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# The Exporter Wage Premium Hypothesis: An Unconditional Quantile Regression and Decomposition Approach

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## ABSTRACT

Relying on the World Bank Enterprise Survey dataset in 2012/13, this paper applies the unconditional quantile regression and decomposition estimation techniques to examine the hypothesis that workers in exporting firms receive higher wages than those in non-exporting firms. The results show that the relationship between export and firm's wage bill is indirect and is transmitted through technology and firm size. Remarkably, these indirect relationships are much more pronounced at the more upper quantiles of the wage bill distribution. However, the net relationships of the interaction between export and technology are relatively larger and positive as compared to that of the interaction between export and firm size which are marginal and mixed. The decomposition analysis indicates that much of the present exporter wage premiums are largely due to the differences in the returns to the characteristics between exporting and non-exporting firms. The findings from this paper suggest directions for future work that can be directly useful for policy.

## KEYWORDS

Exporter wage premium; technology; firm size; indirect relationship; unconditional quantile techniques

## Introduction

The contribution of export to a country's foreign exchange, economic growth and development is highly recognized in both theoretical and empirical literature (Sampson, 2014; Abor, 2011; Rangasamy, 2009; Robson & Freel, 2008; Yeaple, 2005; Seth, 2002; Bernard and Jensen, 1999; Love, 1982). Removal of barriers to business operations (Domeher, Musah, & Hassan, 2017; Gebrewahid & Wald, 2017; Hansen, Langevang, Rutashobya, & Urassa, 2018; Kasseeah & Thoplan, 2012) is crucial for the realization of export's full potential. Over the years, policy makers in many economies have implemented diverse policies to support local firms to engage in international trade (see Xiangkang & Xiangshuo, 2005). Abor (2011) argues that the growth success of the Ghanaian economy can partly be attributed to the implementation of the Economic Recovery programme in 1983, which, among others, significantly stimulated many entrepreneurs to enter into exporting activities.<sup>1</sup> Similarly, the success of South

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<sup>1</sup>See Abor (2011) paper on Ghana's export and firm performance for the details of the various policies and initiatives that the country has embarked on since 1983 and the resulting impact on the country's export and economic growth.]

Africa's economic growth has been significantly and partly be attributed to its exporting activities over the years (Rangasamy, 2009).

As the learning-by-exporting hypothesis predicts, such international exposure gives exporting firms a higher comparative advantage-in terms of advanced and new technology, knowledge and strategies-than their domestic counterparts (Abor, 2011; Biesebroek, 2005; Boermans, 2013; Edwards, 2004; Yeaple, 2005). Such exposure makes firms more efficient and this may consequently lead to higher economic growth (Abor, 2011; Rangasamy, 2009; Yeaple, 2005).

The literature on trade effects is diverse. For instance, while some researchers have investigated the economic and environment effects of trade (Andreoni & Levinson, 2001; Dinda, 2004; Hettige, Mani, & Wheeler, 2000; Kleemann & Abdulai, 2013; Stern, Common, & Barbier, 1996; Vincent, 1997), others on the other hand have examined how trade affects the labor market and income distribution (Bernard, Jensen, & Lawrence, 1995; Edwards, 2004; Hanson & Harrison, 1995; Helpman, Itskhoki, Muendler, & Redding, 2016; Munch & Skaksen, 2008; Roberts & Thoburn, 2004; Schank, Schnabel, & Wagner, 2010). This paper follows the line of Schank, Schnabel, and Wagner (2007), Bernard and Jensen (1999) and Bernard et al. (1995) to examine the validity of the exporter wage premium hypothesis in Ghana. This hypothesis postulates that workers in exporting firms are generally paid higher than their counterparts in domestic firms. It considers the biasness in wages in favor of workers in exporting firms.

The work on US manufacturing plants by Bernard et al. (1995) is credited to be the first empirical paper that explicitly examined and confirmed the exporter wage premium hypothesis. Bernard et al. (1995) findings have, however, generated much debate in the literature. Subsequent researchers have built on this pioneering work through the use of different or similar data sets, approaches and variables to examine the same hypothesis. The general conclusion from these works has been that exports do lead to wage inequalities in favor of workers in exporting enterprises (see Helpman et al., 2016; Sampson, 2014; Schank et al., 2007; Bernard and Jensen, 1999). Some have argued that the extent of this premium reduces when both employee and firm level characteristics are controlled for (Schank et al., 2007). On the same issue, Schank et al. (2010) paper on German found the wage premium to be an ex-ante phenomenon with the claim that these premiums existed before firms engaged themselves in exporting activities.

This paper contributes to the existing literature in many ways. Studies in this area have primarily focused on the direct effect of export on wages, ignoring the possibility of any indirect effect. Yet, an existing work on Denmark by Munch and Skaksen (2008) dramatically revealed no significant direct effect of export on wages but rather an indirect effect through skill intensity (thus, human capital). This finding indirectly implies a human capital wage differential as against the stylized fact of the positive direct effect of export. In addition to human capital variable, this paper extends the literature by examining the indirect relationships between export and wages through the size of the firm and the use of advanced technology.

In the same vein, a large number of studies (like Bernard et al., 1995; Milner & Tandrayen, 2004; Munch & Skaksen, 2008; Schank et al., 2010, 2007) that have analyzed the validity of the hypothesis have predominantly relied on techniques-like the ordinary least square (OLS)-to only estimate the mean effect of export. To fill this gap, this paper applies quantile regression which gives a more superior information on the differential

effects of an independent variable at the different quantiles of the distribution of the outcome variable (Firpo, Fortin, & Lemieux, 2009; Goedhuys & Sleuwaegen, 2010; Koenker & Bassett, 1978; Koenker & Hallock, 2001; Lee & Lee, 2006; Martins & Pereira, 2004). To further justify the use of the quantile regression, an existing theory on trade and wage inequality points out to the differential effects of trade across the upper and lower parts of the wage distribution (Sampson, 2014).

Further, while some existing theories (see Burdett & Mortensen, 1998; Postel-Vinay & Robin, 2002; Sampson, 2014) have acknowledge the importance of market imperfections or frictions in explaining wage differentials, empirical works that have explicitly explored and examined how these imperfections explain the exporter wage premium are very rare. Relying on existing papers on decomposition methods (see Barsky, Bound, Charles, & Lupton, 2002; Blinder, 1973; Deshpande & Sharma, 2016; Fortin, Lemieux, & Firpo, 2010; Oaxaca, 1973), this study seeks to decompose the sources of the exporter wage inequality gap into: the “*composition or covariate effect*” and that of the “*wage structure or return effect*.” While the former explains the part of the gap that is due to differences in observable firm and employee characteristics, the latter measures the component of the gap that is due to market imperfections or differences in the returns to the observed characteristics.

In the same line, works that have provided explicit analysis on this hypothesis in Ghana are very limited. At the last count, the authors came across a related paper by Milner and Tandrayen (2004) that focused on six sub-Saharan Africa nations, including Ghana. Like others, they estimated just the mean effect of export on wages. Also, the authors did not account for the sources of the wage premium. Hence, this study provides a more detail and explicit analysis of the hypothesis for Ghana by relying on unconditional quantile regression and decomposition methods and a more relatively recent data on Ghana’s manufacturing sector.

Over the past three decades, the Ghanaian economy has been experiencing increasing levels of inequality in both rural and urban locations and across most of its regions (GSS, 2014). This uncomfortable situation has generated much worry and debate among policy makers and researchers. Hence, this paper contributes to the ongoing debate by providing some insight and understanding on inequality among workers in the manufacturing industry. Results from this paper can stimulate future study that can be directly useful for policy direction in the country. Among others, this paper seeks to examine the following questions: (1) Do exporters pay higher wages than non-exporters?; (2) Does export indirectly affect firm’s wage bill through technology, firm size and workers’ education?; (3) Are the relationships between export and wages similar or dissimilar across the different parts of firm’s wage bill distribution?; and (4) Is the exporter wage premium largely attributable to composition or wage structure effect?

## Data and methodology

### Data

This paper employs the World Bank Enterprise Survey for Ghana in 2012/13. The survey covered four geographical locations of the country namely Accra, Tema,

Takoradi and North. Data were taken on small, medium and large enterprises that are both private and non-farm. Specifically, it covered manufacturing, services, transportation and construction. Further, the survey collected information on firm's export, labor and other useful information that can enable us to address the above research questions.

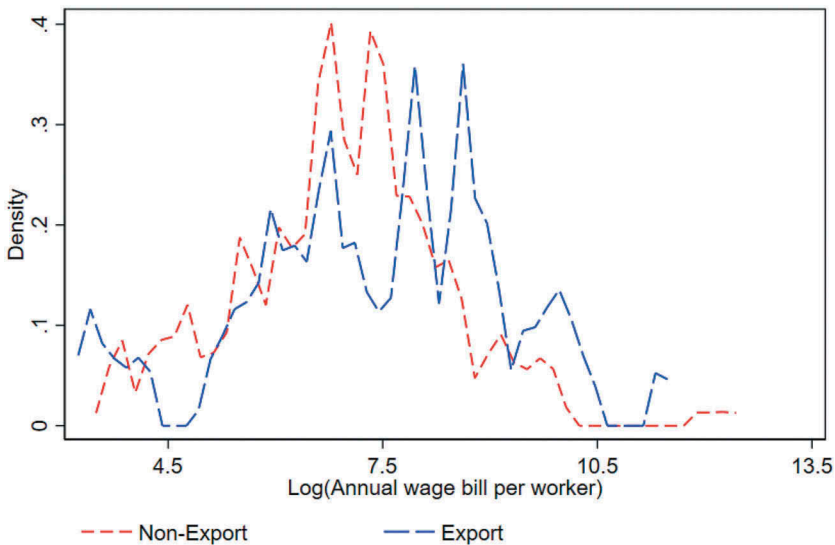
For the purpose of this article, the sample size is limited to manufacturing firms-including food, publishing, printing, metallic and non-metallic sub-sectors. Out of the 720 firms that were interviewed, 377 are found to be manufacturers, representing 52.4%. However, due to some missing data points and generation of variables, the sample reduced to 290 and 269 observations. The 290 sample is used for the simplest model where export is treated as the only explanatory variable while a sample of 269 is used for the other two models which account for interactive terms and other controls. The proportion of firms that engage in some exporting activities are found to be 23.1% and 21.6%, respectively for the samples 290 and 269.

Table 1 provides detail descriptive statistics for the 269 sample. The data reveal the mean and standard deviation of the log of annual wage bill per worker to be GH¢7.04 and GH¢1.55 respectively. Almost one-third (29%) of the firms are technologically advanced (or uses website). Firms differ largely by their size (total number of employees), with the mean and standard deviation values of 44.61 and 106.73, respectively. Around 60% of employees have at least secondary education. Most of the firms in the sample operate at the sole proprietorship level and are located in the capital city, Accra. About one-fourth of the firms are engaged in metallic, machinery and fabricated metal products.

On the overall, the data report higher average values of log of wage bill per worker in exporting firms as compared to non-exporting firms. The test of normality shows the

**Table 1.** Summary statistics of dependent and independent variables.

Variables	Obs.	Mean	Std. Dev.
Log of wage bill per worker	269	7.04	1.55
Export status	269	0.22	0.41
log of experience (years of operation)	269	2.51	0.77
Technology (firm has website)	269	0.29	0.46
Firm size (total number of workers)	269	44.61	106.73
Proportion of workers with secondary education	269	59.73	33.62
Proportion of main inputs imported	269	56.28	42.89
Proportion of female in production	269	0.11	0.19
Firm has a female top manager	269	0.13	0.33
Firm has a firm owner	269	0.01	0.11
<i>Legal status:</i>			
Shareholding Company	269	0.06	0.23
Sole proprietorship	269	0.68	0.47
Partnership Firm	269	0.26	0.44
<i>Manufacturing sub-sector:</i>			
Food	269	0.16	0.36
Publishing/Printing	269	0.17	0.38
Plastic, non-Metallic	269	0.11	0.31
Metallic, machinery and Fabricated metal	269	0.25	0.44
Other	269	0.31	0.46
<i>Location:</i>			
Accra	269	0.51	0.50
North	269	0.21	0.41
Takoradi	269	0.07	0.25
Tema	269	0.21	0.41



**Figure 1.** Kernel Density of wage bill per worker.

distribution to be skewed to the right and thus violates the normality assumption. Figure 1 shows the Kernel density function of the log of firm's annual wage bill per worker for exporting and non-exporting firms. The Figure shows that the distribution of wage bill for exporting firms lies more to the right of non-exporting firms. This implies a higher wage bill for exporting firms than non-exporting ones. Noticeably, the distribution of firm's wage bill is very far from normality.

### **Empirical models specifications**

To carefully examine the exporter wage premium hypothesis, three (3) different empirical models are specified. Models 1, 2 and 3 are respectively represented by equations 1, 2 and 3 below. In model 1, only export is treated as the only independent variable while model 2 accounts for other plausible variables but excludes any form of interaction. Like most works in the literature (see for example, Bernard & Jensen, 1997; Bernard, Jensen, Redding, & Schott, 2007; Verhoogen, 2008), the above models can only examine the direct relationship between export and wages. However, following the recent argument by Munch and Skaksen (2008), the paper specifies model 3 to account for the plausibility of indirect relationships of export through three main channels: the use of advanced technology, the size of the firm and workers' education.

The dependent variable,  $\log Wagebill$ , is the log of the sum of annual wages, salaries, bonuses, and social security paid by a typical firm to a typical worker. A limitation from the data is that the earnings of workers are aggregated at the firm level, making it impossible to distinguish earnings among and between different groups-like skilled and unskilled workers, full-and part-time workers. The export variable,  $Exp$ , is defined in terms of a dummy with a value of 1 if the firm exports and 0 otherwise.

$$\log Wagebill_i = \alpha + \beta Exp_i + \omega_i \quad (1)$$

$$\log Wagebill_i = \alpha + \beta Exp_i + \lambda Z_i + \varepsilon_i \quad (2)$$

$$\begin{aligned} \log Wagebill_i = & \alpha + \beta Exp_i + \delta Exp_i \times Tech_i + \phi Exp_i \times Size_i + \eta Exp_i \times Educ_i \\ & + \gamma Z_i + \mu_i \end{aligned} \quad (3)$$

Where:

Subscript  $i$  is the individual manufacturing firm or enterprise;

LogWagebill is the dependent variable;

Exp is a dummy variable measuring firm's export status;

Exp×Tech is the interactive term for export and technology;

Exp×Size is the interactive term for export and firm size;

Exp×Educ is the interactive term for export and workers' education;

$Z$  is a vector of control variables. Following theory and other empirical works in the literature (Burdett & Mortensen, 1998; Munch & Skaksen, 2008; Postel-Vinay & Robin, 2002; Shank et al., 2010), this paper controls for these variables: a dummy variable for technology with a value of 1 if the firm has its own website and 0 otherwise; firm size which is measured by total number of employees in the firm; education which is measured by the proportion of workers who have at least completed secondary school; experience which is measured by the log of firm's years of operation; a categorical variable for manufacturing sub-sectors (thus, food, publishing/printing, plastic, metal, others); a categorical variable for the legal status of the firm (shareholding company, partnership and sole proprietorship); a dummy variable for female ownership with a value of 1 if the firm has a female owner and 0 otherwise; a dummy variable for female manager with a value of 1 if the top manager of the firm is a female and 0 otherwise; proportion of total workers that are females in the production department; proportion of main inputs that are imported; and a categorical variable for location (Accra, Takoradi, Tema and North).

The parameter  $\beta$  measures the direct relationship between export and firm's wage bill while  $\delta, \phi$  and  $\eta$  measure the indirect relationships of export through technology, firm size and education respectively;  $\lambda$  and  $\gamma$  are vectors of parameters of the controls; and  $\omega$ ,  $\varepsilon$  and  $\mu$  are the error terms in Equations 1, 2 and 3, respectively.

The paper postulates from model 1 that export is likely to exert some significant positive relationship with wages, while in model 2, this direct relationship is expected to become small or possibly vanish as firms and workers' characteristics are controlled for. In model 3, the relationship is predicted to be more indirect rather than direct. The coefficient of the interactive term for export and technology is expected to be positively signed. Generally, technology exerts some spillover effects, which positively affects worker's efficiency and marginal productivity (Edwards, 2004). This therefore increases the rewards of workers if labor is assumed to be paid the equivalent marginal product (see for instance Autor, Katz, & Krueger, 1998).

The expected sign for the interaction between export and firm size is uncertain. In most cases, large firms have been through diverse experiences and have attained some level of goodwill and can therefore retain or even attract new workers at a relatively low wage. However, as postulated by the efficiency wage theory, small firms can quickly expand (through workers' efficiency) by offering an efficiency wage above the prevailing

market wage rate to boost the morale and commitment of workers. On the same issue, large firms may enjoy some economies of scale and can afford to pay workers higher wages in order to among others reduce unnecessary competition from their potential competitors. Based on the predictions from the human capital theory, the sign of the interactive term for export and education is expected to be positive, as returns to higher education is often higher than low and no education. Interacting export with variables like technology and firm size helps to minimize any potential problem of endogeneity.

### Estimation techniques

With regard to the estimation techniques, the study applies the ordinary least square (OLS), unconditional quantile regression (UQR) and two decomposition methods, namely the mean decomposition by Oaxaca (1973) and Blinder (1973) and the unconditional quantile decomposition approach by Fortin et al. (2010). These multiple techniques will help to check for the consistency and robustness of results. Both the OLS and UQR are used to estimate the three models specified above. On the other hand, the decomposition methods will be used to decompose the main sources of wage bill gap between exporting and non-exporting firms.

#### The ordinary least square (OLS)

The OLS estimates the mean effect of an independent variable on a dependent variable. Let  $Y$  be the dependent variable;  $X$  as a vector of explanatory variables (which is assumed to include the constant term);  $b$  as a vector of parameters to be estimated; and  $N$  as the number of firms, then the OLS estimator can be derived from the minimization problem of the sum of squared residuals as:

$$\sum_{i=1}^N (Y_i - X_i b)^2, \text{ where } i = 1, 2, 3, \dots, N \quad (4)$$

#### The unconditional quantile regression (UQR)

As argued above, the OLS cannot reveal the differential effects of an explanatory variable across the distribution of the dependent variable. To address the limitations of the OLS, this paper employs a recently developed unconditional quantile regression (UQR) technique by Firpo et al. (2009).

The UQR technique generally starts with the assumption that the observed  $Y$  depends on a set of independent variables  $X$ , so that  $Y$  and  $X$  will have a joint distribution of the form  $F_{Y,X}(\cdot, \cdot) : \mathbb{R} \times \chi \rightarrow [0, 1]$ , and  $\chi \subset \mathbb{R}^k$  is the support of  $X$ . Then the unconditional (marginal) distribution function of  $Y$  is defined as:

$$F_Y(y) = \int F_{Y|X}(y|X = x) \cdot d F_X(x) \quad (5)$$

The technique is largely built upon two related concepts, namely the influence function (IF) and the re-centered influence function (RIF). The IF, which is a widely applied tool in most robust estimations, is defined for the  $\tau^{\text{th}}$  quantile as:

$$IF(Y; q_\tau, F_Y) = (\tau - 1\{Y \leq q_\tau\}) / f_Y(q_\tau) \quad (6)$$

While the RIF, the new dependent variable, is defined in terms of the IF for the  $\tau^{\text{th}}$  quantile as:

$$RIF(Y; q_\tau, F_Y) = q_\tau + (\tau - 1\{Y \leq q_\tau\}) / f_Y(q_\tau) \tag{7}$$

Where;  $q_\tau$  is the sample quantile;  $f_Y(q_\tau)$  is a density function at that point  $q_\tau$ ; and  $1\{Y \leq q_\tau\}$  is a dummy that shows whether the value of the outcome variable is below  $q_\tau$ . According to Firpo et al. (2009), three separate regression approaches, namely RIF-OLS, RIF-Logit and RIF-Nonparametric can be used to estimate the unconditional quantile partial effects (UQPE) of the Xs on the new dependent variable,  $RIF(Y; q_\tau, F_Y)$ . All the three approaches are said to yield similar estimates (Firpo et al., 2009). For the purpose of this study, we seek to however employ the RIF-OLS technique. The UQPE, denoted by  $\alpha(\tau)$ , is defined by the expression:

$$\alpha(\tau) = E[dE[RIF(Y; q_\tau, F_Y)|X]/dx] \tag{8}$$

**The mean decomposition method**

The mean decomposition by Oaxaca (1973) and Blinder (1973), denoted here as OB, estimates the difference in the means between the outcome variables of two groups. The method assumes linearity and a conditional independence between the Xs and the error term. By assuming additive property, the equation for the log of annual wage bill per worker (denoted by Y) for exporters (E) and non-exporters (N) can be specified generally as:

$$Y_{gi} = \beta_{go} + \sum_{k=1}^K X_{ik}\beta_{gk} + v_{gi} \tag{9}$$

Where  $g = E, N$ ;  $K$  is the number of parameters to be estimated; and  $i$  is a typical firm.

The OB method works by estimating the difference between the mean values of the log of wage bill per worker between non-exporting (N) and exporting (E) firms as:

$$\hat{\Delta}_{OB} = \bar{Y}_N - \bar{Y}_E \tag{10}$$

Where the symbol ‘ $-$ ’ indicates the mean value.

Alternatively, the overall raw wage bill gap per worker can be stated differently in terms of the two main sources of variation as:

$$\hat{\Delta}_{OB} = \underbrace{\sum_{k=1}^K (\bar{X}_{Nk} - \bar{X}_{Ek}) \hat{\beta}_{Ek}}_C + \underbrace{(\hat{\beta}_{N0} - \hat{\beta}_{E0}) + \sum_{k=1}^K \bar{X}_{Nk}(\hat{\beta}_{Nk} - \hat{\beta}_{Ek})}_S \tag{11}$$

Where the first component, ‘C’, is the composition (covariate or explained) effect while the second component, ‘S’, is the wage structure (return or unexplained) effect. This shows that the composition effect arises from the differences in the characteristics or covariates while the wage structure effect is due to the differences in the estimated coefficients or ‘returns’ to the characteristics between the two groups.

**The unconditional quantile decomposition**

While there is no doubt about the wide application of the mean decomposition approach by Oaxaca and Blinder, some researchers have strongly argued that this standard approach may fail to provide a more comprehensive analysis on issues related to inequality gaps between two groups (see Barsky et al., 2002; Firpo et al., 2009). Aside the OB not been able to estimate the gaps across different quantiles, it often yields unreliable and inconsistent results when the function is not linear or some of the Xs are categorical (Barsky et al., 2002; Fortin et al., 2010; Oaxaca & Ransom, 1999). On the other hand, the UQD approach addresses the aforementioned limitations (Fortin et al., 2010).

Hence, following Fortin et al. (2010), the UQD for the exporter wage differential at the  $\tau^{th}$  quantile can be represented below as:

$$\Delta_Y^\tau = E[RIF(Y_E; q_{E,\tau})] - E[RIF(Y_N; q_{N,\tau})] \tag{12}$$

Alternatively, this can be re-stated in terms of the main sources as:

$$\Delta_Y^\tau = \frac{[(\bar{X}_E - \bar{X}_N)\hat{\beta}_{E,\tau}]}{C\tau} + \frac{[(\hat{\beta}_{E,\tau} - \hat{\beta}_{N,\tau})\bar{X}_N]}{S\tau} \tag{13}$$

Where  $\Delta_Y^\tau$  is the overall raw wage bill per worker gap at the  $\tau^{th}$  quantile;  $C\tau$  (the first term) and  $S\tau$  (the second term) are respectively the composition and wage structure effects at the  $\tau^{th}$  quantile of the distribution.

**Estimation results and discussions**

**Regression results from the OLS and UQR**

Tables 2, 3 and 4 provide information on the estimation results from empirical models 1, 2 and 3, respectively. The estimates from the UQR are presented for the 25th, 50th, 75th quantiles and 10th and 90th deciles. In each Table, column (1) gives estimates from the OLS while columns (2) to (6) give those from the UQR. Due to the limited data points, the paper prefers interpreting the results in terms of relationships rather than effects. By and large, the findings seem to support the initial claim that beyond the mean analysis, the relationship between an independent variable and a firm’s wage bill might differ across the various quantiles of the distribution. Some of the coefficients of the independent variables are rightly signed but are not statistically significant at a 10% (or lower) level.

**Table 2.** Estimation results from model 1 (export as the only explanatory variable).

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	OLS	q10	q25	q50	q75	q90
Export (dummy)	0.3738 (0.2337)	0.3179 (0.9485)	0.1689 (0.3136)	0.3495 (0.2264)	0.6079** (0.2677)	0.5280 (0.3919)
Constant	6.9565*** (0.0997)	4.8115*** (0.4782)	6.0670*** (0.1561)	7.0143*** (0.1099)	7.9011*** (0.1144)	8.8856*** (0.1547)
Observations	290	290	290	290	290	290
R-squared	0.0103	0.0004	0.0010	0.0081	0.0205	0.0081

Robust standard errors (for OLS and bootstrapped standard errors for UQR are all given in parentheses). \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Table 3.** Estimation results from model 2 (No indirect relationships).

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	q10	q25	q50	q75	q90
Export (dummy)	-0.0858 (0.2791)	-0.3094 (0.5861)	-0.3726 (0.3888)	-0.1604 (0.2937)	0.1876 (0.3017)	0.0401 (0.3911)
Technology (dummy)	0.4371* (0.2264)	0.7238 (0.4509)	0.3963 (0.3391)	0.3736 (0.2619)	0.2608 (0.2738)	0.3757 (0.3283)
Firm size	0.0014 (0.0012)	0.0003 (0.0026)	0.0010 (0.0012)	0.0011 (0.0013)	0.0019 (0.0014)	0.0025 (0.0018)
Workers' education	0.0061** (0.0029)	0.0078 (0.0076)	0.0131*** (0.0048)	0.0101*** (0.0034)	0.0015 (0.0030)	0.0031 (0.0035)
Experience (log)	-0.0452 (0.1185)	-0.4750 (0.2987)	-0.2289 (0.1742)	-0.1225 (0.1435)	0.0869 (0.1431)	0.2090 (0.1758)
Share of imported input	0.0017 (0.0023)	0.0064 (0.0059)	0.0046 (0.0038)	0.0023 (0.0027)	0.0009 (0.0023)	-0.0027 (0.0032)
Female in production	0.7628 (0.5476)	1.9785** (0.9514)	0.8331 (1.0002)	0.5896 (0.7163)	0.4097 (0.6646)	0.2396 (0.7733)
Female top manager	-0.0532 (0.2853)	0.4883 (0.6009)	-0.0061 (0.5039)	-0.4515 (0.3468)	-0.2598 (0.2790)	-0.2236 (0.3395)
Female owner	-0.0804 (0.6867)	0.8511* (0.4432)	-0.2226 (1.3771)	-0.6238 (1.1779)	0.3741 (1.2422)	-0.3699 (0.4213)
<i>Firm's legal status:</i>						
Shareholding company	0.8058* (0.4312)	1.0229 (0.9892)	1.2504** (0.5269)	0.5748 (0.4836)	0.7260 (0.5488)	0.4672 (0.6836)
Partnership	0.4654* (0.2495)	0.4143 (0.4966)	0.2529 (0.3459)	0.4342 (0.2769)	0.5926** (0.2876)	0.7672** (0.3856)
<i>Manufacturing sub-sector:</i>						
Food	0.0615 (0.2955)	0.5002 (0.6877)	0.1212 (0.4924)	0.1556 (0.3465)	-0.5754* (0.3074)	0.0954 (0.4388)
Publishing/printing	0.0041 (0.2662)	1.1418** (0.5611)	-0.2054 (0.4585)	-0.1038 (0.3358)	-0.1382 (0.3452)	-0.7180** (0.3257)
Plastic, non-metal	-0.3734 (0.3298)	-0.0702 (0.9690)	0.3935 (0.4921)	-0.4221 (0.3681)	-0.6899* (0.3532)	-0.8994** (0.4513)
Metallic, machinery	-0.0164 (0.2855)	0.4809 (0.8141)	0.6318 (0.4309)	-0.2627 (0.3117)	-0.4480 (0.2930)	-0.2388 (0.3790)
<i>Location:</i>						
Accra	0.2682 (0.2662)	1.3273* (0.7787)	0.3300 (0.4475)	0.1196 (0.2882)	-0.0382 (0.2484)	-0.1513 (0.3318)
Takoradi	0.1811 (0.3971)	0.8374 (1.3488)	-0.0627 (0.7054)	-0.1667 (0.4082)	0.0669 (0.4086)	0.4867 (0.5580)
Tema	0.9050*** (0.3145)	2.3436*** (0.7825)	1.0945** (0.4651)	0.6428* (0.3449)	0.8267** (0.3420)	0.5794 (0.4258)
Constant	5.9681*** (0.4385)	3.0018** (1.2135)	4.7507*** (0.6452)	6.3236*** (0.4556)	7.3959*** (0.4512)	8.2045*** (0.6190)
Observations	269	269	269	269	269	269
R-squared	0.1671 (0.2855)	0.1129 (0.8141)	0.1239 (0.4309)	0.1476 (0.3117)	0.1611 (0.2930)	0.1323 (0.3790)

Robust standard errors for OLS and bootstrapped standard errors for the UQR are all given in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

From Table 2, where export is considered as the only independent variable, the OLS results show statistically insignificant relationship between export and wage bill. However, the estimation results from the UQR reveal a statistically significant relationship at the 75th quantile of the distribution. On the surface, this result seems to give an indication of wage premium at the upper quantile.

On the other hand, both the OLS and UQR results from model 2 indicate that after controlling for other plausible factors (excluding the interactive terms), none of the estimated coefficients of export are statistically significant, confirming the earlier assertion. Therefore, relying solely on the results from this tradition approach (of ignoring the

**Table 4.** Estimation results from model 3 (direct and indirect relationships).

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	q10	q25	q50	q75	q90
Export (dummy)	0.2947 (0.8037)	0.4259 (1.5543)	-0.4833 (1.2372)	0.7153 (0.8389)	-0.3903 (0.7186)	0.0437 (1.0484)
Technology (dummy)	0.0979 (0.2513)	0.4971 (0.5022)	0.1151 (0.4101)	0.2003 (0.3120)	-0.1143 (0.3027)	-0.0363 (0.3616)
Export×Technology	0.9623* (0.5254)	0.3905 (1.0657)	0.7922 (0.7563)	0.3749 (0.5607)	1.1234* (0.5903)	1.2868* (0.7756)
Firm size	0.0034*** (0.0011)	0.0036** (0.0018)	0.0026** (0.0011)	0.0031*** (0.0010)	0.0034** (0.0016)	0.0040 (0.0026)
Export×Firm size	-0.0033* (0.0018)	-0.0056 (0.0041)	-0.0025 (0.0019)	-0.0036* (0.0018)	-0.0022 (0.0022)	-0.0022 (0.0034)
Workers' education	0.0078** (0.0031)	0.0093 (0.0085)	0.0136*** (0.0050)	0.0119*** (0.0036)	0.0016 (0.0032)	0.0045 (0.0038)
Export×education	-0.0084 (0.0095)	-0.0079 (0.0155)	-0.0011 (0.0156)	-0.0115 (0.0106)	0.0032 (0.0094)	-0.0060 (0.0125)
Experience (log)	-0.0709 (0.1178)	-0.5122* (0.3030)	-0.2409 (0.1731)	-0.1551 (0.1393)	0.0829 (0.1420)	0.1923 (0.1779)
Share of imported input	0.0020 (0.0022)	0.0075 (0.0060)	0.0046 (0.0039)	0.0031 (0.0027)	0.0006 (0.0023)	-0.0029 (0.0031)
Female in production	0.8920 (0.5483)	2.1311** (0.9980)	0.8906 (1.0278)	0.7400 (0.6954)	0.4333 (0.6614)	0.3381 (0.7540)
Female top manager	-0.1025 (0.2774)	0.4503 (0.5986)	-0.0395 (0.5090)	-0.4870 (0.3416)	-0.2978 (0.2816)	-0.2771 (0.3302)
Female owner	-0.0295 (0.6212)	0.9359** (0.4473)	-0.1898 (1.3821)	-0.5632 (1.1276)	0.3972 (1.1578)	-0.3373 (0.3878)
<i>Legal status:</i>						
Shareholding company	0.7670* (0.4208)	0.9506 (0.9815)	1.2143** (0.5216)	0.5365 (0.4722)	0.6881 (0.5642)	0.4401 (0.6946)
Partnership	0.4210* (0.2482)	0.3939 (0.4923)	0.2334 (0.3421)	0.3979 (0.2818)	0.5759** (0.2869)	0.7180* (0.3949)
<i>Manufacturing sub-sector:</i>						
Food	0.0167 (0.2986)	0.4603 (0.6939)	0.1157 (0.4928)	0.0945 (0.3412)	-0.5579* (0.3111)	0.0627 (0.4562)
Publishing/Printing	0.0438 (0.2669)	1.1578** (0.5635)	-0.1687 (0.4651)	-0.0927 (0.3389)	-0.0836 (0.3468)	-0.6627** (0.3246)
Plastic, non-metal	-0.2846 (0.3313)	0.1103 (1.0208)	0.4354 (0.5108)	-0.2844 (0.3794)	-0.6902* (0.3550)	-0.8665* (0.4403)
Metal	0.0049 (0.2886)	0.4908 (0.8220)	0.6395 (0.4387)	-0.2435 (0.3134)	-0.4434 (0.2951)	-0.2162 (0.3808)
<i>Location:</i>						
Accra	0.2570 (0.2658)	1.3189* (0.7806)	0.3212 (0.4491)	0.1129 (0.2863)	-0.0494 (0.2472)	-0.1643 (0.3335)
Takoradi	0.1708 (0.4083)	0.8140 (1.3575)	-0.0495 (0.7123)	-0.2029 (0.4135)	0.1043 (0.4157)	0.4938 (0.5770)
Tema	0.8583*** (0.3124)	2.2990*** (0.7896)	1.0603** (0.4654)	0.6077* (0.3458)	0.7879** (0.3399)	0.5315 (0.4165)
Constant	5.9445*** (0.4465)	2.8942** (1.2384)	4.7654*** (0.6621)	6.2309*** (0.4699)	7.4650*** (0.4574)	8.2382*** (0.6128)
Observations	269	269	269	269	269	269
R-squared	0.1888	0.1184	0.1297	0.1614	0.1808	0.1463

Robust standard errors for OLS and bootstrapped standard errors for the UQR are all given in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

indirect relationship) as others have done (Bernard et al., 1995; Schank et al., 2010, 2007), will lead to the conclusion that exporters do not pay higher wage than their domestic counterparts in the Ghanaian manufacturing industry. This will then contradict both the

theoretical literature and other empirical findings (see for instance Helpman et al., 2016; Schank et al., 2007; Bernard and Jensen, 1999; Bernard et al., 1995).

Estimation results from model 3—which accounts for direct and indirect relationships of export – are shown in Table 4. As already said, the indirect relationships are examined through three plausible channels: the use of advanced technology, the size of the firm and workers' education. A general observation is that the relationship between export and firm's wage bill per worker is found to be statistically significantly indirect but not direct. To be more specific, while the direct export variable meets the expected sign, the paper only finds its indirect relationships to be statistically significant. Thus, the interactive term for export and technology is found to be statistically significantly positive from the OLS results. The UQR reveals that the indirect relationships through technology are statistically significant at the more upper parts of the wage bill distribution, specifically at the 75th quantile and 90th decile. On the other hand, the interactive term for export and firm size is statistically significantly negative at the mean (from the OLS) and 50th quantile (from the UQR), implying higher wage bill among small exporting firms than their large counterparts.

Therefore, this paper follows the literature (see Asongu & Nwachukwu, 2018a, 2018b; Tchamyou, 2018; Tchamyou & Asongu, 2017) to examine the extent to which export modulates the relationships of technology and firm size across the distribution. To do this, the net relationships of the interaction between export and technology and that of export and firm size are computed and compared. For consistency, the computations are done for the parts of the distribution where the interactive terms are statistically significant. From the OLS, the mean estimates show the net relationship of the interaction between export and technology to be 1.0602  $((1 \times 0.9623) + 0.0979)$ . Where the value for export (firms that export) is 1 since export is a dummy variable, the unconditional relationship of technology is 0.0979 and the conditional relationship from the interaction between technology and export is 0.9623. If export is a continuous variable, then the mean value can be used for the computation (Asongu & Nwachukwu, 2018a; Tchamyou & Asongu, 2017). Similarly, the net relationships of the interaction between export and technology at the 75th quantile and 90th decile are reported to be 1.0091  $((1 \times 1.1234) + (-0.1143))$  and 1.2505  $((1 \times 1.2868) + (-0.0363))$  respectively. On the other hand, the net relationships of the interaction between export and firm size at the mean (from the OLS) and the 50th quantile are respectively 0.0001  $((1 \times -0.0033) + 0.0034)$  and  $-0.0005 ((1 \times -0.0036) + 0.0031)$ . Hence, the findings reveal the net relationships of the interaction between export and technology to be generally positive while the net relationships of the interaction between export and firm size are positive and negative at the mean and 50th quantile respectively. Another key finding is that the net relationships of the interaction between export and technology are relatively larger (in magnitudes) than that of the interaction between export and firm size.

However, the results on the interactive term for export and education is found to be surprisingly statistically insignificant and thus contradicts the empirical findings of Munch and Skaksen (2008). The implication is that labor returns to education in exporting firms are not statistically significantly different from domestic firms in the manufacturing sector of Ghana.

Apart from export status and the interactive variables, the present wage premium is found to be attributable to some other factors. Focusing on the estimates from the full

model (thus, model 3), for instance, shareholding firms and partnerships are found to be associated with higher wage premium than sole proprietorships. Comparatively, at the upper quantiles, lower wage premium is found to be associated with manufacturing firms that are engaged in food, publishing/printing, and plastic/non-metal products. Very expectedly, firms located in Tema (the most industrialized city) are found to be paying higher premium to their workers; it is only at the 10th quantile where firms in the capital city, Accra, are found to be associated with higher wage premium.

### The decomposition results: OB and UQD

Table 5 provides summary results from the Oaxaca-Blinder mean decomposition in column (1) and the unconditional quantile decomposition in columns (2) to (6). The results reveal a higher wage bill per worker for exporters than non-exporters. While the difference is found to be statistically insignificant at the mean, the results from the quantile decomposition reveal significant wage differentials across all quantiles. The exporter premium first declines significantly from 0.2903 at the bottommost (10th) decile to 0.2271 at the 25th quantile and thereafter increases monotonically to 0.6567, 0.8538 and 1.1959 at the 50th and 75th quantiles and 90th decile respectively. This shows much wage dispersion at the more upper part of the distribution.

What are the main source of the observed significant wage dispersions across the distribution? As already explained above (Barsky et al., 2002; Fortin et al., 2010), we seek to pay more attention to the estimates from the UQD as it provides a more consistent and robust estimates than the OB. Thus, from the UQD method, the wage structure effect is found to be the major component of the exporter wage gap, accounting for over 90% of the variations across all quantiles. Thus, the wage bill inequality gap is found to be attributable to the differences in the returns to (or prices of) the characteristics between exporting and non-exporting firms. This component is consistent with inefficiencies and sometimes discriminations in the market which favor exporting firms than non-exporting ones.

**Table 5.** The main sources of exporter log wage differentials/inequalities.

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	q10	q25	q50	q75	q90
Export firm	7.3841*** (0.2697)	5.1187*** (0.0082)	6.2679*** (0.0103)	7.6040*** (0.0099)	8.6430*** (0.0076)	9.7905*** (0.0047)
Non-export firm	6.9459*** (0.1047)	4.8284*** (0.0044)	6.0408*** (0.0051)	6.9473*** (0.0051)	7.7891*** (0.0040)	8.5947*** (0.0025)
Difference	0.4382 (0.2893)	0.2903*** (0.0093)	0.2271*** (0.0115)	0.6567*** (0.0111)	0.8538*** (0.0086)	1.1959*** (0.0054)
Explained	0.5927*** (0.1717)	0.0123* (0.0071)	0.0147* (0.0083)	0.0259*** (0.0082)	0.0180*** (0.0063)	0.0144*** (0.0045)
Unexplained	-0.1544 (0.3207)	0.2780*** (0.0113)	0.2124*** (0.0133)	0.6308*** (0.0131)	0.8359*** (0.0100)	1.1815*** (0.0069)
Observations	269	269	269	269	269	269

Robust standard errors for OLS and bootstrapped standard errors for the UQR are all given in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

## Conclusion and recommendation

This work attempted to analyze the reality of the exporter wage premium hypothesis for Ghanaian manufacturing sector. Relying on the World Bank Enterprise survey for Ghana in 2012/13, the paper applied the ordinary least square and unconditional quantile regressions to primarily estimate the direct and indirect relationships between export and firm's wage bill. This paper relied also on the unconditional quantile decompositions to examine the sources of the wage premium/gap across the distribution. The estimation shows that the relationships between export and firms' wage bill per worker are statistically significantly indirect but not direct. Thus, the paper finds the interaction between export and the use of advanced technology to be statistically significantly positive while that of the interaction between export and the size of the firm is found to be rather statistically significantly negative. Very remarkably, the unconditional quantile regression reveals that these indirect relationships of export are much more pronounced at the upper quantiles of the wage bill distribution. However, the net relationships of the interaction between export and technology are relatively larger and positive as compared to that of the interaction between export and firm size which are marginal and mixed.

Further, the unconditional quantile decomposition analysis reveals the main sources of the exporter wage premium to be due to the differences in the returns to (or prices of) the characteristics of exporting and non-exporting firms. This implies that the prevailing market conditions do favor the labor force in the exporting firms than their counterparts in domestic firms. The findings from this paper suggest directions for future work that can be directly useful for policy.

However, as common in the literature, this paper is not without any limitation. The data reported information at the firm level rather than at the individual employee level. This therefore makes it impossible to analyze the presence of exporter premium within certain cohorts of workers-like skilled and unskilled labor, productive and unproductive labor-as examined by others (Munch & Skaksen, 2008; Postel-Vinay & Robin, 2002; Bernard and Jensen, 1999). Also, in contrast to other empirical papers (like Munch & Skaksen, 2008; Schank et al., 2010) that had access to panel dataset to show some dynamic and trend analysis, this paper relied on a cross sectional data due to the unavailability of a more appropriate and recent longitudinal data on manufacturing firms in Ghana. Hence, results are to be interpreted in terms of association rather than causality. Therefore, future studies that seek to examine the hypothesis are encouraged to incorporate these issues in their analysis.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## References

- Abor, J. (2011). Do export status and export intensity increase firm performance? *Thunderbird International Business Review*, 53(1), 9–18.
- Andreoni, J., & Levinson, A. (2001). The simple analytics of the environmental Kuznets curve. *Journal of Public Economics*, 80, 269–286.

- Asongu, S. A., & Nwachukwu, J. C. (2018a). Openness, ICT and entrepreneurship in Sub-Saharan Africa. *Information Technology & People*, 31(1), 278–303.
- Asongu, S. A., & Nwachukwu, J. C. (2018b). Educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, 129, 164–172.
- Autor, D. H., Katz, L. F., & Krueger, A. B. (1998). Computing inequality: Have computers changed the labor market? *The Quarterly Journal of Economics*, 113(4), 1169–1213.
- Barsky, R., Bound, J., Charles, K., & Lupton, J. (2002). Accounting for the Black-White wealth gap: A nonparametric approach. *Journal of the American Statistical Association*, 97, 663–673.
- Bernard, A. B., & Jensen, J. B. (1997). Exporters, skill upgrading, and the wage gap. *Journal of International Economics*, 42(1–2), 3–31.
- Bernard, A. B., & Jensen, J. B. (1999). Exceptional exporter performance: Cause, effect, or both? *Journal of International Economics*, 47(1), 1–25.
- Bernard, A. B., Jensen, J. B., & Lawrence, R. (1995). Exporters, jobs, and wages in U.S. manufacturing: 1976–1987. *Brookings Papers on Economic Activity: Microeconomics*, 1995, 67–119.
- Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. (2007). Firms in international trade. *The Journal of Economic Perspectives*, 21(3), 105–130.
- Biesebroeck, J. V. (2005). Exporting raises productivity in sub-Saharan African manufacturing firms. *Journal of International Economics*, 67, 373–391.
- Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human Resources*, 8, 436–455.
- Boermans, M. A. (2013). Learning-by-exporting and destination effects: Evidence from African SMEs. *Applied Econometrics and International Development*, 13(2), 156–173.
- Burdett, K., & Mortensen, D. T. (1998). Wage differentials, employer size, and unemployment. *International Economic Review*, 39(2), 257–273.
- Deshpande, A., & Sharma, S. (2016). Disadvantage and discrimination in self-employment: Caste gaps in earnings in Indian small businesses. *Small Bus Econ*, 46, 325–346.
- Dinda, S. (2004). Environmental Kuznets curve hypothesis: A survey. *Ecological Economics*, 49, 431–455.
- Domeher, D., Musah, G., & Hassan, N. (2017). Inter-sectoral differences in the SME financing gap: Evidence from selected sectors in Ghana. *Journal of African Business*, 18(2), 194–220.
- Edwards, L. (2004). A firm level analysis of trade, technology and employment in South Africa. *Journal of International Development*, 16, 45–61.
- Firpo, S., Fortin, N. M., & Lemieux, T. (2009). Unconditional quantile regressions. *Econometrica*, 77(3), 953–973.
- Fortin, N., Lemieux, T., & Firpo, S. (2010). Decomposition methods in economics. Working Paper No. 16045, National Bureau of Economic Research (NBER).
- Gebrewahid, G. G., & Wald, A. (2017). Export barriers and competitiveness of developing economies: The case of the Ethiopian leather footwear industry. *Journal of African Business*, 18(4), 396–416.
- Goedhuys, M., & Sleuwaegen, L. (2010). High-growth entrepreneurial firms in Africa: A quantile regression approach. *Small Bus Econ*, 34, 31–51.
- GSS. (2014). *Ghana living standards survey sixth round (GLSS6) report*. Accra, Ghana: Ghana Statistical Service.
- Hansen, M. W., Langevang, T., Rutashobya, L., & Urassa, G. (2018). Coping with the African business environment: Enterprise strategy in response to institutional uncertainty in Tanzania. *Journal of African Business*, 19(1), 1–26.
- Hanson, G., & Harrison, A. (1995). Trade, technology and wage inequality. Working Paper no. 5110, National Bureau of Economic Research.
- Helpman, E., Itskhoki, O., Muendler, M. A., & Redding, S. J. (2016). Trade and inequality: From theory to estimation. *Review of Economic Studies*, 01, 1–53.
- Hettige, H., Mani, M., & Wheeler, D. (2000). Industrial pollution in economic development: The environmental Kuznets curve revisited. *Journal of Development Economics*, 62, 445–476.

- Kasseeah, H., & Thoplan, R. (2012). Access to financing in a small Island economy: Evidence from Mauritius. *Journal of African Business*, 13(3), 221–231.
- Kleemann, L., & Abdulai, A. (2013). The impact of trade and economic growth on the environment: Revisiting the cross-country evidence. *Journal of International Development*, 25, 180–205.
- Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica*, 46(1), 33–50.
- Koenker, R., & Hallock, K. F. (2001). Quantile regression. *The Journal of Economic Perspectives*, 15(4), 143–156.
- Lee, B. J., & Lee, M. J. (2006). Quantile regression analysis of wage determinants in the Korean labor market. *The Journal of the Korean Economy*, 7(1), 1–31.
- Love, J. (1982). The determinants of export performance of developing countries. *Journal of Economic Studies*, 9(3), 55–60.
- Martins, P. S., & Pereira, P. T. (2004). Does education reduce wage inequality?: Quantile regression analysis from 16 countries. *Labour Economics*, 11, 355–371.
- Milner, C., & Tandrayen, V. (2004). The impact of exporting and export destination on manufacturing wages: Evidence for Sub-Saharan Africa. Research Paper No. 04/01, CREDIT.
- Munch, J. R., & Skaksen, J. R. (2008). Human capital and wages in exporting firms. *Journal of International Economics*, 75, 363–372.
- Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 14, 693–709.
- Oaxaca, R. L., & Ransom, M. R. (1999). Identification in detailed wage decompositions. *Review of Economics and Statistics*, 81(1), 154–157.
- Postel-Vinay, F., & Robin, J. M. (2002). Equilibrium wage dispersion with worker and employer heterogeneity. *Econometrica*, 70(6), 2295–2350.
- Rangasamy, L. (2009). Exports and economic growth: The case of South Africa. *Journal of International Development*, 21, 603–617.
- Roberts, S., & Thoburn, J. T. (2004). Globalization and the South African textiles industry: Impacts on firms and workers. *Journal of International Development*, 16, 125–139.
- Robson, P. J. A., & Freel, M. (2008). Small firm exporters in a developing economy context: Evidence from Ghana. *Entrepreneurship & Regional Development*, 20(5), 431–450.
- Sampson, T. (2014). Selection into trade and wage inequality. *American Economic Journal: Microeconomics*, 6(3), 157–202.
- Schank, T., Schnabel, C., & Wagner, J. (2007). Do exporters really pay higher wages? First evidence from German linked employer-employee data. *Journal of International Economics*, 72(1), 52–74.
- Schank, T., Schnabel, C., & Wagner, J. (2010). Higher wages in exporting firms: Self-selection, export effect, or both? First evidence from linked employer-employee data. *Review of World Economics/Weltwirtschaftliches Archiv*, 146(2), 303–322.
- Seth, N. B. (2002). Financing non-traditional exports in Ghana. *Journal of Business & Industrial Marketing*, 17(6), 501–522.
- Stern, D. I., Common, M. S., & Barbier, E. B. (1996). Economic growth and environmental degradation: The environmental Kuznets curve and sustainable development. *World Development*, 24, 1151–1160.
- Tchamy, V. S. (2018). Education, lifelong learning, inequality and financial access: Evidence from African countries. *Contemporary Social Science*. doi:10.1080/21582041.2018.1433314
- Tchamy, V. S., & Asongu, S. A. (2017). Information sharing and financial sector development in Africa. *Journal of African Business*, 18(7), 24–49.
- Verhoogen, E. A. (2008). Trade, quality upgrading, and wage inequality in the Mexican manufacturing sector. *The Quarterly Journal of Economics*, 489–530.
- Vincent, J. R. (1997). Testing for environmental Kuznets curves within a developing country. *Environment and Development Economics*, 2, 417–431.
- Xiangkang, Y., & Xiangshuo, Y. (2005). Can developing countries benefit from export promotion? *Journal of Economic Studies*, 32(1), 60–80.
- Yeaple, S. R. (2005). A simple model of firm heterogeneity, international trade, and wages. *Journal of International Economics*, 65, 1–20.