its impact on firm-level outcomes, we cannot control for country-level confounders while using specification (10). Furthermore, since the data used in this analysis are non-experiment data, a matching approach is recommended to address the non-random nature of the data (Dehejia and Wahba, 2002). However, the country-level nature of

the treatment limits the usefulness of a matching approach (i.e., collinearity between the country dummy and the treatment variable will arise). Therefore, we will use a DDD specification to effectively single out the impact of the policies by controlling for country-level and industry-level confounders in the following manner.

Medium and large exporting firms are likely to benefit the most from AGOA. Therefore, we eliminate country-level confounders by evaluating how the impact of AGOA differs between medium and large exporting firms and other firms. On the other hand, in the case of the apparel provision, we follow the same concept proposed in the case of AGOA, but use textile firms instead of medium and large export firms because the provision was targeted specifically at textile firms. To do this, we first create a new dummy variable, *I,* such that $I = 1$ if the firm is a medium or large exporting firm for the AGOA evaluation (or a firm in the textile/apparel industry, for the apparel provision evaluation) and $I = 0$ otherwise. The DDD model specification is such that:

$$Y = \beta_0 + \beta_1 * D + \beta_2 * T + \beta_3 * I + \beta_4 * (D * T) + \beta_5 * (D * I) + \beta_6 * (I * T) + \beta_7 * (D * T * I) + \beta_8 * X + \varepsilon \quad (11)$$

The coefficient of the usual DD is β_4, which evaluates the impact of the policy without controlling for the country-level and industry-level confounders. The coefficient of the triple interaction term β_7 is the coefficient of interest here; it measures the impact of the policy on the outcomes.

The nature of the DDD estimate can be explained as follows: We define EF and AC as a medium or large exporting firm and an AGOA-eligible country, respectively, and NF and NC as a non-exporting firm and a non-AGOA country, respectively. The DDD used to measure the effect of AGOA is such that:

$$DDD=[(Y^{AC,\,EF}_{D=1} - Y^{AC,\,EF}_{D=0}) - (Y^{AC,\,NF}_{D=1} - Y^{AC,\,NF}_{D=0})] - [(Y^{NC,\,EF}_{D=1} - Y^{NC,\,EF}_{D=0}) - (Y^{NC,\,NF}_{D=1} - Y^{NC,\,NF}_{D=0})] \quad (12)$$

This procedure is particularly beneficial because it allows the analysis to account for possible externalities. In fact, targeted firms work with other firms that supply inputs or complementary services, such as logistics, accounting, or accommodation. For that reason, AGOA and its apparel provision will have unintended effects on those non-targeted firms, and failing to account for them would bias the evaluation of the true impact of the policy. In addition to comparing the results between treatment and control countries, the DDD approach allows us to account for these externalities by comparing the policy impact between the intended and unintended targets within the countries.

c) *Endogeneity of AGOA eligibility*

One may reasonably argue that for the treatment group (firms located in AGOA countries), eligibility for AGOA is endogenous, as a country's eligibility is dependent on its past implementation of market-based policies, its political stability, human right records, etc. To verify this claim, we estimated a Durbin-Wu-Hausman (DWH) test using the Heritage Foundation Index of Economic Freedom as an instrument. This index is composed of 10 sub-indices, including business freedom, trade freedom, fiscal freedom, government spending, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption, and labor freedom.

We use the average of the index between 1995 and 2000, the period before the first country became eligible for AGOA. The DWH test consists of three stages. We first estimated a reduced form regression, with the suspected endogenous variable as the dependent variable and all the exogenous variables using a linear probability model (LPM) in the first stage. The use of the LPM model is justified here because it frees us from imposing a functional form (Angrist and Krueger, 2001). Second, we saved the residual from the above regression and included it in the main equation, then estimated the main equation by OLS. Third, we tested the significance of the coefficient of the added residual.

The DWH test showed that using the dummy for eligibility for AGOA gives consistent results, which implies that it is not necessary to correct for any endogeneity problems. Considering that AGOA eligibility may necessitate a discretionary presidential decision, a country's effort to adopt free-market policies may not be determinants of its eligibility. Given the democratic, and therefore random, process that elects the American presidency, it is fair to assume that AGOA eligibility is a random process.

d) *Censored distribution*

More than 12% of the firms considered in this analysis were not operational before their country of operation became eligible for AGOA. Therefore, the dependent variables of those firms in the base year are equal to zero. Failing to account for this may bias the results because a large number of the observations are in the minimum.

Suspecting the existence of a correlation between the employment and productivity error terms, we initially estimated a bivariate Tobit using the Geweke-Hajivassiliou-Kearne (GHK) smooth recursive estimator. However, because the correlation coefficient of the error terms was not statistically significant, we estimated specification (11) separately for each equation using a Tobit model.

6. Results

a) *Impact of AGOA eligibility*

Table 3 below presents the results of estimating the impact of AGOA on employment. In addition to the main specification, we estimated quantile regressions in order to obtain the distributional impact of the policy. We found that on average, AGOA has a positive impact on employment, but this positive impact disappears when we control for the country confounders using the DDD identification. Further, the age of the firm and the size of the firm are positively correlated with employment, and are statistically significant. The relationship between employment and the number of years of experience of the firm's top manager is also positive and statistically significant. The quantile regressions reveal that AGOA negatively affected firms with employment in the 25th quantile, while those in the 50th and 75th were not affected by the policy. We suspect that AGOA led small and inefficient firms to lay off employees due to the greater competition introduced by firms seeking to take advantage of the new trade opportunity.

Next, we calculated firm productivity by taking the ratio between firm revenue and number of permanent workers. This measures the average product of labor, which is the average revenue contribution brought by each worker. We found that AGOA has had a positive impact on average firm productivity (see Table 4). Firm size is positively correlated with productivity, implying that medium and large firms are more likely to have high productivity. The relationship between first year of operation and productivity is negative, suggesting that older firms are more productive. Finally, the relationship between number of years of experience of the top manager and productivity is inconclusive.

Bernard et al (2007b) emphasize that the impact of trade liberalization on firm productivity will vary by firm size. Medium and larger firms will become more productive, to the detriment of smaller ones. To test this hypothesis, we estimated quantile regressions to further understand how AGOA impacted firms at various points of the productivity distribution. The results confirm the hypothesis, brought forth by Bernard et al (2007b), that trade liberalization will lead to a reallocation of productive resources from less productive activities to more productive ones. In fact, we found that AGOA lowered the productivity of less productive firms (those below the 10th percentile) and increased the productivity of productive ones (those in the 50th percentile). This is possible because new entrants often bring new technologies, pressure incumbent firms to improve productivity, and force inefficient incumbents to exit.

Table 3: Impact of AGOA on employment

Variable	Tobit		Quantile Regression						Tobit with control	
		25th Quantile		50th Quantile		75th Quantile				
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated	-29.261***	0.00	-6.00***	0.00	-7.00***	0.02	-8.00	0.24	-22.90**	0.04
Year	-23.47**	0.03	-3.00**	0.03	-2.00	0.53	-2.00	0.79	-23.58**	0.03
Export	-2.69	0.66	0.00	1.00	0.00	1.00	3.00	0.78	-7.39	0.19
Treated*year	23.19*	0.07	5.00***	0.00	3.00	0.47	5.00	0.61	23.27*	0.07
Treated*export	59.12**	0.04	2.00	0.52	23.00***	0.00	112.00***	0.00	52.66*	0.06
Year*export	8.51*	0.38	50.00***	0.00	38.00	0.14	-2.00	0.97	22.37**	0.03
Treated*year*-export	-14.10	0.71	-47.00***	0.00	-11.00	0.68	-11.00	0.86	-27.94	0.43
First year									-0.71**	0.00
Experience									0.92**	0.02
Size	57.62***	0.00	16.00***	0.00	24.00***	0.00	58.00***	0.00	51.36***	0.00
Constant	32.03**	0.02	9.00***	0.00	12.00***	0.00	15.00***	0.01	1424.15***	0.00

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Table 4: Impact of AGOA on productivity

Variable	Tobit		Quantile Regression						Tobit with control	
		25th Quantile		50th Quantile		75th Quantile				
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated	1209.84	0.88	-1666.67***	0.00	-3295.65	0.14	-4940.272	0.63	4295.99	0.62
Year	1647.33	0.79	1571.43***	0.00	2266.95	0.36	0.00	1.00	1330.75	0.84
Export	19377.34	0.31	46.63	0.90	4399.72	0.15	10101.01	0.46	16643.46	0.40
Treated*-year	16966.21	0.19	-1567.75***	0.00	-2000.96	0.51	4118.50	0.76	17740.70	0.18
Treated* export	-35642.23	0.20	-837.65	0.18	-4502.76	0.38	18311.30	0.43	-43455.01	0.11
Year*export	-74358.57***	0.00	2352.97	0.23	-7452.13	0.65	-61372.15	0.40	57833.68*	0.10
Treated*-year* export	81500.14**	0.02	-2350.03	0.26	33623.71**	0.04	75605.25	0.97	65107.78*	0.07
First year									-1068.76**	0.02
Experience									70.95	0.82
Size	67495.61***	0.00	843.78***	0.00	3933.62**	0.02	45631.4***	0.00	62639.15***	0.00
Constant	-7680.23	0.19	2111.11	0.00	3333.33*	0.08	12121.21	0.16	2123009**	0.02

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

b) *Impact of apparel provision eligibility*

Table 5 presents the results of estimating the impact of the apparel provision on employment. Although firm size and the number of years of experience of the top manager have a positive relationship with employment, we found that the provision did not have a statistically significant impact on employment. However, looking at the quantile regressions, we notice that the provision negatively affected employment at the 25th and 50th quantiles, with a larger effect on the 75th quantile.

Table 6 presents the results of estimating the impact of the apparel provision on productivity. Using results from the tobit model with control, we found that the number of years of experience of the top manager is positively related to productivity, while the first year of operation is negatively related to productivity. We found that the provision resulted in increased productivity, driven mostly by smaller firms. In fact, only firms whose productivity was in the 25th quantile were positively impacted by the provision, while the rest were not impacted. Unlike with AGOA, the apparel provision's impact on productivity does not follow Bernard et al (2007b)'s hypothesis.

c) *Robustness check*

Considering the inconclusive results from the evaluation of the apparel provision on employment, we initially hypothesized that the drop in textile trade between the U.S. and SSA, caused by the expiration of the ATC, may have undermined the effectiveness of the apparel special provision on firms. We performed a robustness check to test this by adding a dummy variable, *atc*, such that *atc* = 1 if ATC expired between the base and the follow-up year and *atc* = 0 otherwise. The results do not indicate that the expiration of the ATC undermined the effectiveness of the apparel provision's impacts. We suspect that ATC did not have any statistically significant impact because total textile exports from SSA to the world did not change after 2005, as illustrated in Figure 4. One reason that could explain the poor results is the exclusion of countries that were successful under AGOA, as we suspected in section 3. The less optimal price effect of AGOA on exporters could have also caused this. Second, the power held by U.S. importers in the market may have undermined the potentially higher export price that African exporters were supposed to enjoy as a result of AGOA.

A potential concern with our analysis is its sensitivity to the definition of medium and large firms. We define "medium and large firms" as firms with at least 20 full-time permanent employees. There is reason to believe that the results may not be stable if one chooses a different cut-off point. In Tables A2 and A3 in the appendix, we present results using cut-off points of 25, 30, 50, and 70 full-time permanent employees in order to verify the robustness of the main results.

Table 5: Impact of apparel provision on employment

Variable	Tobit		Quantile Regression						Tobit with control	
		25th Quantile		50th Quantile		75th Quantile				
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated*year	7.27	0.17	0.00	1.00	1.00	0.24	1.00	0.54	7.01	0.19
Treated*textile	-19.89	0.38	0.00	1.00	-14.00***	0.00	-18.00***	0.00	-20.44	0.37
Year*textile	-8.34	0.67	4.00**	0.02	10.00	0.11	47.00***	0.00	-4.71	0.81
Treated*year textile	31.06	0.38	-4.00**	0.04	-12.00*	0.10	-45.00***	0.00	27.73	0.43
Textile	-1.09	0.76	0.00	1.00	0.00	1.00	-1.00	0.47	-0.12	0.97
Treated	-12.93***	0.01	-1.00***	0.00	-1.00*	0.10	0.00	1.00	-9.63*	0.08
Size	31.31***	0.00	-3.00***	0.00	13.00***	0.00	29.00***	0.00	31.28***	0.00
Year	-39.49***	0.00	1.00***	0.00	1.00	0.16	0.00	1.00	-39.50***	0.00
First year									-0.08	0.67
Experience									-0.33**	0.02
Capital city									5.31*	0.06
Constant	44.04***	0.00	5.00***	0.00	6.00***	0.00	10.00***	0.00	217.36	0.60

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Table 6: Impact of apparel provision on productivity

Variable	Tobit		Quantile Regression						Tobit with control	
		25th Quantile		50th Quantile		75th Quantile				
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated*year	-29391*	0.08	519.32***	0.01	1153.04***	0.00	1504.50	0.18	-28862.92*	0.08
Treated*t extile	-54446.4**	0.04	-1574.45**	0.03	1773.61	0.23	-3426.84	0.43	-43965.26*	0.07
Year*textile	-61301.4*	0.10	-1350.72	0.30	-3019.03	0.27	-6717.73	0.40	-81594.59**	0.05
Treated year*textile	85404.56*	0.07	3239.03**	0.04	1753.17	0.60	6291.98	0.51	104009.70**	0.04
Treated	-4258.01	0.35	-6.02	0.96	-911.19***	0.00	-4565.06***	0.00	4895.53	0.31
Year	31196.54*	0.06	-7.64	0.96	-562.13**	0.08	-776.76	0.40	33405.21**	0.05

Textile	-581.75	0.89	-313.85**	0.04	-1515.15***	0.00	-3066.67***	0.00	-4066.62	0.33
First year									-2043.91**	0.03
Size	13492.98*	0.10	600.43***	0.00	2074.07***	0.00	7479.26***	0.00	3882.61	0.56
Capital city									4723.42	0.14
Experience									1502.58**	0.04
Constant	-3133.87	0.63	1293.9***	0.00	4320.27***	0.00	12237.31***	0.00	4054484.00**	0.03

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

In the case of employment, the coefficient β_7 remains statistically insignificant for the 25 and 30 cut-off points. However, β_7 becomes positive and statistically significant at the cut-off points of 50 and 70. We suspect that the weak stability of the employment coefficient may be associated with the omission of successful AGOA countries. In the countries used in the present analysis, only very large firms increased employment as a response to AGOA.

In the case of productivity, β_7 is positive and statistically significant regardless of the cut-off points. The statistical and economic significance of the coefficients remains unaltered. However, the impacts increase somewhat when the age cut-off point is raised. This implies that the impact of AGOA is proportional to the firm's initial productivity level.

7. Conclusion

We evaluated the impact of general AGOA eligibility and apparel provision eligibility on employment and productivity. Based on the Stolper-Samuelson theorem, we hypothesized that AGOA would positively affect firm employment and productivity. In order to effectively eliminate the impact of the policies and address the limitations associated with non-experimental data, as well as potential spillover effects, we used a DDD specification to specifically account for both country-level and industry-level confounders in our empirical analysis.

Although AGOA had no effect on employment, the evidence shows that it did increase firms' productivity. AGOA's impact on aggregate firm productivity is due to a reallocation of resources from less productive firms to more productive ones. The impacts of apparel provision eligibility on the relative employment levels of textile firms, on the other hand, were inconclusive. Its impact on productivity was positive, but we did not find evidence that it positively affected productive firms to the detriment of less productive ones.

Substantial evidence shows that AGOA has had a strong impact on trade volume,

trade diversification, and now firm-level productivity. However, the extent to which AGOA has impacted firms depends on the business environment in eligible countries. Important factors such as trade engagement, customs efficiency, business licensing, and permit delays, as well as regulation burden, may have influenced the extent to which firms benefited from AGOA. Further work must be done to determine how these factors may affect firms' ability to benefit from free trade opportunities.

On the other hand, the impact of the apparel provision on firm-level employment in SSA countries is rather unclear. One reason for the weak results could be associated with the omission of AGOA-successful countries, which may have undermined the robustness of the standard errors. Nevertheless, these results are sufficient to support an expansion of the act's scope and coverage.

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Notes

[1] Ianchovichina et al (2001) used a general equilibrium simulation model and found an increase of 0.6% (or $192 million) in non-oil exports for SSA countries as a group due to preferential access to the U.S. apparel market. Using a gravity model, Lederman and Ozden (2003) found that in aggregate, AGOA countries export between 20 and 40% more than excluded countries of similar economic and geographic characteristics.

[2] The Multi Fibre Arrangement governed world trade in textiles and garments from 1974 through 2004, imposing quotas on the amount that developing countries could export to developed countries. It expired on January 1, 2005.

[3] United States International Trade Commission (2009) "Sub-Saharan African Textile and Apparel Inputs: Potential for Competitive Production."

[4] UN COMTRADE Standard International Trade Classification, Revision 3.

[5] Note that we used only full-time permanent employees; temporary and part-time workers were not used because of data limitations. This large outlier may be from a multinational firm that has a small representation in the country. However, we remove the outliers before estimating our models.

Appendix

Table A1: List of countries and group allocation

Country	Follow-up year	Base year	Policies		Group allocation	
			AGOA eligible	Apparel provision eligible	Policy 1	Policy 2
Burkina Faso	2006	2003	2004	2006	Trial	n/a
Burundi	2006	2003	2006		Control	Control
Chad	2009	2006	2000	2006	n/a	Trial
Congo, Dem. Rep.	2010	2006	2002	no	n/a	Control
Eritrea	2009	2006	no	no	Control	Control
Gabon	2009	2006	2000	no	n/a	Control
Guinea	2006	2003	2000	no	n/a	Control
Guinea-Bissau	2006	2003	2000	no	n/a	Control
Liberia	2009	2006	2006		n/a	Control
Mauritania	2006	2003	no		Control	Control
Nigeria	2007	2004	2000	2004	n/a	Trial
Rwanda	2006	2003	2000	2003	n/a	Trial
Togo	2009	2006	2008	no	Trial	Control

Source: http://www.agoa.gov/eligibility/country_eligibility.html, enterprisesurveys.org, and author's analysis

Table A2: Employment robustness check

Variable	Employment							
	Cut-off at 25		Cut-off at 30		Cut-off at 50		Cut-off at 70	
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated	-11.5838	0.199	-13.2882	0.126	-16.2886**	0.029	-19.505***	0.003
Year	-15.2526*	0.088	-16.2114*	0.064	-9.23161	0.206	-11.2414*	0.091
Export	-0.63975	0.89	-0.36242	0.939	5.174265	0.25	12.62946***	0.00
Treated*year	15.51129	0.151	18.08513*	0.085	11.18754	0.206	10.66455	0.184
Treated* export	37.51337	0.265	31.40266	0.37	-3.3464	0.933	-7.56432	0.86
Year*export	-43.3767***	0.001	-58.2366***	0.00	-131.826***	0.00	-174.728***	0.00
Treated year*export	20.05918	0.638	37.5945	0.40	113.7166**	0.026	129.4881**	0.017
Size	115.49***	0.00	129.2187***	0.00	186.7035***	0.00	222.2229***	0.00
Constant	13.27901**	0.044	15.09175**	0.016	18.68029***	0.00	23.11702***	0.00

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$

Table A3: Productivity robustness check

Variable	Productivity							
	Cut-off at 25		Cut-off at 30		Cut-off at 50		Cut-off at 70	
	Beta	p-value	Beta	p-value	Beta	p-value	Beta	p-value
Treated	4536.192	0.611	3673.149	0.676	-2656.89	0.736	-4292.27	0.572
Year	5029.189	0.357	4524.587	0.404	3244.543	0.49	971.7192	0.828
Export	20407.22	0.253	17542.38	0.303	13575.13	0.363	12595.24	0.351
Treated*year	12838.1	0.323	13422.91	0.296	14146.01	0.261	15819.68	0.203
Treated* export	-33477.8	0.238	-35970.3	0.213	-18712	0.564	-13906.6	0.713
Year*export	-66340.3***	0.001	-69191.2***	0.001	-63342.8**	0.011	-70877.3***	0.01
Treated*-year*export	79974.86**	0.046	90992.67**	0.032	96059.07*	0.065	99178.06*	0.085
Size	48073.74***	0.001	53016.62***	0.002	43308.03**	0.045	53201.94**	0.033
Constant	-1332.11	0.832	-54.6239	0.993	9052.881**	0.041	10589.83***	0.007

* = $p < 0.10$, ** = $p < 0.05$, *** = $p < 0.01$