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#### DEPARTMENT OF ECONOMICS

### THE EFFECT OF IMPORT COMPETITION ON GHANAIAN MANUFACTURING FIRMS AFTER TRADE POLICY LIBERALIZATION: 1991-2002

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A thesis submitted in partial fulfillment of the requirements for baccalaureate degrees in economics and sociology with honors in economics.

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#### ABSTRACT

Trade policies have shifted dramatically over the last quarter-century in 'developing' nations. Economic reforms have been successful in many parts of the world, but some nations have not been able to implement beneficial trade policy reforms. In the 1990s, Ghana liberalized restrictions on imports, lowering tariff rates and eliminating most non-tariff barriers. Trade volumes grew rapidly throughout the latter half of the 1990s and into the 2000s, a time of unprecedented globalization. Using the Regional Program on Enterprise Development (RPED) database and World Trade Organization (WTO) data, I examine the impact of increased import competition on Ghana's manufacturing sector over the decade from 1992 to 2002. I employ a series of empirical models to estimate the effect of import competition on the output and productivity of domestic firms. Textile and garment producers benefited from increased competition but metal and machine product manufacturers were harmed by import competition.

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#### **Chapter I: Introduction**

In the 1980s and 1990s, Ghana's government drastically reduced trade barriers and allowed markets to decide more of the nation's economic future. Since the 1990s, Ghana's economy has grown more quickly and consistently. Despite the strong correlation between openness and growth that a cursory examination suggests, the relationship between policy change and economic activity is likely not so straightforward. Francis Teal (1998), then a researcher at Oxford's Center for the Study of African Economies tackles the impact of Ghana's policy changes in the early 1990s in a paper entitled "The Ghanaian Manufacturing Sector 1991-1995: Firm Growth, Productivity, and Convergence." Using data from the Regional Program on Enterprise Development (RPED), Teal (1998) showed that Ghana's manufacturing sector experienced a high rate of job creation during the trade policy liberalization process. Lower trade barriers were associated with growth in the manufacturing sector during a short period early in the liberalization process (Teal 1998).

In May 1995, Ghana ascended to the World Trade Organization (WTO), an international entity that promotes trade between countries. Member nations of the WTO must have minimal restrictions on the flow of capital and goods across their borders. Ghana joined the WTO while the government was in the process of lowering trade barriers. Imports and exports increased dramatically after those restrictions were relaxed in the 1990s (WTO). These trends appear to have been a boon for Ghana's manufacturing firms. Teal showed that the manufacturing sector grew due to increased labor and capital inputs, presumably fueled by increased interaction with global markets (Teal 1998).

The last half of the 1990s was a tumultuous time for the global economy. Meteoric growth seen in the United States and some other Western economies slowed, interest rates rose, and financial crises erupted in East Asia, Mexico, and Argentina. Some developing nations like

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Thailand mismanaged policy changes as they relaxed trade and capital flow restrictions. The result was forced currency devaluations and deep recessions in many parts of the developing world. Ghana experienced no such economic crisis. In fact, the manufacturing sector continued to grow throughout the 1990s and 2000s (Shafaeddin 2005). Ghana is a relatively stable sub-Saharan African economy; its manufacturing firms are farther down the 'developmental roadmap' than many other countries in Africa. For those nations, it is crucial to determine whether opening their borders to goods and investment will prove productive or harmful in the long run. There is an unstudied period in Ghana's economic history during the policy reform period that could help economists understand how a reduction in trade barriers impacts manufacturing firms. Using RPED data from 1991 to 2002, I will measure the effect of increased trade and competition on Ghana's manufacturing sector.

#### **Chapter II: Ghana's Shifting Trade Policies**

Ghana's economy performed poorly throughout the 1960s and 1970s; per capita incomes fell from \$430 in 1960 to \$390 in 1978 and GDP growth was highly erratic, as Figure 1 (next page) demonstrates (Mwaba 2000). During this period, Ghana's domestic manufacturing sector was largely protected from competition by government regulation, but the larger economy was still susceptible to global fluctuations. Volatile inflation hurt the agricultural sector, and domestic trade policies further damaged the floundering economy. Import prohibitions restricted the availability of imported consumer goods and encouraged inefficient domestic production throughout the 1960s and 1970s (Mwaba 2000). This contributed to poor economic performance throughout the 1970s and into the 1980s. Ghana's Real Gross Domestic Product (RGDP) fell 30 percent from 1971 to 1983. The manufacturing sector's share of GDP declined from 11 percent to 3 percent (Teal 1998). Though macroeconomic shocks clearly contributed to poor growth,



Figure 1: Ghana's Real GDP Growth 1961-2012

government policies damaged domestic industries further. Examples of this range from the aforementioned import restrictions to the prevalence of state-owned enterprises.

In 1983 Ghana began implementing an ambitious and comprehensive set of economic reforms with substantial assistance and guidance from the World Bank and the International Monetary Fund (IMF) (Dordunoo and Dogbey 2002). These reforms impacted the entire economy, but I will focus only on the reduction of trade barriers; tariffs and non-tariff barriers like quotas. The average tariff rate in 1992 was estimated to be 17 percent (Ackah). Duties on consumer goods were high at 20-25 percent, and tariffs on industrial goods were somewhat lower (Figure 7, Appendix). Average tariff rates continued to fall throughout the 1990s (Figure 6, Appendix). Export barriers (e.g. export licensing) were abolished in the early 1990s; this gave domestic firms more access to world markets (Ackah). Ghana's trade reforms were very progressive when compared with other sub-Saharan African (SSA) economies.

Policy changes led to an increase in trade. Imports grew by 113 percent from 1990 to 1993, and exports gained 9 percent (WTO). Teal (1998) showed that employment in the manufacturing sector increased, but there is little evidence to suggest that declining regulation and lower trade barriers resulted in increased profitability or efficiency.

Economists have done substantial empirical and theoretical work to evaluate the impact of trade on domestic firms, sectors, and economies. I discuss a selection of that literature in the next chapter to frame Ghana's policy decisions and the resulting economic shifts.

#### **Chapter III: Literature Review**

Since the time of Adam Smith and David Ricardo, economists have developed models to describe and conceptualize how trade helps economies grow. These models have been used by generations of economists to study international trade policies. Over the last three decades the volume of economic literature on the gains (or losses) from trade has grown substantially. Much of that literature has been of the empirical variety; many researchers are able to show that trade benefits developing economies using statistical techniques. In the 1990s, institutions like the World Bank and IMF championed the reduction of trade restrictions. East Asian nations (e.g. Taiwan, South Korea) saw high growth rates after opening their economies and implementing a form of "managed capitalism" (Rajan 2010, 47). The World Bank, IMF, and others held up policy changes and ensuing growth in the developing world as evidence that trade barriers could only restrain the growth of a developing economy. The economic events of the 1990s and 2000s challenged that idea. Many of trade's effects on developing economies are known, but the precise regulatory climate that will facilitate sustained growth and productivity gains is unclear. Economists are, in short, far from consensus on how trade barriers impact developing economies. *Openness and Growth: The case for removing trade barriers* 

By the early 1990s many developing countries had reduced or eliminated barriers to trade. Other countries maintained protectionist policies that isolated their industries and firms from foreign competition. Economists used this 'natural experiment' to study the effects of trade policy liberalization on growth. Robert Barro's (1991) research on trade barriers was part of a literature that examined the factors that affected growth for a large sample of countries. Barro used price distortions to measure how accessible domestic markets were to foreign firms. There was a negative relationship between the magnitude of price distortions and growth, suggesting that trade barriers inhibit growth. In 1985, before Barro's work on cross-national growth, Sachs

and Warner (1985) suggested that differences in growth between Latin America, Africa, and Asian economies were a result of differential exchange rate and trade regime policies. Later work supported, and expanded upon, both Sachs and Warner's conclusions and Barro's ideas on the importance of trade policy. Dollar (1992) studied a large sample of countries across a nearly ten-year period (1976-1985), and concluded, like Barro, that growth is negatively associated with price distortions. Growth was also negatively associated with the variability of the exchange rate, lending credence to the idea that exchange rate regimes also matter for growth (Dollar 1992). Dollar separated countries into four quartiles based on their openness. Ghana fell in the *least* open quartile, and was cited specifically by Dollar as an economy that stood to gain from trade policy liberalization. Ghana could add 5 percent growth per year simply by eliminating trade barriers (Dollar 1992). Later research on the same time period characterized the relationship between Ghana's trade policies and growth patterns in a similar manner (Sachs and Warner 1995). In short, economists saw Ghana's use of trade barriers to restrict foreign competition as a drag on growth.

Research on trade restrictions sometimes considered politics and economics simultaneously. Bhalla (1994, 17) characterized trade limitations as a restriction of "economic freedom" that would lead to a decrease in growth potential. He posits that a "sustained 10 percent increase in openness" over 10 to 15 years "leads to an annual increase of .3 [percent] in per capita income growth," suggesting that a nation's decision to open its borders to trade will help not just the economy at large, but individuals as well (Bhalla 1994, 30). Empirical evidence from Dollar, Sachs and Warner, Bhalla, and others suggest that trade barriers can reduce growth and harm economies as well as individuals.

This research constituted evidence for a clear and cohesive argument that trade barrier reduction was a policy tool that developing nations should use to grow. Transnational institutions interested in development, like the World Bank, Organization for Economic Co-Operation and Development (OECD), and IMF encouraged governments of developing nations to relax trade restrictions. An OECD document (1998, 36) states that "[m]ore open and outward-oriented economies consistently outperform countries with restrictive trade and [foreign] investment regimes." echoing an IMF (1997) report from the previous year. Ghanaian policy makers relied on these recommendations and a body of empirical research when they decided to reduce trade barriers in the early 1990s. Empirical quantifications of gains from trade rely on theoretical formulations of how trade can positively affect economies. Next I discuss the most relevant theoretical approaches to trade economics at the national, industry, and firm level.

#### *Comparative Advantage*

I do not address the validity of comparative advantage, but it is necessary to recognize modern formulations of the idea because it is deeply ingrained in the literature of trade and development economics. Ricardian trade models show that when markets are competitive, the most efficient allocation of labor and capital inputs across nations occurs under free trade; therefore, restrictions on trade between nations create macroeconomic inefficiencies (Ray 1998). The Heckscher-Ohlin Model, which further develops Ricardo's concept of comparative advantage, posits that the most efficient outcome arises when a country produces the good that is most easily produced with its stocks of labor, capital and natural resources, and trades with foreign nations to obtain other goods (Ray 1998). Comparative advantage is important for understanding why some countries and sectors grow more quickly than others, but my focus

herein is on the intra-sectoral effects of trade. I therefore now turn to work on how trade barrier reduction an impact productivity at the firm and sector level.

#### Intra-Firm Productivity Gains

A frequent refrain from free trade proponents is that domestic firms become more productive when they compete with foreign firms. One proposed source of productivity gains is the increasing returns to scale that may accompany a sector facing import competition. When foreign firms begin to import goods to a nation, domestic firms lose market power. As a result, domestic producers will increase output and move down the average cost curve. Here, domestic producers become more productive simply because of economies of scale.

Despite economic intuition, productivity gains may not arise from increased output. Pavcnik (2002, 245) notes that "[g]ains from scale economies are not very likely in developing countries." If a firm is losing domestic market share, they will need to find new markets for their output in a foreign market. Suboptimal market structure and prohibitive barriers to export markets may prevent domestic firms from entering foreign markets (Pavcnik 2002).

A more likely source of productivity gains is the increased efficiency of firms across a sector. In a sector that faces import competition, the least efficient firms are likely to drop out or, if they wish to stay in business, invest in technologies to boost efficiency. This suggests that all firms should eventually innovate due to a competitive process of efficiency gains. In the long run, therefore, the entire sector becomes more productive.

When trade barriers are eliminated domestic firms can learn about and implement technological innovations and processes that they previously were unable to access. Liberalization facilitates technology transfer between firms that previously did not interact. This

may be especially true when foreign firms invest in domestic industries because they may bring innovation with them.

These proposed sources of productivity gains underwent significant empirical testing in the 1990s and 2000s. As discussed previously, many developing nations opened their economies during this period. That trend provided researchers many 'natural experiments' to investigate how trade barriers affect the performance of domestic firms.

#### Trade and Intra-Firm Productivity: Evidence from Chile, Mexico, and sub-Saharan Africa

Chile reformed its trade policies in the 1970s. Several researchers studied Chile's manufacturing sector during and after the radical liberalization of the economy. DeMelo and Urata (1986) found that productivity was hurt by the reduction of trade barriers in the 1970s. Tybout *et al.* (1991) found few productivity gains for manufacturers, but hypothesized that macroeconomic conditions of the time could have limited the effectiveness of trade policy liberalization. Pavenik (2002) found that the import-competing firms experienced efficiency gains that were, on average, 3-10 percent more than firms who faced no foreign competition. This could be do to firms "trimming their fat" to compete with foreign producers (Pavenik 2002, 271). Pavenik's also notes that exiting firms were 8 percent less productive than plants that survived trade liberalization. There is evidence to suggest that liberalization did increase the efficiency of Chile's manufacturing sector during and after liberalization. Nevertheless, the variance in empirical results highlights the difficulties faced by economists when attempting to isolate the effects of policy change amidst the tumultuous landscape of local and global economies.

Another case study is Mexico's trade policy liberalization in the 1980s. Mexico's economy expanded rapidly during that period and the sectors that grew the most were those with

the greatest exposure to import competition (Tybout and Westbrook 1995). Despite this correlation, Tybout and Westbrook (1995) do not associate those efficiency gains directly with foreign competition. The evidence surrounding economic growth relative to trade barriers in Mexico is mixed.

If theory holds, trade liberalization should facilitate technology transfer across firms and lead to broad productivity gains. Van Biesebroeck (2003) studied nine sub-Saharan African (SSA) economies (including Ghana) with relatively small manufacturing sectors that, despite their size, manage to employ a sizeable portion of the population in the given country. He finds evidence that exporters in SSA not only have higher levels of productivity than their non-exporting counterparts (Van Biesebroeck 2003). Exporters are assumed to integrate better with global markets and have increased access to technologies and processes that might improve productivity. This is part of the larger assumption that exporters are different than non-exporters in some meaningful way. There is some evidence to suggest that one distinguishing characteristic may be ownership structure. Rankin *et al.* (2005) show that foreign plant ownership is a significant factor in the decision to export in five sub-Saharan African economies, including Ghana. Increased engagement with foreign entities appears to increase productivity for firms in a developing nation, particularly in SSA.

Productivity gains are at the core of the relationship between trade policy liberalization and growth in the developing world. Manufacturing firms will benefit from lower trade barriers if they can increase their productivity to compete with foreign importers by producing more, investing in more efficient technologies, or absorbing superior processes and methods from other firms.

#### Skepticism on the Benefits of Liberalization

Despite the evidence for trade barrier reduction described herein, as well as many other works by Alesina et al. (1992), DeLong and Summers (1991), Levine and Renalt (1992), and Svensson (1994), some economists remained skeptical of the benefits of liberalization. Rodriguez and Rodrik (2000) took issue with much of the empirical research, and the claims made by transnational institutions about the potential benefits of free trade for developing nations. Much of their criticism was directed towards the measures of openness used by researchers. Rodriguez and Rodrik argued that the methodological issues present in empirical work made much of the first wave of liberalization research insufficient for policy recommendations. The difficulties in achieving robust results in large cross-country studies of trade policy liberalization largely come from the nature of the studies themselves. It is very difficult to control for a common set of variables and to eliminate the possibility of spurious results across a large sample. For this reason, economists have used case studies to examine the effects of trade barrier reduction on growth. Even when economists use a case-study methodology (Chile, Mexico, etc.), they do not reach consensus on how much protection is beneficial, and if trade barriers should be removed entirely from the palette of policy prescriptions available to governments.

Trade policy liberalization is generally accepted to be a positive step towards growth for developing nations, but most economists agree that there are cases in which nations ought to impose some barriers to trade. Many of these stem from disconnects between models and reality. Nearly all models (e.g. Ricardo, Heckscher-Ohlin) assume perfect mobility of factors within a country. More importantly, even when appropriate levels of capital and labor reach a country, there are barriers to the distribution of those inputs across sectors. Even then, there is no

guarantee that firms within a sector are operating efficiently. Governments seek to remedy a situation in which factors (e.g. labor) cannot be easily redistributed between sectors when economic or political conditions change.

Proposed governmental interventions are designed to correct failures in the market. In these situations, the market creates an inefficient outcome and a trade restriction could increase welfare for the country as a whole. This argument is exemplified by the domestic market failure idea, which states that when a particular sector is operating below its potential, the government ought to step in and incentivize participation in that sector (Krugman and Obstfeld 2000). For example, if a textile industry is receiving proper domestic investment and is operating efficiently, but below the level of foreign firms, the government should limit imports of foreign textiles to allow the domestic industry to reach the scale necessary to compete with foreign industries. This is the so-called 'infant industry' argument. Krugman and Obstfeld (2000) note that tariffs, when implemented carefully, may actually carry a net marginal benefit for society. For this to occur, the marginal benefit created by a tariff must be greater than the loss to consumers and producers from restricting trade with other nations for the good in question.

Tariffs, quotas, and other restrictions can be designed to benefit a myriad of industries, but the goal is always the same: to produce a more efficient outcome and increase social welfare, not just for a firm or sector, but also for consumers. Trade barriers are implemented differently around the world because economies are fundamentally different. Market or government solutions that work in South America may not work in East Asia or West Africa. To understand this I briefly discuss the regional differences that affect development.

#### Regional Differences: Is sub-Saharan Africa different?

While Asian economies experienced significant gains during the 1976-1985 period studied by Dollar (1992), African and Latin American economies did not. The pace of development was markedly slow in sub-Saharan Africa over the last half of the 20<sup>th</sup> century. From 1976-1985, per capita income actually declined in sub-Saharan Africa (Dollar 1992). In the 1980s and 1990s, countries like Ghana adjusted their approach to economic growth by stabilizing inflation, reforming currency regimes, and reducing or removing trade barriers. I will examine evidence from Cote d'Ivoire to understand how economies in SSA did this.

Cote d'Ivoire reversed course and removed many barriers after a decade of protectionist trade policies in the 1970s (Harrison 1994). Different sectors in Cote d'Ivoire disparate levels of foreign competition due to inequities in tariff rates (Harrison 1994). After liberalization, competition increased in sectors with higher import penetration, and price distortions were higher in sectors that faced less competition (Harrison 1994). This illustrates the point that tariffs create harmful market distortions. Though Harrison (1994) does not specifically address this last point, the implication is that import competition is a positive influence because it increases productivity and the availability of consumer goods.

Research is limited, but Harrison (1994) demonstrates that Cote d'Ivoire benefited from reducing trade barriers and permitting more competition. Like Ghana, Cote d'Ivoire is further down the 'developmental roadmap' than much of SSA. Though much of SSA is mired in economic mismanagement, corruption, and a host of other issues, there is no reason to think that firms in nations like Ghana and Cote d'Ivoire will not benefit from increased import competition.

#### The Case of Ghana in the 1990s

Teal (1998) studied Ghana's manufacturing sector in the early 1990s with RPED data from 1990-1993. He concludes that growth was due to increased labor inputs, not productivity gains. At the time of Teal's work, Ghana had just joined the WTO, and had not been an 'open' economy for very long. Firms may not have yet adjusted to the new economic climate. For example, the technology exchange oft-cited as the avenue for technological innovation and productivity gains, may not have yet occurred. It is entirely reasonable to think that, in the first few years after import and export duties and quotas were removed, manufacturers might not focus on innovation, but simply on scaling up their operations to meet demand. Foreign investment might need time to trickle through financial, governmental, and non-governmental institutions to reach domestic firms. Uncertainty about the new trade regime could abound, putting limits on international investment. In short, though Ghana's imports boomed in the years immediately following the removal of import quotas in the early 1990s, progress in manufacturing may easily have lagged (WTO).

Indeed, exports rose a meager 9 percent from 1990 to 1993, but gained 72 percent from 1993 to 2000, a period when imports rose 113 percent (WTO). That Teal (1998) did not observe significant gains in productivity is not altogether surprising given that trade liberalization was not effective in boosting Ghana's manufacturing sector overnight. Using subsequent rounds of RPED data, I will update Teal's work, providing a decade-long snapshot of Ghana's manufacturing sector.

#### **Chapter IV: Data**

I use data from the Regional Project on Enterprise Development (RPED) Ghana Manufacturing Enterprise Survey (GMES), collected in Ghana over an eleven year period from 1991-2002 by the Centre for the Study of African Economies (CSAE) at the University of Oxford, the University of Ghana, Legon, and the Ghana Statistical Office. The dataset contains comprehensive information on approximately two hundred Ghanaian firms that were drawn randomly from firms in the 1987 Census of Manufacturing Activities. Approximately half of the original sample of firms is represented in every round. Firms not present in the first round were added in later rounds to compensate for the firms that dropped out. As a result, the sample size fluctuates very little. The dataset is representative of the distribution of firms across the major industries of Ghana's manufacturing sector. In my analyses, I limit the sample to five industries: textiles, garments, metal products, machinery, and chemicals manufacturing. I eliminate the food processing, beverage production, and furniture sectors, as these firms are somewhat less likely to face competition from trade.

I use two types of publicly available trade flow data from the World Trade Organization (WTO) to complement the RPED, GMES dataset. Import indices are, for this research, more important than exports, because I am interested in import competition. As such, I focus on the imports data from the WTO. Data on specific industries and commodities is only available for some years. To study the entire span of the RPED, GMES dataset I rely on broad aggregations of merchandise trade that offer few, if any, nuanced insights into the Ghana's imports.

The highest aggregation level of trade data I used was "Total Merchandise Trade" (WTO). This includes all trade in manufactured fuel, mining, and agricultural products as well as other manufactures. This index is a relatively comprehensive measure of trade between countries. The data for Ghana is complete for the entire span of the RPED, GMES dataset. This

dataset allows me to examine the broad impact of how the reduction in trade barriers and the ensuing increase in trade volume impacted Ghanaian manufacturers.

Manufactures trade data from the WTO is a better estimate of the import competition Ghanaian manufacturers might have faced from foreign firms in the 1990s and early 2000s. This dataset provides the quantity of manufactured import goods for specific industries. For example, the dataset provides the amount of manufactured garments or textile products imported in a given year. Unfortunately, this data is not available for a key segment (1993-1997) of the RPED, GMES dataset. Despite this key limitation, import data from the WTO still provides reasonable measures that I use to study the impact of import competition on Ghanaian manufacturers.

#### **Chapter V: Methods & Measures**

#### Production Function Methodology

I construct a production function to estimate the effect of import competition on the productivity and profitability of domestic manufacturing firms. Following Teal (1998), van Biesebroeck (2003), and others, I estimate a basic production function with the following form.

$$y_{it} = \alpha_{it} + \beta_{it}l_{it} + \beta_{it}k_{it} + \beta_{it}m_{it} + \epsilon \tag{1}$$

The dependent variable, *y*, is a logarithmic measure of the quantity of output produced by firm *i* at time *t*, the year in which the data was collected. Each firm is given a unique identifier in the dataset, thus the subscript for the specific firm. Output is a function of a logarithmic measure of the labor (*l*) employed by firm *i* at time *t*, a logarithmic measure of the capital (*k*) owned by firm *i*, at time *t*, and a logarithmic measure of the material inputs into the manufacturing process used by firm *i* at time *t*. The constant ( $\alpha$ ) is an endogenous measure of the firm's productivity.  $\alpha$  represents the variability in output that cannot be captured by the three basic inputs: labor, capital, and material inputs.

To account for the influence of import competition on domestic firms, I add a measure of imports (*imports*) and controls to equation (1). I control for three types of firm characteristics. The first (*skill*) is the percentage of a firms' workers that are skilled. Labor structure and the level of human capital should affect firms. The second control (*export*) measures the influence that the ability to export might have on a firm. Research (e.g. van Biesebroeck, 2003) indicates that exporters are in some way 'different' than other firms. This variable allows me to study whether this is true for Ghanaian firms. To control for discrepancies in firm ownership structure I include three variables (described below) in a control set denoted *own*. There is evidence that the productivity of foreign-owned firms is affected differently by trade regimes than the productivity

of domestic-owned firms (Clerides, *et al.* 1998). Equation (2) shows an expanded production function that measures the impact of import competition and controls for firm characteristics.

$$y_{it} = \alpha_{it} + \beta_{it}l_{it} + \beta_{it}k_{it} + \beta_{it}m_{it} + \beta_{t}imports_{t} + \beta_{i}skill_{i} + \beta_{i}export_{i} + \beta_{i}own_{i} + \epsilon$$
 (2)  
The central assumption is that import competition, the ratio of skilled workers to unskilled  
workers, and the ownership structure of the firm are uncorrelated with the basic production  
function inputs. This assumption may not be valid. Table 5 (Appendix) shows that expanded  
production function inputs are correlated.

I use another technique to overcome the correlation of production function terms. I preserve the residuals of  $\alpha$  from equation (1) and regress them on merchandise import values. Equation (3), shows the formulation of this methodology.

$$residual_{it} = \gamma_{it} + \beta_t imports_t \tag{3}$$

The unobserved residuals associated with unique constants from equation (1) are a rough proxy for the productivity of the firm. I predict productivity with a broad measure of import competition. I add the same set of controls used in equation (2) to the regression to control for firm characteristics. The expanded regression takes the following form.

$$residual_{it} = \gamma_{it} + \beta_t imports_t + \beta_i skill_i + \beta_i export_i + \beta_i own_i + \epsilon \qquad (4)$$

The techniques described to this point are used only with the broadest measure of import competition available, commercial merchandise imports. As discussed above, the import data for specific sectors is unavailable for five key years (1993-1997). Nevertheless, I use data from the last five years (1998-2002) to study the effect of import competition on five specific sectors: textiles, garments, metal products, machinery, and chemicals manufacturing.

I execute equation (1) on specific sectors for all years after 1998. I perform equation (2) for the available samples of each sector. Then, I preserve the residuals from equation (1) and use

them as the dependent variable in a regression similar to equation (3). I replace the broad measure of import competition with a measure of import competition specific to each industry. This regression is simply equation (4) limited to data specific to individual sectors after 1998. These results will allow me to examine the influence of import competition on productivity across subsets of the Ghanaian manufacturing sector.

#### Key RPED, GMES Variables

To measure firm output I use two variables from my primary data source. The first is the real value of manufactured output. Prices are normalized with price levels from 1991 and are specific to individual firms. I divide the nominal value of manufactured output by the price index for output given in the data to obtain the quantity of output for each firm in each year. The result is an approximate quantity of output. The logarithmic value is  $f_output$ , the dependent variable in equations (1) and (2).

The RPED, GMES dataset provides excellent measures for capital, labor, and material inputs. The value of these variables is adjusted with a price deflator based on the value of the Cedi (Ghana's currency) in 1991. The creators of the dataset did price adjustments for these variables (along with all others mentioned); I did not perform these calculations. I add the replacement value of the manufacturing plant and machinery owned by the firm to a separate measure of the real imputed sale value of all land and buildings and take the logarithm to derive *lkapital*, my measure of capital. Labor inputs are measured with the variable *lworker*, a logarithmic measure of the total number of workers employed by the firm. Finally, material inputs were measured with *lrmata*, the logarithm of the real cost of raw material inputs.

In addition to production function inputs, the RPED, GMES dataset also contains variables for individual firms' characteristics. Above I describe three categories of controls that I

used to add firm characteristic to equations (2) and (4). The labor structure of the firm is captured with *skillwork*; the firm's skilled workers as a percentage of total workers. I take the logarithm of this variable (*lskillwork*) to include it in my regressions. The control variable *export* is a dummy variable coded positively when the firm exports any share of their output. The *own* control variable set contains three dummy variables coded positively when the firm falls into 3 categories of private ownership; exclusive Ghanaian ownership, exclusive foreign ownership, and mixed Ghanaian-foreign ownership. These variables were selected with two criteria; hypothesized impact on firm productivity and feasible integration into the models.

#### Import Competition





Figure 2: Ghanaian Merchandise Trade with other nations (current millions of USD)

Statistics Database. To estimate the general effect of the opening of the Ghanaian economy to international trade, I use a broad measure, the Merchandise Trade Index. This index form the WTO is displayed in Figure 2 (previous page). Figure 2 illustrates the opening of the Ghanaian economy that occurred alongside the dramatic reduction in trade barriers. The data show that trade flows began increasing in the 1980s and rose dramatically during the 1990s. I use the logarithm of Merchandise Imports (*limport*) in my initial analyses.

The WTO has detailed data on specific categories of manufactures trade (e.g. Textiles, Machinery) available across all sectors in 1998. This data can be carefully tracked until 2002, the end of my period of study. I use these specific measures of manufactures imports to study nuances across different industries (e.g. textile manufacturing). Each industry has its own log-measure of import competition (e.g. *itextile*). I use this data in conjunction with the higher aggregation level variables to study how increased import competition might have affected the output and productivity of manufacturing firms in Ghana.

#### **Chapter VI: Results & Discussion**

The basic production function is an excellent fit for the output of the Ghanaian firms in the RPED, GMES dataset. A basic Ordinary Least Squares (OLS) multivariate regression yields an  $r^2$  value of .8453. All three basic inputs into the production function have positive and highly significant coefficients. Results (Table 1) for this regression are available in the Appendix. These results show that the firms in the sample studied adhere to common-sense economics; the output of the firm is highly reliant on their capital, labor, and material inputs. I performed the same regression on the limited sample of firms to ensure that the production function is robust when the sample was limited to firms in the five industries discussed above. Focusing on these five industries cut the sample roughly in half. Results (Table 2, Appendix) buttress the reliability of the production function. The  $r^2$  value remains high and all three inputs reach the .05 level of significance. These two regressions show that the basic production function is a reliable basis for an examination of the Ghanaian manufacturing sector.

The expanded production function shows that a 1 percent increase in commercial merchandise imports is associated with a 2 percent decline in firm output (Table 6, Appendix). Imports negatively affect output after I control for firm characteristics. The coefficient for skilled labor (positive and significant) is consistent with economic intuition and coefficient associated with exporting (positive and significant) indicates that exporters are different than other firms. These results should be interpreted with caution. The fit of the regression ( $r^2$ =. 93) is better than the fit of the regression for the basic production function without a measure of imports or controls. The results of equation (2) show that import competition may have negatively impacted the production capabilities of domestic producers.

Table 3 (Appendix) shows the breakdown of production coefficients by year. Though an aggregate analysis of the basic production function (equation (1)) shows that capital, labor, and

material inputs are all very important to the production process, a year-by-year analysis shows that the coefficients of labor and capital inputs fluctuated during the liberalization period. Figure 5 (Appendix) makes these fluctuations easy to visualize. In 1995 (the year Ghana joined the WTO), the coefficient associated with labor inputs dropped dramatically. From 1992-1996, labor inputs were not a significant input into the production function. Capital input coefficients follow roughly the opposite pattern. The coefficients associated with capital inputs rose steadily throughout the 1990s as Ghana was removing trade barriers. The shifts in coefficients imply that a technology shift occurred over this period.

The mean number of employees in manufacturing firms rose sharply from 1995-1996; (Table 4, Appendix) this indicates that hiring increased to complement the shift in available productive capital. The basic and expanded production function methodologies provide two key insights: increases in merchandise imports were associated with falling production of manufacturing firms, and labor inputs became less important (per-unit) than capital inputs.

I used two empirical techniques to study the effect that import competition may have had on specific industries in Ghana's manufacturing sector. The outputs of the multivariate OLS regressions I discuss next are available in Tables 7-12 (Appendix). Table 7 contains the results of expanded production functions executed for each industry. These results show the impact of import competition on the *output* of firms. Tables 8-11 show the results of equation (4) limited to each industry; control variables are introduced to the regression systematically to show how the impact of import competition changes as I control for firm characteristics. These results show the impact of import competition on the *productivity* of firms. Generally,  $r^2$  values increase with the number of explanatory variables. Increases in import competition are associated with increases in output and productivity in both the textile and garment industries. Table 7 shows that a 1 percent increase in textile and garment imports is associated with a 26 percent in textile output and a 121 percent increase in garment output. The former result is not statistically significant. There are very few observations for these regressions; the results are likely biased due to the correlation of explanatory variables. Tables 8 and 10 show, however, that 1 percent increases in textile and garment imports are associated with 41 percent (p<0.001) and 103 percent (p<0.001) increases in the residuals of the production functions (my proxy for firm productivity) for those industries. There is a methodological flaw with these results; I do not control for time in my regressions. The coefficients, therefore, are likely capturing the *total* increases in output and productivity that occurred over the study period (1998-2002). Still, these coefficients and the statistical significance associated with them show that the textile and garment industries benefited from an increase in import competition.

The remaining three industries appear to have been negatively impacted by increased import competition over the same period. For two industries, metal and machine production, this can be observed for both output and productivity. A 1 percent increase in machine and metal product imports is associated with 3.5 percent and 2.9 percent decreases in output, respectively. The productivity of machine and metal production firms were impacted similarly. Tables 11-12 show that that a 1 percent increase in import competition reduced the productivity of machine and metal production firms 5.1 and 3.4 percent, respectively. These coefficients are both statistically significant at the .001 level. Results for chemical manufacturing firms are not attainable; collinearity of variables prevented Stata from reporting a coefficient or standard error for the import competition term. There was, however, a statistically significant (p<0.001) 0.445

decrease in the productivity of chemical manufacturing firms (Table 9, Appendix). These results have limited power due to the methodological limitations already discussed, but still show that there is a negative correlation between import competition and firm productivity in the chemical, machine, and metal products manufacturing industries from 1998-2002.

These results suggest that there is a fundamental difference between the two sectors that were positively impacted by import competition, and the three that saw declines in output and productivity. The type of manufacturing is one possible explanation. Textiles and garments may be simpler to produce because they require less complex techniques. Firms can therefore invest in more productive capital and quickly hire more workers to boost productivity and increase output. One empirical clue that this is the case is that neither textile nor garment production firms benefit from a higher ratio of skilled workers. Of the three firms that saw their productivity decline alongside import competition, two industries (chemical and metal products manufacturing) have positive and statistically significant coefficients associated with the ratio of skilled to unskilled workers (Tables 9 & 11-12, Appendix). Differential production process complexity may explain why firms in different industries are impacted differently by import competition.

Machine product manufacturing was the industry most harmed by import competition (Table 11, Appendix). The key to success for these firms may be exporting. When ownership structure controls are not included, firms that export experience a .315 percent (p<0.001) increase in productivity over firs that do not export. After I control for ownership, that coefficient falls to .245 (p<0.001). Machine product manufactures are also the only industry for which ownership structure is significant; full Ghanaian ownership is associated with a .296 decline in productivity (p<0.10). A lack of engagement with global markets could explain why

machine product manufacturers were harmed by import competition. The results of my industryspecific modeling show not just that import competition influenced firm output and productivity, but that there are large differences between how import competition affects individual industries.

The results of my work should be interpreted cautiously. I use relatively simplistic empirical techniques to estimate the effect of import competition on Ghanaian manufacturing firms' output and productivity during a period of economic change fueled by trade policy shifts. My analysis is limited, most obviously, by the lack of nuance in the trade data used. Though I can identify the imports as "Manufactured Goods", I cannot determine whether the goods being imported are the specific type produced by domestic firms (WTO). I could be, in one sense, be comparing 'apples to oranges' - domestic producers of a certain set of goods against foreign exporters of a different set of goods. There are also issues with my methodology. Economists use a variety of econometric tools to account for biases (e.g. simultaneity) of many types in their analyses. I use few of these tools in my own analyses. A fundamental assumption of my second model is that the explanatory variables that appear in equation (4) are not correlated with explanatory variables included in equation (1). In fact, there are correlations between many variables. This likely creates bias. I am able to overcome this specific issue with my second methodology, but there I assume that the residual for the constant of the firms' production function is a reasonable substitute for a measure of firm productivity. This may not be entirely correct. Though my data and approach are flawed, I demonstrate import competition substantially impacted Ghanaian manufacturing firms in the 1990s and early 2000s.

#### Conclusion

I have sought to address the question of whether or not Ghana's removal of trade barriers and the ensuing rise in import competition was beneficial to domestic manufacturing firms. Dramatic policy reforms in the 1980s and 1990s improved the health of the economy substantially. Ghana went from erratic and sluggish growth throughout the 1970s and 1980s to strong and consistent growth in the 1990s and first half of the 2000s. Trade liberalization may well have contributed to this turnaround. Ghana can now be considered a 'leading' developer in SSA; its manufacturing sector is more developed than many other SSA nations, and most others in West Africa. Thus, the impact of trade barrier reduction on the manufacturing sector in Ghana likely holds valuable lessons for other developing nations.

I use a series of empirical techniques that estimate the effect of import competition on firm output and productivity. I show that increased import competition is associated with both higher output and productivity in both the textile and garment production industries. These industries may use less complex processes and therefore can invest more readily in new capital to boost productivity and output. The opposite may be true in the machine product and metal goods industries where import competition was associated with decreases in output and productivity. The machine product industry is particularly interesting; those firms received substantial benefits from exporting.

The manufacturing sector did improve as a whole over the study period. There are methodological issues with my empirical methods that I discuss at length in the previous section, however my results indicate that free trade does not always result in productivity gains for domestic firms. There were 'winners and losers' in Ghana during and after the liberalization period. In one sense, this is consistent with the literature; firms that have the ability to become more efficient do so and gain market power, those that do not drop out of the market. However,

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there is no way of knowing if the firms that were harmed by import competition were operating 'inefficiently'. In short, this snapshot of Ghana's manufacturing sector during and after a radical period of economic policy liberalization is unclear. There should be more research on Ghana in the future to uncover how increased trade affected manufacturing firms, as well as agricultural entities and other sectors. I have displayed evidence that suggests that some manufacturing firms benefited from import competition, but a more complete picture is needed for policy makers in the developing world to understand Ghana's experience with economic reform, and learn from it as they guide their own countries forward in a time of unprecedented global interconnectivity.

### Appendix



Figure 3: Ghana's Trade Policy in the 1990s

Source: Ackah, Charles "Who Gained from Trade Liberalisation in Ghana"

Figure 4: Industrial Tariffs in Ghana from 1992-1994

Country	Agric. materials	Crude Fertilizers	Chemicals	Manuf. Fertilizer	Electric Machines	Transport equip	Prof. equip	All items
Angola	8.2	9.4	9.2	1.4	17.4	6.2	8.6	11.6
Malawi	3.9	0.3	9.7	0.0	23.8	7.8	18.3	15.2
Mozambique	16.2	9.5	10.3	4.9	11.5	16.2	15.6	15.6
Tanzania	29.6	22.5	22.2	0.0	27.5	13.7	20.4	29.8
Zambia	25.1	17.5	20.3	7.1	33.4	17.4	28.5	29.9
Zimbabwe	1.4	0.2	3.7	0.6	15.4	7.8	10.3	10.1
Cote'Ivoire	9.3	18.0	20.7	19.8	25.4	17.4	30.6	23.3
Senegal	39.9	2.1	7.7	0.0	14.6	14	14.7	12.3
Uganda	26.1	10.0	12.3	10.3	17.8	14.3	16.3	17.1
Nigeria	25.0	16.9	22.2	10.0	31.4	22.7	21.2	32.8
Ghana	10.0	9.5	9.4	5.0	7.0	7.0	7.4	8.9
All SSA	23.6	17.0	19.8	5.1	28.5	18.9	26.5	26.7
Fast G.Exp.	7.3	4.7	8.2	5.3	13.4	9.7	10.2	10.8
SSA/FGE	3.2	3.5	2.4	1.0	2.1	2.0	2.6	2.5

Table 2: Average percentage tariffs in selected African countries 1992-94

Source: Ngy and Yeats (1997).

*Source:* Mwaba, Andrew. 2000. "Trade Liberalization and Growth: Policy Options for African Countries in a Global Economy"

Table 1: Results of Basic Production Function performed with OLS Regression technique for entire RPED, GMES sample.

	β	Standard Error	T-Statistic	P>t
Capital Stock	0.10	0.018	5.32	0.000
Number of Workers	0.20	0.039	5.24	0.000
Raw Material Inputs	0.81	0.020	41.3	0.000
Constant	-4.51	0.298	-15.14	0.000

N =1471 F = 2641

 $R^2 = 0.84$ 

Table 2: Results of Basic Production Function performed with OLS Regression technique for restricted RPED, GMES sample.

	β	Standard Error	T-Statistic	P>t
Capital Stock	0.09	0.02	3.91	0.00
Number of Workers	0.17	0.06	2.98	0.00
Raw Material Inputs	0.82	0.03	30.38	0.00
Constant	-4.63	0.38	-12.07	0.00

*N* =663

F = 1608 $R^2 = 0.88$ 

### Table 3: Production Function Coefficients and P-Values for individual years

	Ca	pital	La	abor	Materia	al Inputs	Ν	R2
Year	β	P-value	β	P-value	β	P-value	*****	******
1991	0.011	0.76	0.248	0.00	0.825	0.00	34	0.984
1992	0.086	0.02	0.239	0.00	0.713	0.00	43	0.981
1993	0.018	0.65	0.250	0.06	0.848	0.00	20	0.986
1994	0.082	0.02	0.207	0.02	0.818	0.00	47	0.969
1995	0.116	0.00	0.223	0.02	0.767	0.00	51	0.965
1996	0.115	0.01	0.015	0.86	0.887	0.00	83	0.964
1997	0.111	0.01	0.042	0.66	0.866	0.00	86	0.962
1998	0.154	0.00	0.083	0.50	0.806	0.00	71	0.955
1999	0.122	0.02	0.035	0.78	0.863	0.00	67	0.955
2000	0.135	0.01	0.088	0.56	0.866	0.00	56	0.946
2001	0.180	0.00	0.054	0.71	0.807	0.00	53	0.947
2002	0.133	0.03	0.106	0.53	0.839	0.00	52	0.944



Figure 5: Production Coefficients by Year

Table 4: Workers	employed by	<sup>,</sup> Manufacturing	Sector Firms

Year	Number of Firms	Mean Number of Workers	Standard Deviation	Max Number of Workers
1991	99	51	145	1277
1992	97	52	145	1280
1993	91	40	75	501
1994	86	43	83	501
1995	86	43	79	409
1996	94	94	251	1649
1997	97	95	250	1742
1998	83	89	228	1800
1999	83	84	192	1400
2000	65	62	181	1401
2001	65	61	178	1371
2002	65	58	174	1351

Figure 6: Workers Employed by Manufacturing Firms



Table 5:	<b>Correlation</b>	Matrix for	<b>Production</b>	Function 1	nputs (	Manu	facturing	Firms	Only)
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	Labor	Materials	Capital	Imports	Workers§	Exporter	D. Owned	F. Owned	Own.
Labor	1.00								
Materials	0.32	1.00							
Capital	0.74	0.68	1.00						
Imports	-0.01	0.05	0.02	1.00					
Skilled Workers§	-0.12	-0.01	-0.04	-0.03	1.00				
Exporter	0.17	0.12	0.20	-0.23	-0.10	1.00			
Domestically Owned	-0.44	-0.18	-0.42	0.06	-0.06	-0.11	1.00		
Foreign Owned	-0.05	-0.02	-0.04	-0.01	0.17	-0.04	-0.26	1.00	
Mixed Ownership	0.42	0.19	0.37	-0.04	0.00	0.09	-0.79	-0.06	1.00

*Note:* § *As a percentage of all workers.* 

	β	Standard Error	T-Statistic	P > t
Capital Stock	0.06	0.02	2.8	0.01
Number of Workers	0.25	0.05	4.5	0.00
Raw Material Inputs	0.79	0.02	35.7	0.00
Total Merchandise Imports	-2.00	0.11	-19.0	0.00
Skilled Workers§	0.14	0.04	3.2	0.00
Firm Exports	0.12	0.07	1.9	0.06
Private Firm with Full Ghanaian Ownership	-0.34	0.13	-2.7	0.01
Private Firm with Full Foreign Ownership	0.10	0.25	0.4	0.70
Private Firm with Mixed Ownership	-0.20	0.12	-1.6	0.10
Constant	39.96	2.30	17.4	0.00

# Table 6: Imports, Skilled Worker Control, and Firm Ownership added to Production Function

N = 658

F = 0

 $R^2 = 0.93$ 

<b>Table 7: Expanded Production</b>	Function Performed on Specific Industries
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	Textile	Garment		Chemical	Machine		Metal	
Capital Stock	0.736	0.0713		-1.317	-0.195		0.187	*
	(0.74)	(1.25)		(-0.93)	(-0.92)		(2.67)	
Number of Workers	-0.311	0.445	*	3.042	0.513		0.0322	
	(-0.47)	(2.46)		(1.07)	(1.47)		(0.18)	
Raw Material Input	0.655	0.648	***	-0.0503	0.746	*	0.746	**
	(1.64)	(10.55)		(-0.04)	(4.39)		(11.54)	
Skilled Workers§	-0.515	0.248		0.312	0.579		0.182	*
-	(-0.75)	(1.45)		(0.41)	(1.55)		(2.26)	
Firm Exports	0.205	0.0906		2.022	-0.655		0.226	
	(0.35)	(0.19)		(0.80)	(-1.13)		(1.04)	
Textile Imports	26.04							
	(1.59)							
Garment Imports		121.7	***					
		(10.56)						
Chemical Imports				0				
				(.)				
Machine Imports					-3.521	*		
					(-3.39)			
Metal Product Imports							-2.892	**
							(-10.43)	*
							(-10.43)	
Constant	-463.4	-1972.0	***	26.69	75.16	*	48.09	**
	(-1.69)	(-10.56)		(0.72)	(3.24)		(9.33)	*
N	8.00	34.00		8.00	10.00		52.00	
$R^2$	1.00	0.96		0.97	0.97		0.97	

*Note:* § *As a percentage of all workers. t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

	Imports		Skilled Workers		Exporter		Ownership	
Textile Imports	39.73 (21.94)	***	39.76 (21.81)	* * *	41.24 (22.25)	***	41.35 (22.60)	***
Skilled Workers§			-0.0290 (-0.68)		-0.0123 (-0.29)		-0.0288 (-0.68)	
Firm Exports					0.269 (2.97)	**	0.210 (2.26)	*
Private Firm with Full Ghanaian Ownership							-0.262 (-1.68)	+
Private Firm with Full Foreign Ownership							0.100 (0.39)	
Private Firm with Mixed Ghanaian/Foreign Ownership							0.0129 (0.07)	
Constant	-687.6 (-21.95)	***	-688.2 (-21.82)	***	-713.8 (-22.26)	***	-715.6 (-22.61)	***
N R <sup>2</sup>	249.00 0.66		248.00 0.66		244.00 0.67		242.00 0.69	

# Table 8: Influence of Imports on Productivity in Textile Firms Post-1998

Note: § As a percentage of all workers.

*t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

### Table 9: Influence of Imports on Productivity in Chemical Production Firms Post-1998

	Imports		Skilled Workers		Exporter		Ownership	
Chemicals Imports	-0.452 (-9.03)	***	-0.435 (-8.69)	***	-0.440 (-8.73)	***	-0.445 (-8.90)	***
Skilled Workers§			0.180 (3.00)	**	0.186 (3.08)	**	0.165 (2.73)	**
Firm Exports					0.0955 (0.76)		0.0278 (0.22)	
Private Firm with Full Ghanaian Ownership							-0.203. (-0.90)	
Private Firm with Full Foreign Ownership							0.318 (0.89)	
Private Firm with Mixed Ghanaian/Foreign Ownership							0.179 (0.72)	
Constant	9.075 (9.64)	***	9.070 (9.67)	***	9.138 (9.70)	***	9.326 (9.66)	***
N R <sup>2</sup>	323.00 0.20		321.00 0.22		317.00 0.23		315.00 0.25	

*Note:* § *As a percentage of all workers. t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

	Imports		Skilled Workers		Exporter		Ownership	
Garment Imports	101.0 (22.79)	***	101.4 (22.85)	***	103.2 (22.49)	***	103.4 (22.38)	***
Skilled Workers§			0.0662 (1.61)		0.0749 (1.80)	+	0.0668 (1.58)	
Firm Exports					0.139 (1.58)		0.115 (1.25)	
Private Firm with Full Ghanaian Ownership							-0.105 (-0.68)	
Private Firm with Full Foreign Ownership							0.135 (0.53)	
Private Firm with Mixed Ghanaian/Foreign Ownership							0.000895 (0.01)	
Constant	-1634.5 (-22.78)	***	-1641.4 (-22.84)	***	-1670.7 (-22.49)	***	-1673.7 (-22.37)	***
N R <sup>2</sup>	249.00 0.68		248.00 0.68		244.00 0.68		242.00 0.69	

# Table 10: Influence of Imports on Productivity in Garment Production Firms Post-1998

*Note:* § *As a percentage of all workers.* 

*t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

### Table 11: Influence of Imports on Productivity in Machine Production Firms Post-1998

	Imports		Skilled Workers		Exporter		Ownership	
Machine Imports	-4.839 (-21.78)	***	-4.854 (-21.70)	***	-5.053 (-22.36)	***	-5.070 (-22.95)	***
Skilled Workers§			0.0150 (0.35)		0.0350 (0.83)		0.0166 (0.40)	
Firm Exports					0.315 (3.52)	***	0.245 (2.70)	**
Private Firm with Full Ghanaian Ownership							-0.296 (-1.93)	+
Private Firm with Full Foreign Ownership							0.110 (0.43)	
Private Firm with Mixed Ghanaian/Foreign Ownership							0.0260 (0.15)	
Constant	99.47 (21.72)	***	99.81 (21.63)	***	103.9 (22.29)	***	104.4 (22.91)	***
N R <sup>2</sup>	249.00 0.66		248.00 0.66		244.00 0.68		242.00 0.70	

*Note:* § *As a percentage of all workers.* 

*t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

	Imports		Skilled Workers		Exporter		Ownership	
Metals Imports	-3.342 (-24.01)	***	-3.354 (-24.07)	***	-3.429 (-23.87)	***	-3.433 (-23.83)	***
Skilled Workers§			0.0680 (1.74)	+	0.0773 (1.96)	+	0.0701 (1.76)	+
Firm Exports					0.151 (1.82)	+	0.113 (1.31)	
Private Firm with Full Ghanaian Ownership							-0.0258 (-0.18)	
Private Firm with Full Foreign Ownership							0.215 (0.89)	
Private Firm with Mixed Ghanaian/Foreign Ownership							0.147 (0.91)	
Constant	59.56 (23.91)	***	59.88 (23.99)	***	61.21 (23.79)	***	61.28 (23.73)	***
N R <sup>2</sup>	249.00 0.70		248.00 0.70		244.00 0.71		242.00 0.71	

# Table 12: Influence of Imports on Productivity in Metal Products Production Firms Post-1998

*Note:* § *As a percentage of all workers. t* statistics in parentheses : + p<0.10, \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

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### ACADEMIC VITA

# William F. Dawson wd6492@gmail.com

### Education

The Pennsylvania State University, University Park, Pennsylvania – August 2010-May 2014

- Baccalaureate of Arts Degree

   Majors in Economics & Sociology
- Schreyer Honors College Honors Program in Economics

### **Honors and Awards**

Dean's List

 Fall 2010, Fall 2011-Spring 2014

### **Association Memberships/Activities**

The Pennsylvania State University Economics Association

- <u>Executive Vice-President & Vice-President of Education</u> January 2013 Present
   Improving the Association's collective understanding of economic issues and concepts
  - through discussions, debates, and publications as head of the Education Committee.
  - Advancing the overall mission of the Association as a senior member of the Executive Board.

Alpha Kappa Delta: International Sociology Honors Society – Penn State Chapter

### **Professional Experience**

The Department of Sociology & The Population Research Institute – May 2013 – Present

- <u>Research Assistant</u> "Religion & Sexual Behavior in two Ghanaian Communities" Dr. Jenny Trinitapoli
  - Unraveling the complex abilities of peer groups, adult influences, and religious messages to constrain risk-taking behavior among youth in two demographically similar Ghanaian communities.

The Department of Economics & Bates White LLC – January 2013 – May 2013

- <u>Research Assistant</u> Excess Reserves, Interest Rates, and the Money Supply Dr. Russell Chuderewicz
  - Examining the effect of excess reserve levels on the growth of the Money Supply in the context of unconventional monetary policy regimes in the United States.

The Department of Economics - September 2012 - May 2013

• Teaching Assistant – Intermediate Macroeconomics – Dr. Russell Chuderewicz

### **Professional Presentations**

Trinitapoli, Jenny and William Dawson . (2013, November). *Religion and Sexual Behavior in Two Ghanain Communities*. Research Presented at Society for the Scientific Study of Religion Annual Conference, Boston, Massachusetts.