Firm-size and wages: a case study of the manufacturing sector in Zimbabwe

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Thesis submitted in partial fulfilment of the requirements for the degree of Master of Commerce (Economic Science)

School of Economics

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March 2021

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Acknowledgement

This thesis would not have been possible without the guidance and tireless support from my supervisor Professor Haroon Bhorat. I am very grateful for the time he spent reading. and providing me with feedback and assisting me at every stage of this research. I have benefitted greatly from his expertise, immense knowledge of the subject and mentorship.

I would like to thank the National Research Fund (NRF) SARChair through Professor Bhorat as the Grant holder for funding my master's studies. The Beit trust scholarship and the International/Refugee scholarship for providing me with extra funds to cushion my studies. The School of Economics at UCT provided a stimulating research and learning environment.

Finally, I am indebted to my husband Godfrey Kamutando for his ever-present, enduring support and unconditional love throughout this journey. He gave me all the support that I needed and always encouraged me not to give up. Special thanks to our kids Taneisha and Aiden for their patience and for giving a smile when things got tough. To my mom Constance Kupeta for taking care of Aiden and to my in-laws Killian and Petronella Kamutando for the support. I would also like to thank my entire extended family for their support and encouragement.

Dedication

To my husband Godfrey, and my children Taneisha and Aiden.

Abstract

It has long been argued in the mainstream literature that workers in large firms earn higher wages than those in smaller firms. This phenomenon is recognised as an important puzzle that explains wage disparities in labour markets. This thesis analyses the link between firm size and wages in the Zimbabwean manufacturing sector and it is structured around three main research questions: (1) What is the link between firm size and wages in the formal and informal manufacturing sector in Zimbabwe? (2) Is there a firm-size wage premium in the formal and informal manufacturing sector in Zimbabwe? (3) If yes, what are the sources of the firm-size wage premium? The analysis of the study draws on the Matched Employer-Employee manufacturing firm-level survey dataset for formal and informal sector firms and workers that was collected in 2015. Using this dataset, we are able to distinguish between theories that attribute wage disparities to worker heterogeneity and those that hypothesise the importance of firm heterogeneity, which advances the existing literature by including the informal sector and a developing country case. We then apply the Mincerian wage regression approach to determine the magnitude, significance, and sources, of the firm size-wage premium. We control for a variety of human capital, individual, job, and firm characteristics to determine the source of the firm size wage relationship. The empirical results indicate a positive and significant association between firm size and wages in both the formal and informal sectors, as theoretically expected. The firm-size premium is more nuanced in the informal sector. Human capital endowments are found to contribute to the firm size-wage relations, at least for the formal sector. Job characteristics did not explain major variation in firm-size wage relationships. Thus, apart from human capital characteristics, most theories cannot explain the wage premium received by large firms. The results further indicate that capital intensity and firm productivity are important in shaping the firm size wage premium, although they did not alter the size effect much.

Table of Contents

List of Figures

List of Tables

List of Acronyms

2SLS	2 stage Least Square
GMM	Generalised Measure of Moments
K/L	Capital per labour ratio
OLS	Ordinary Least Square
SSA	Sub-Sahara Africa
UK	United Kingdom
US	United States
V/L	Valued added per Labour

1. Introduction

It has long been argued in the mainstream literature that workers in large firms earn higher wages than those in smaller firms (Brown and Medoff, 1989; Morissette, 1993). This phenomenon is recognised as an important puzzle that explains wage disparities in labour markets. For example, Oi and Idson (1999) found that workers in large firms earn 35 percent higher than those in smaller firms in the US. The importance of firm characteristics in explaining labour market outcomes may therefore be critical in explaining inequalities in labour markets, such as wage inequalities.

Although the empirical evidence of firm-size wage premium appears to be well documented, reasons as to why such a premium exists remain a subject of much debate in the literature (Brown and Medoff, 1989; Schmidt and Zimmerman, 1991; Main and Reilly 1993; Oi and Idson, 1999). While this subject is of particular importance, little is still known on the extent to which firm characteristics such as firm size and capital intensity may help to determine wage differences in developing countries-let alone Zimbabwe.

Notwithstanding the growing importance of firm-size wage premium, the paucity of studies in the context of developing and emerging economies has largely been constrained by the unavailability of suitable datasets. Although most of the theoretical predictions stress the need to match workers and firms (employers) to provide a plausible test for the firm-size wage premium, much of the conventional empirical literature has relied on either household and labour force surveys with very limited information of firm characteristics (Schmidt and Zimmermann, 1991). Other previous studies have relied on firm surveys that have little information on worker characteristics (Dunne and Schmitz, 1992)

Another area that has not received much attention in the literature is the inclusion of the informal sector into the analysis of the firm-size wage premium. Yet, in most emerging and developing economies including Zimbabwe, the informal sector constitutes more than 60 % of employment and contributes significantly towards the national economy (Binswanger-Mkhize and Moyo, 2012; Medina & Schneider, 2018). The exclusion of the informal sector may lead to biased estimates of the firm size-wage coefficient. While Velenchik (1997), and Strobl and Thornton (2002) tested the firm-size wage premium for Zimbabwe, our study contributes to this literature by incorporating the informal sector-which is a large sector in Zimbabwe.

Further, studies that have only incorporated the formal sector have treated formal workers as homogenous and tested how firm size is related to wages. Yet, formal labour market workers are heterogeneous in most developing economies. For example, formal labour markets may be divided based on employee contracts (e.g., permanent vs part-time workers). Thus, a large firm may pay these workers different wages based on their contracts. Hence, we may also have within-firm wage differences that may not be captured should one assume homogenous labour markets.

This paper, therefore, seeks to address the gap in the literature by using the matched employee-employer dataset for the Zimbabwe formal and informal manufacturing firms and workers collected in 2015.[1] The main objective of this paper is to test firm-size wage premium, with rigour, between the formal and informal labour markets. We specifically test for the following questions.

1. What is the link between firm size and wages in the formal and informal manufacturing sector in Zimbabwe?
2. Is there a firm-size wage premium in the formal and informal manufacturing sector in Zimbabwe?
3. If so, what are the sources of the firm-size wage premium?

Using the matched employer-employee dataset offers unique and several advantages in testing the above research questions. First, the data allows us to control for both firm (demand-side) and worker (supply-side) characteristics in accounting for the firm-size wage differences in Zimbabwe. To our knowledge, no such has been done in the context of Zimbabwe which incorporates the informal sector. The analysis in this paper adds to the existing literature by providing the relative importance of firm and individual characteristics in explaining wages and determine how this varies between the formal and informal sector labour markets. The findings of this study can be easily generalised to other developing economies with large informality and can also be compared to other studies in the context of developing economies.

The analysis of this paper draws on the methodology by Troske 1999. This methodology allows us to decompose the wage gap and determine the extent to which firm size contributes to wage differences.

[1] For access to the data, please see https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/702/study-description .

Zimbabwe provides a suitable case study to analyse the above research questions in the context of emerging economies. First, Zimbabwe has a large informal labour market that coexists with the formal labour market. Hence, we can take into account the multiplicity of the labour markets between sectors. Second, Zimbabwe shares many common characteristics with other emerging economies, such as the existence of distorted markets, the sectoral structure of employment, and unionism. The results of this chapter can easily be generalised to other emerging economies.

This study makes some key contributions. First, it uses a recent employer-employee matched survey dataset on informal and formal manufacturing sector firms and employees. This data allows one to control for both firm-specific characteristics and individual characteristics. Second, we incorporate the informal sector into the analysis of the link between firm size and wages. Most of the studies in literature only focus on the formal sector despite that the informal sector is abundant in many developing economies.

1.1. Background performance of the Zimbabwean formal and informal manufacturing sector.

Zimbabwe is a low-income economy emerging from a decade of long economic crisis. From 2000 to 2009, the Zimbabwean economy collapsed in the face of hyperinflation and severe micro-macro economic imbalances. With the stabilization and reduction of inflation in response to the dollarization of the economy in 2009, growth recovered, averaging close to 8 percent per annum from 2009 to 2011 (World Bank, 2016), but has subsequently collapsed. It is argued, that in the face of these economic crises, Zimbabwe has experienced a structural regression, with the acceleration of deindustrialisation and informalisation of the economy (CZI, 2012). The manufacturing firms operate in an environment of economic volatility and policy uncertainty.

With declining output production capacity in the formal manufacturing sector, high levels of unemployment and dwindling wage earnings have of late exacerbated poverty levels through reduced household income in Zimbabwe. According to the literature (see World Bank, 2016; CZI, 2012), the informal sector assumed greater prominence through its absorption of retrenched workers, the unemployed tertiary college graduates and school leavers and as a source of livelihoods. However, direct policy to enhance production and employment in the informal manufacturing sector has been marginal.

The informal sector co-exists with the formal sector since the early 1990s. The growth of the informal sector in Zimbabwe can be traced to the economic structural adjustment programme of 1990-1995. The adjustment policies led to the shrinking of the formal sector. With retrenchments, company closures and lack of capacity for the formal sector to create jobs, the informal sector expanded massively. The informal sector gradually started growing by absorbing excess labour from the formal sector. Today the informal sector has a huge presence in Zimbabwe.

While wages in the formal sector are regulated, the implementation of these regulations is weak given the economic meltdown. A common way that firms have responded to low levels of demand and economic uncertainty in Zimbabwe has been to only pay wages sporadically, for example when they receive outstanding payments from their customers. This has eroded the wages of the formal workers, to the extent that some workers go months without receiving salaries.

The rest of this dissertation is structure as follows. Section 2 provides a brief overview of the theoretical and empirical literature while Section 3 presents the methodology and data. Results are discussed in section 4 and, lastly, the conclusion is presented in section 5.

2. Theoretical and Empirical Review

2.1. Theoretical review

The paper is guided by the theoretical models that link the relationship between firm size and wages. The theoretical foundations underpinning this analysis are vast and varied. Holding everything equal, the productivity of workers under a competitive environment should determine workers' wages. This means that there are supposed to be no differences in the pay of workers with similar skills. However, empirical literature shows that there exists a wage gap between workers of similar characteristics due to differences in firm or employer size (Brown and Medoff 1989; Green et al. 1996, Troske 1999). The question that guides the discussion in this section is what drives the firm size wage variation.

Several theories explain the differences in wages of workers with the same characteristics which arise due to differences in employer size. Neoclassical and institutional theories have given light to the reasons why bigger firms offer more wages compared to smaller firms. The neoclassical perspective emphasises working conditions or labour quality in explaining the

wage size differentials. Whilst the institutionalist view focuses on factors such as rent sharing and market power, and unionisation. First, employees receive higher wages as a way to compensate for undesirable working conditions which are positively associated with firm size.

Second, the Lucas model (1978) states that big firms employ more sophisticated physical capital which requires highly skilled workers to operate the capital (Griliches, 1970; Hamermesh, 1980; Reily 1995) and highly skilled managers operate the biggest firm hence, they employ most skilled personnel to complement the capital stock. This means that wages will go up due to the skill requirement and will give rise to the firm size wage differences. In addition to the issue of technology, big firms can offer training to their workers thereby increases the specialisation of work (Dunne and Schmitz 1995). There is a need to control for the capital-labour ratio to correct for the firm size wage differences.

Third, according to the Oi model (1983), large firms are associated with high monitoring costs so they trade-off between less monitoring costs and higher wages (Oi and Idson 1999). This is known as the efficiency wage model in the labour market where employers pay their workers' wages above the market-clearing wage to attract highly skilled workers who require less monitoring. Managers share their time between managing the firm and monitoring workers. Shapiro and Stiglitz (1984) argue that firms are likely to use this way of curbing monitoring costs if there are diseconomies of scale in monitoring. Thereby resulting in higher wages for bigger firms. Therefore, there is a need to control the amount of monitoring within a firm and the skill of managers.

Moreover, the wage differential as a result of firm size can be explained by union levels between firms with different sizes. There are two schools of thought on the argument of firm size and unionisation. On one hand, according to Pedace (2010), bigger firms offer wages above the market-clearing in an attempt to discourage workers from joining unions. On the other hand, according to Belfield and Wei (2004), it is a stylised fact that there is a positive relationship between unionisation and firm size. The larger the firms the more frequent are the unions.

Furthermore, rent sharing and market power have been used to explain the difference between wages due to firm size. Larger firms are normally found in industries with less competition hence they earn higher profits which can now be shared with their employees (Weiss 1966, Mellow 1982; Akerlof and Yellen 1990). Nevertheless, there is no clear explanation of the

channels and reasons for the occurrence of rent-sharing. There is a debate in the literature of whether employees can extract rents from profitable firms or profitable firms share the rents). Hence, the market power of a firm needs to be controlled. Likewise, Brown and Medoff (1989) state that the firm size wage premium is attributed to those firms which are likely to survive and grow. Thus, plant age has to include in the estimation to eliminate the effect of firm size.

Lastly, another alternative hypothesis is that firm ownership shapes the determination of wages. There is an argument that foreign-owned firms pay higher wages than domestic owned firms (Strand, 2002). In most developing countries it is often that most foreign-owned firms are multi-national companies, and more likely to abide by local labour market regulations- and hence ultimately more likely to pay workers more (Aitken, Harrison & Lipsey, 1996). Besides, there is a debate that foreign firms are more likely to attract high-quality workforce, are more productive and hence able to share their rents with workers (Budd et al., 2002).

2.2. Empirical Literature Review

Differences in the theoretical formulations of the relationship between wages and firm size have resulted in different views and findings in the empirical literature. This section provides a review of the literature on the relationship between firm size and wages, focusing on the empirical methods, the data and key findings.

Different datasets and methods have been used to analyse the link between firm size and wages. Earlier studies have tested the relationship using either household, labour, or firm surveys (Abowd, Kramarz, & Margolis, 1999; Brown and Medoff, 1989, Schmidt and Zimmermann, 1991; Dunne and Schmitz, 1992). For example, Brown and Medoff (1989) applied OLS on different datasets: the Current Population Survey and Quality Employment Survey (QES) for individual characteristics, and the Wage Distribution Survey, Employer Expenditure for Employee Compensation, and Minimum Wage Employer Survey data for firms in examining the size and explanations of the employer-size wage variation in the US. They used three different measures of firm size derived from three different datasets: a categorical size variable, company sales, and firm employment. They found that holding all things equal, large establishments provide a wage premium ranging between 1.5% and 3.8% although with little support of the traditional explanations.

Schmidt and Zimmermann (1991) used the West German individual data set and run a wage regression to estimate the impact of firm size on wages. They used the number of workers to measure firm size. They found a significant employer-size wage premium. Their results showed that the magnitude and significance of the wage premium do not change even after controlling for many control variables.

Other studies that have used similar types of data sets include (Oi,1983 for the US; and Dunne and Schmitz 1992 for the US). For example, Dunne and Schmitz (1992) based on the Lucas model used plant-level data sets in the US manufacturing to examine the firm size wage variation. By employing a standard wage regression, they found out that firms that use advanced technology require and employ highly skilled labour and pay higher wages.

Testing for the existence of wage premium between foreign and domestic firms, Aitken et al., (1996) used firm-level survey data for Venezuela, Mexico, and the US. Their study was interested in how foreign direct investment shapes firm ownership wage differences. They employed a wage regression model and controlling for foreign direct investment, industry and location effects among other key variables. They proxy foreign ownership by the share of labour employed by foreign ownership as compared to the conventional use of the foreign ownership dummy. They found that foreign investment is associated with higher wages for foreign-owned firms in all countries but with greater spillover effects in the US. Subsequent studies on firm ownership and wage differences have found similar results. For example, Dobbelaere (2004) use first-difference 2SLS methods on Bulgarian firms and found strong results confirming foreign ownership wage premium. On the contrary, Heyman et al. (2007) use an employer-employee dataset for Swedish firms and found a very small wage premium for foreign-owned firms that found in other studies that have used only firm data, signifying the importance of using employee-employer datasets.

The disadvantage of relying on either household surveys or firms' surveys is that one may not be able to control for both firm and individual characteristics in determining the firm-size premium. Therefore, the findings from studies that rely on such datasets may be misleading.

With growing access to firm-level datasets, recent studies in the literature are testing the link between firm size and wages relationship using the matched employer-employee datasets (Abowd et al., 1999; Troske, 1999 for the US; Aria, 2003; Belfield and Wei, 2004 for the UK; Soderbon et al, 2005 for Kenya and Ghana; Lallemand et al, 2007 for five European countries;

Bhorat et al, 2017 for South Africa). The advantage of matched employer-employee data is that we can control for both firm and worker characteristics.

Abowd et al. (1999) paper was one of the first research work to use employee-employer datasets and extensive statistical analysis to test for wage determination processes. The researchers used a French longitudinal dataset for workers and firms. Using a detailed wage regression analysis, they decomposed wages per worker into firm heterogeneity, worker heterogeneity, observable characterises and residual variation. They found that person-effects not attributed to observable characteristics such as schooling to be the most important source of wage differences. Person-effects were found to be more important than firm-effects. They also found that firms that pay higher wages are more productive, more capital intensive, and more profitable. Their study provides a more comprehensive methodology on which several subsequent studies are based.

Lallemand et al (2007) did a cross country study in five European countries to identify the magnitude and what determines firm size wage variation employing the employer-employee data set. There were able to test different traditional explanations in the literature of firm size variation which includes compensatory of working conditions theory, the Oi model of monitoring costs, and labour quality hypothesis. The issue of job stability and the concentration of skilled workers (still new in literature) were also included in the analysis. The findings were in support of traditional theories. In consensus with other studies, there was still a significant wage premium for employees in large firms.

Troske (1999) employs the matched employer-employee data set to investigate the various theories that explain the firm size wage gap in the US and found that large firms employ better employees, and both (large firms and their employees) are in a better position to invest in firm-specific training. They controlled for a wide range of firm characteristics and found a significant and large firm size wage gap that was not accounted for by the existing empirical tests. Troske's data had several disadvantages of not being randomly collected. The data was for the manufacturing sector only, there was no information on the intra-firm job specifications and pay determination methods. Hence some important determinants of the firm size wage gap were precluded from the study. Belfield and Wei (2004) included the issue of monitoring costs which was neglected by Troske (1999) in his earlier studies due to data limitations. Belfield and Wei (2004) used a matched employee-employer data set to test a wide range of competing

explanations for the firm size wage premium. The data set used was a randomly selected sample of the UK. However, in agreement with Troske's findings after controlling for a range of firm-level variables there still exists a sizeable wage premium.

While the majority of the studies were done in the context of advanced economies, studies in the context of developing economies are starting to emerge (Soderbon et al, 2005; Bhorat et al, 2017).

Bhorat et al. (2017), in South Africa, used a matched employer-employee data from South African Revenue Services (SARS) and employed the FEiLSDVj[2] method to measure how firm and individual characteristics in the formal sector explains wage variation. They found that 21 percent in wage variation is attributed to individual characteristics, and 13 percent is attributed to firm-level determinants. They concluded that profitability, age, capital intensive, productivity, and trade in the international market has a positive correlation with wages on average. Firm size was found to be negatively related to wages which are quite contrary to the existing literature. However, the dataset used excluded the public sector employees due to the unavailability of corresponding firm-level data. Further, the data for their study being a tax authority dataset, it was not possible to account for informal sector workers and firms. The variables in the dataset were also limited and did not include other important individual characteristics such as gender, marital status, education, and population group which are very important in wage determination. The data did not contain specific information on the number of employees, they had to generate their key variable which is firm size. Wages were manipulated to come up with individual-level data and they used monthly wages. However, in literature hourly wages are more preferred.

The empirical literature in the context of Zimbabwe is still very limited. Velenchik (1997) used a matched employer-employee dataset collected in the year 1993 for Zimbabwe to test for the firm-size wage premium. Their results show a substantial firm-size wage premium suggesting that larger firms pay more wages. However, they found that worker quality and job characteristics are not important in explaining the firm-size wage premium. Strobl and Thornton (2002) also analyse the possible explanations for the existence of firm-size wage premium in 5 African countries, including Zimbabwe. Like most studies in literature, they found apart from worker characteristics, most theories cannot explain the wage premium

[2] Fixed effects least squares dummy variable

received by large firms. They also found that the employer size wage effect does not differ greatly across the five African countries. These two studies are much related to our study. We contribute to these by incorporating the informal sector, which has largely been ignored in these studies.

Soderbon et al (2005) in Kenya and Ghana used OLS, fixed effects, and first differences estimators to estimate the firm size wage variation in the manufacturing firms and found that bigger firms remunerate higher wages compared to small firms. They concluded that it is not because firms employ high ability workers, the effect of size after controlling for individual characteristics was still substantial. Their results were consistent with other studies (see for example Velenchik, 1997; Strobl and Thornton, 2002; Manda, 2002; Soderbon and Teal, 2004) which provided evidence that the effect of firm size on wages is much higher in the developing (especially in Africa) than developed nations.

To this end, we can draw the following lessons from the literature above. First, none of the studies has incorporated the informal sector in the analysis although the informal sector is growing and plays and key role. It is therefore key to incorporate the informal sector when analysing labour markets in developing countries.

Second, several studies have used household or labour survey datasets in analysing the link between firm size and wages. However, such datasets do not include plausible measures of firm size and often, they fail to account for firm characteristics that have theoretically and empirically shown to be important. Other studies that have relied on the firm survey have also failed to account for important individual characteristics in modelling wage functions.

Third, several studies have been done in the context of developed countries (Schmidt and Zimmermann, 1991; Troske, 1999; Beifield and Wei, 2004; Lallemad et al, 2007). The literature on developing countries is still very limited despite the importance of this subject to emerging economies. For the limited studies in developing countries, very few have used credible employer-employee datasets.

Our study utilises the firm-level employer-employee dataset in the context of Zimbabwe, a developing country and it is one of the very few for Sub Sahara Africa (SSA). We are also able to incorporate the informal sector into our analysis.

3. Methodology and Data

This section presents the methodology and data used to answer the research questions of this study. First, the section presents an overview of the estimation strategy used to test the importance of firm size in determining wages and the associated variables that drive this relationship. Lastly, this section presents a description of the data used in the analysis of this study and discuss how the key variables are measured.

3.1. Estimation Strategy

The empirical method in this study draws on estimating the standard Mincerian wage regression. There are broadly two ways studies in the literature have estimated the firm-size wage premium. Some studies have regressed the logarithm of hourly (monthly) wages on the logarithm of firm size and determine the magnitude of the firm-size elasticity. Other studies have regressed the log of hourly (monthly) wages on the categories of firm size and compare the coefficients of these categories to the base (see Bhorat et al., 2017). In this study, we follow both approaches (categorical and continuous variable of firm size). We first estimate the baseline model specified in equation (1).

$$logW_i = \delta + \theta FirmSize_j + \xi_{ij} \quad (1)$$

where $logW_i$ is the logarithm of the individual hourly wages, $FirmSize_j$ is the measure of firm size, the number of workers in firm *j*, and ξ_{ij} is the stochastic error term. We first estimate equation (1) for the pooled sample (both formal and informal workers). We then estimate the equations separately for formal and informal sectors. θ is the coefficient of importance that depicts the firm-size premium, and it is theoretically expected to be positive, showing that, relative to small-sized firms, large-sized firms pay higher wages to their workers.

Although equation (1) is useful in estimating the firm-size premium, its weakness is that we do not know what accounts for the premium should it exist. As such, we expand equation (1) to control for other theoretical variables that explain differences in wages. We insert controls step by step for us to test the validity of the various theoretical explanations. The full model is specified in equation (2).

$$logW_i = \delta + \theta FirmSize_j + X'_{ij}\beta + Z'_j\lambda + \varepsilon_{ij} \quad (2)$$

where $logW_i$ is the logarithm of the individual hourly wages, $FirmSize_j$ is the measure of firm size, the number of workers in firm j. X_{ij} is a vector of human capital characteristics (such as education, experience, and tenure), individual and job characteristics (such as gender, marital status, and job conditions) for individual i in firm j, Z_j is a vector of firm characteristics (such as firm age, capital intensity, labour productivity) and ε_{ij} is the error term. We follow the same estimation approach as in equation (1).

One of the major issues when estimating the firm-size wage premium using nonexperimental data is that workers may self-select to work in large firms due to unobserved heterogeneity. The problem also arises when comparing wages for labour market subgroups such as formal vs informal workers or permanent vs contract workers. This problem is commonly known in the literature as selection bias. Hence, controlling for selection bias based on observable and unobservable characteristics may be necessary for identification. To account for possible selection bias, the conventional method in literature is the use of the Heckman two-stage selection model. In the first stage, a reduced form selection probit model is estimated to account for the selection of workers into labour market subgroups (e.g. into larger firms or the formal sector). In the second stage, the selection bias correction variable (inverse mills ratio) is computed from the probit model which is then incorporated in the wage model used for decomposition. The exclusion restriction requires that an available valid instrument explaining employment selection be included in the selection equation but not in the wage equation.

It is however acknowledged in the literature that finding such an instrument is difficult (see for example Bhorat, and Goga 2013; Casale and Posel, 2011; Muller, 2009). The use of inappropriate exclusion instruments may generate identification problems such as collinearity and high standard errors. Further, the selection procedure may lead to measurement errors given that the expected value of the error term is used in the second stage of the procedure. Besides, Burger and Walters (2008) attested that the selection methods are sensitive to heteroskedasticity, and the validity of the distribution assumptions discussed in the above section. In literature, no proposals have so far been suggested on how best to tackle the issue of the exclusion variable problem. Thus, given these shortfalls, our inability to find plausible instruments, and the lack of alternative methods to deal with the exclusion variable in literature we do not correct for the selection bias in this study. However, we acknowledge that this may bias our results and the direction of the bias is difficult to predict.

3.2. Data

This study is based on the employer-employee matched dataset of the Zimbabwean manufacturing firms that was collected in 2015 under the "Matched Employee-Employer Data for Labour Market Analysis in Zimbabwe" project[3]. This data was sourced from Datafirst.[4] The data was collected for both manufacturing firms and workers in the formal and informal sectors. The surveys yielded a sample size of 195 formal manufacturing sector firms and 1388 formal workers within these firms. The sample for informal sector firms was 131 firms and 174 workers.

Manufacturing firms were grouped into 2-digit industrial sectors. The industrial sectors in the formal sector are food, beverages and tobacco; wood and furniture; metal, machinery and equipment; textile and leather; and chemical and rubber. We have the informal sector data on the following industries: wood and furniture; metal, machinery and equipment; and textile and leather. The data was collected using two separate questionnaires: a firm questionnaire and a worker questionnaire. The survey was carried in four main cities in Zimbabwe: Harare, Bulawayo, Mutare and Gweru. A stratified sampling procedure was used in the formal sector to select the sample size with firm size, industry and location strata. One of the challenges when administering informal sector surveys is getting a representative sample. This issue arises as a result of the unavailability of a sampling frame of the informal firms, as they are not registered with the government. A two-stage sampling process was followed in selecting informal manufacturing firms[5]. It should be noted that, while the formal sector firm surveys are representative of the population, the survey for the informal sector is not representative of the total population of informal manufacturing sectors in Zimbabwe but of informal enterprises in the respective geographical areas surveyed. While the data includes weights for the formal sector and informal sector firms that correct for non-response and oversampling of firms across size categories, industries and location, the data does not include weights for workers. It is worth noting that, guided by literature, we did not apply weights to the econometric analysis.

[3] The project was carried by SALDRU at University of Cape town in partnership with and ZEPARU in Zimbabwe

[4] For access to the data, please see https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/702/study-description .

[5] In the first stage, main areas where informal production is located in a single area for each of the industry strata were selected. Where it is possible or sensible these areas were then divided into blocks (enumerating areas) with roughly equal numbers of firms based on spatial area or building complex. Blocks were then randomly selected. In the second stage, firms within each of these randomly selected blocks were listed. A random sample of firms was then selected for interviewing purposes from the listed firms in each randomly chosen block.

There is inconclusive econometric debate on the use of weights in regression analysis (Lohr, 2019; Cochran, 2007; Deaton, 1997; DuMouchel & Duncan, 1983). These studies argue that the use of weights in regression analysis may impose additional noise to the standard errors, leading to inefficient estimates.

The data contains very rich information on individual characteristics. It includes valuable information on employee human capital endowments and individual variables such as education, training, experience, age, gender, and marital status. It also includes employee job characteristics such as employment status (permanent vs contract), mode of salary, monthly earnings, hours of work per week, and job allowances among other useful information. This information allows us to offer a robust analysis of wages.

Further, given that the data is employee-employer matched, one of the advantages of using such data is that we can control firm characteristics. The data contains rich information on firms' characteristics such as firm size, firm age, capital intensity, and industry subsector among other variables. More so, we can control for labour productivity that we can calculate using the information on firms' sales and production and determine the extent to which labour productivity can explain the wage gap.

The advantage of our data is that it includes both formal and informal workers. Hence, we can analyse and compare the effect of firm size on wages for the formal and informal sectors. The dependent variable used in the analyses is the individual hourly wages. This wage variable is net of tax but includes both monetary and non-monetary allowances. We, therefore, do not have the problem of overestimation of the formal sector wages that are subject to taxes.

3.2.1 Measuring Key Independent Variables

The key variable in our analysis is the *firm size*. In the data, firm size is measured as the exact number of workers a firm has, including both full-time and part-time. For the analysis of this study, we use firm size both as a continuous variable and as a categorical variable. We have categorised the firm size variable into 4 groups: (1) 1-4 micro, (2) 5-19 small, (3) 20-99 medium, and (4) 100+ large. It should be noted, however, that for the informal sector we only have two categories for micro and small firms while for the formal sector we have three categories: small, medium and large.

The other key control variables are grouped into four categories: human capital; individual; job; and firm characteristics. *Human capital characteristics* include education, experience,

tenure, and training. Traditionally education is captured in the wage equation linearly as the number of completed years of schooling. The basic assumption is that each additional year of education has the same proportional effect on earnings. However, recent literature has argued that there exists a non-linear relationship (Trostel, 2004; Schady, 2000) between education and wages, especially in developing countries. To take into account the non-linearity, literature has suggested the use of education categories as compared to the years of completed education. Hence in our analysis education is categorised as 1. Primary education, 2. Secondary education and 3. Tertiary education. Experience is measured as the years of experience before starting to work at the current place of work. Further, we also include tenure in our analysis which is measured as the number of years the worker has spent in the current workplace. Training is a binary variable that captures if a worker has received some form of training on the current job.

Individual characteristics are gender, marital status, and age. Gender is a dummy variable that is coded 1 if a worker is male and zero otherwise. Marital status is also a dummy variable coded 1 if one is married and zero otherwise. Marital status has also been included in the literature to control for worker's productivity. The idea is that employers perceive married workers as motivated, stable, and disciplined and hence more productive (Rospabe 2001).

Job characteristics include weekly hours of work, methods of payment (1=per time period, 2=piece rate, 3=percentage of firm sales, 4=commission), job allowance (1=yes and 0 otherwise), work type (1=permanent and zero otherwise). Job allowance refers to benefit allowances that are given to workers in addition to their wages. These, for example, include food, transport, and housing allowance among others. Again, for detailed decomposition, we only include variables and categories that overlap to mitigate the problem associated with the common support assumption.

Besides firm size, other *firm characteristics* of interest include; firm age, capital intensity, value-added per worker, firm industry and firm location.

Table 1 presents the summary statistics of the relevant variables employed in this analysis for the firm size wage differentials for the formal and informal manufacturing sector sample. Column 1 presents the average characteristics for formal manufacturing sector workers while column 2 presents for the informal sector counterparts. Columns 3 and 4 show the characteristics of the pooled sample and the average ratios for the formal/informal employees

characteristics respectively. Table 1 indicates that the mean hourly wage is USD2.34 for formal sector employees and USD1.09 for informal sector workers.

Table 1. Summary statistics on key variables for the formal and informal sector manufacturing employees.

	(1)		(2)		(3)		(4)	5
	Formal sector employees		Informality Sector employees		Overall		Formal/Informal sector ratios	Differences in mean (p-values)
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std, Dev,		
Hourly wages (USD)	2.34	7.08	1.09	1.69	2.20	6.71	2.15	0.035
Education Level								
1. Primary (share)	0.07	0.26	0.04	0.20	0.07	0.25	1.71	<0.001
2. Secondary (share)	0.75	0.43	0.89	0.31	0.76	0.43	0.84	
3. Tertiary (share)	0.18	0.39	0.07	0.25	0.17	0.38	2.67	
Experience (years)	5.57	7.22	3.02	4.31	5.28	7.00	1.84	<0.001
Age (years)	41.70	11.60	29.66	9.03	40.34	11.96	1.41	<0.001
Gender (share)	0.80	0.40	0.82	0.38	0.81	0.40	0.98	0.62
Married (share)	0.87	0.34	0.73	0.45	0.85	0.35	1.20	<0.001
Weekly Hours of work	43.70	5.43	50.86	10.14	44.51	6.54	0.86	<0.001
Methods of Payment								
1. Per time period (share)	0.97	0.18	0.51	0.50	0.92	0.28	1.91	<0.001
2. Piece rate (share)	0.01	0.10	0.31	0.46	0.04	0.20	0.03	
3. % of firm sales (share)	0.01	0.11	0.14	0.35	0.03	0.16	0.09	
4. Commission (share)	0.01	0.10	0.05	0.21	0.01	0.12	0.20	
Job Allowance (share)	0.62	0.49	0.41	0.49	0.60	0.49	1.51	<0.001
Union (share)	0.41	0.49	0.00	0.00	0.36	0.48		<0.001
Other Jobs	0.31	0.46	0.11	0.31	0.28	0.45	2.78	<0.001
Number of Employees	1154		146		1300			

Source: Author computations

It is also evident from the table that on average informal sector workers are less educated, less experienced, younger, and are less likely to receive job allowances compared to the formal sector workers, as indicated by ratios greater than one in column 4. 97 percent of the formal workers are paid their earnings per time period. However, the informal workers are paid their wages using different payment methods, for example, 47 percent receive their wages per time period, 31 percent on piece rate, 14 percent use percentage of firm sales and 5 percent are paid on commission. Additionally, the summary statistics show that on average the manufacturing sector is dominated by males in both the formal and the informal sectors. 40 percent of the formal workers are union members, whilst there is no union representation in the informal sector. Informal sector workers work for more hours (about 50 hours a week) compared to

formal sector workers who work an average of 43 hours a week. Column 5 shows the p-values of statistical differences for characteristics across the formal and informal sectors. Except for gender, the results in column 5 suggest some significant heterogeneity in worker characteristics across the sectors.

In Table 2, we further present employee characteristics by firm size categories. The idea is to get a flavour of the possible variables which are related to firm size and wages.

Table 2: Average employee characteristics by firm size categories

	Formal Sector			Informal Sector	
			Firm size		
	Small	Medium	Large	Micro	Small
Variable	Mean	Mean	Mean	Mean	Mean
Hourly wage (USD)	1.81	1.95	1.99	0.97	1.54
Education Level					
1. Primary (share)	0.10	0.07	0.06	0.04	0.03
2. Secondary (share)	0.69	0.76	0.76	0.90	0.87
3. Tertiary (share)	0.21	0.17	0.18	0.06	0.10
Years of education	11.22	11.14	11.39	10.86	11.06
Years of experience	6.74	5.71	4.85	2.81	3.81
Work age (years)	42.32	42.17	40.77	29.77	29.26
Gender (1=male)	0.84	0.80	0.79	0.83	0.81
Married (1=yes)	0.88	0.87	0.86	0.73	0.71
Training (1=yes)	0.05	0.12	0.15	0.00	0.00
Tenure (year)	12.01	12.94	12.54	3.57	4.19
Weekly Hours of work	42.36	43.63	44.88	51.11	49.94
Methods of Payment					
1. Per time period (share)	0.90	0.98	0.99	0.47	0.65
2. Piece rate (share)	0.01	0.00	0.01	0.37	0.06
3. % of firm sales (share)	0.05	0.01	-	0.13	0.16
4. Commision (share)	0.04	0.01	-	0.03	0.13
Job Allowance (share)	0.51	0.66	0.61	0.38	0.52
Union (share)	0.47	0.38	0.40	-	-
Other Jobs	0.36	0.28	0.32	0.10	0.16
Firm age	31.09	39.92	49.60	8.77	10.13
N	171	551	420	115	31

Source. Author calculations from our employer-employee dataset

The results in Table 2 indicates that average wages are higher for employees in larger firms than in smaller firms in both the formal and informal sector. For example, average employee wages are USD1.99 in large firms vs USD1.81 in smaller firms in the formal sector and USD0.97 in micro firms vs USD1.54 in smaller firms in the informal sector. Years of

education, years of experience and worker age are high for larger firms. This may indicate that large firms pay higher wages to compensate for the skill quality of workers. Looking at job quality, Table 2 suggest a high quality of jobs in large firms. This is shown by the high proportions of workers that receive job allowances and whose form of payment is fixed. However, the union share is lower for large firms. It also seems that large firms are older than small firms, suggesting that firm age may shape firm size wage relationships.

We also show the average firm characteristics (capital intensity, firm productivity and firm age) by firm size in Table A1 in the Appendix. The results in Table A1 indicates that, for formal firms, average capital intensity decreases with firms' size while firm productivity and firm age increase with firm size for both formal and informal firms.

4. Results

4.1. Stylised Facts – Link between Firm Size and Wages.

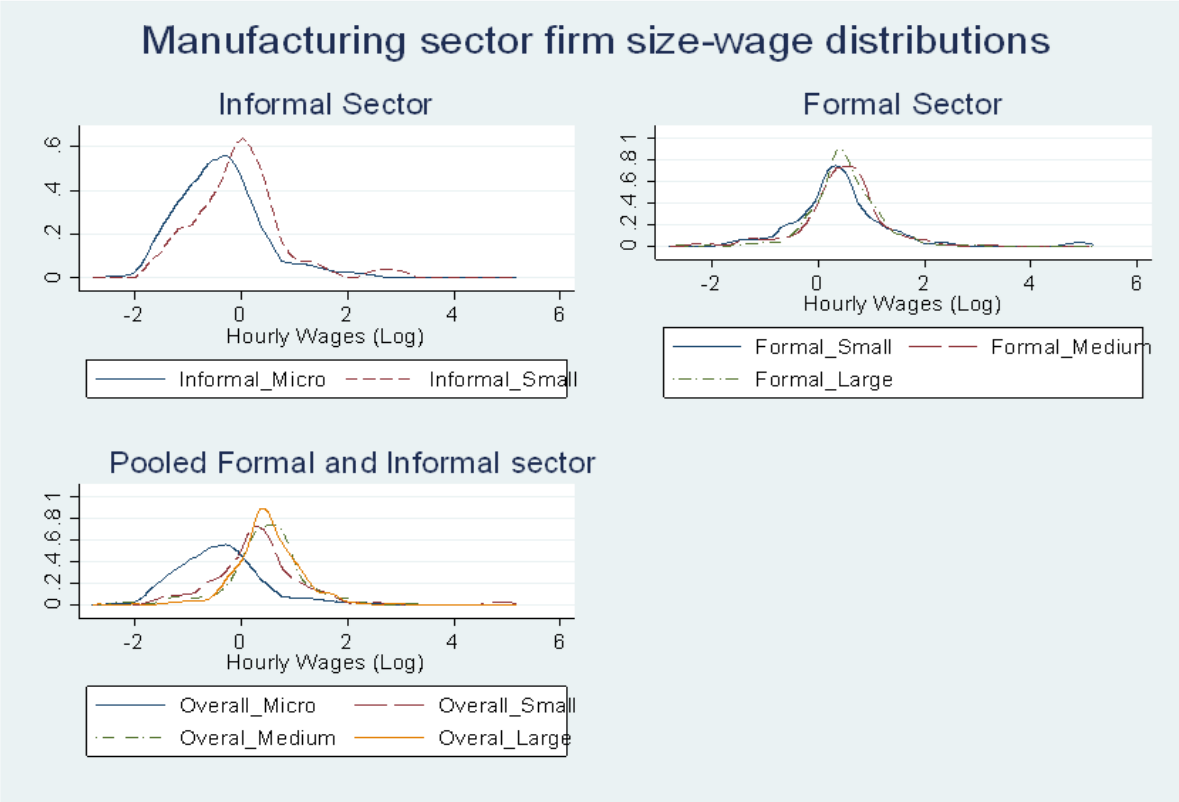
This section presents a descriptive analysis of the data highlighting some of the main stylised facts related to the firm size and wage relationships for the formal and informal sector. The section establishes a criterion that would provide insights into the presence of the firm size wage premium.

4.1.1 Firm size and Wages

The section first presents some kernel density functions to illustrate and have some insights on how wages are distributed by firm size for both the formal and informal manufacturing sectors. Figure 1 shows the kernel density wage distribution. The size of firms is defined by the number of workers employed by the firm. For instance, firms with 1-4 workers are grouped as micro firms, 5-19 workers small firms, 20-99 medium and finally 100+ are grouped as large firms. Figure 1 shows that within the informal sector the distribution of wages in the small firms is positioned to the right of that of the micro firms. This is in line with the theory that larger firms pay higher wages compared to the small ones. In Figure 1, the graph to the right shows the wage distribution for the formal sector workers. Again, the plot for employees in small-sized firms is positioned to the left suggesting on average these workers are paid less wages compared to large and medium-sized firms. There are no clear differences in wages between employees in large- and medium-sized firms. Overall, from the plot in the left bottom in Figure 1 we observe that employees in relatively smaller firms seem to be paid less wages than

employees in relatively large firms. What is left is to test for the significance of these wage differences and determine factors that drive such differences. This is done in the empirical results section.

Figure 1: Firm size-wage distribution between formal and informal manufacturing sector.



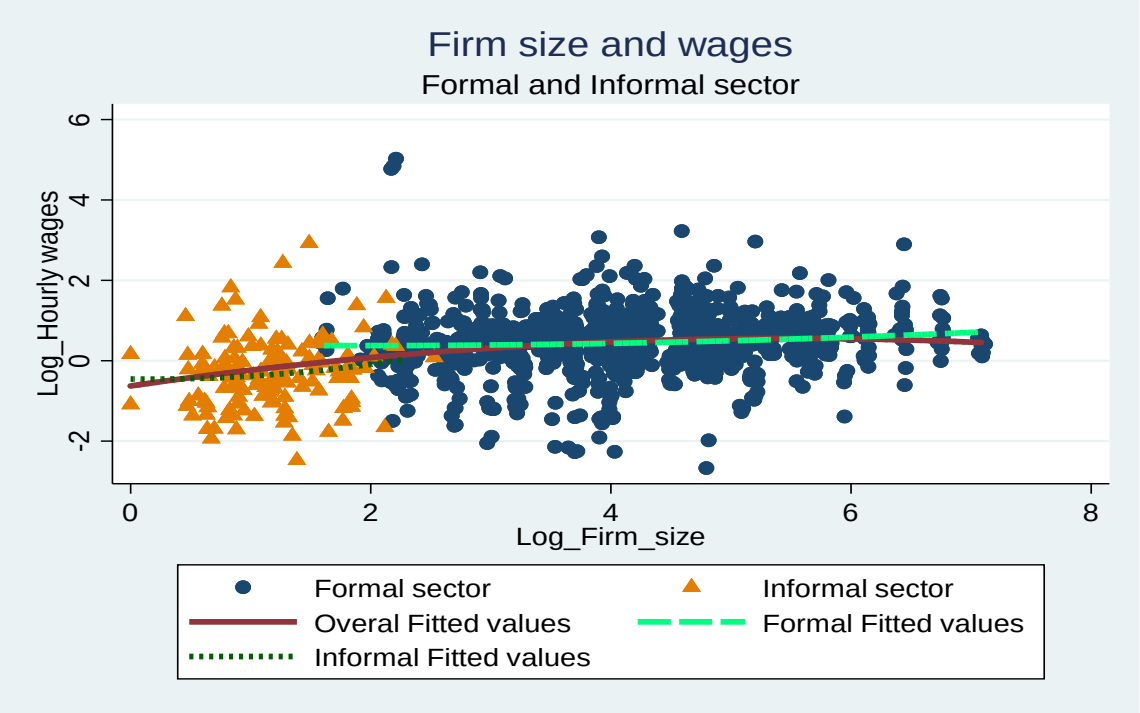
Source. Author construction from the employee-employer dataset presented above.

Notes. Firm size categories are as follows; *Informal_Micro* 1-4 workers, *Informal_Small and Formal_Small* 5-19 workers, *Formal_Medium* 20-99 workers, and *Formal_Large* 100+ workers. The data does not include a sample for micro-firms in the formal sector.

While Figure 1 provides some interesting insights, the kernel density distributions obscure some important heterogeneity on the link between firm size and wages. We, thus, further analyse the relationship between firm size and wages using a scatter plot as depicted in Figure 2. Figure 2 presents plots for both formal and informal manufacturing sector workers. The plots show that, for the formal sector workers, there is a positive but weak relationship between wages and firm size. This is shown by the relative flat fitted line for the formal sector. For the informal sector, the plots also suggest a positive relationship between firm size and wages. The relationship is stronger in the informal sector as shown by the relative steeper fitted line.

Overall, the plots suggest a positive association between wages and firm size. This is in line with our theoretical predictions. What still remains unanswered is how significant is such a relationship.

Figure 2. Relationship between wages and firm size for the formal and informal manufacturing workers



Source: Author calculations

Notes: Firm size is measured as logarithms of the number of employees at a firm

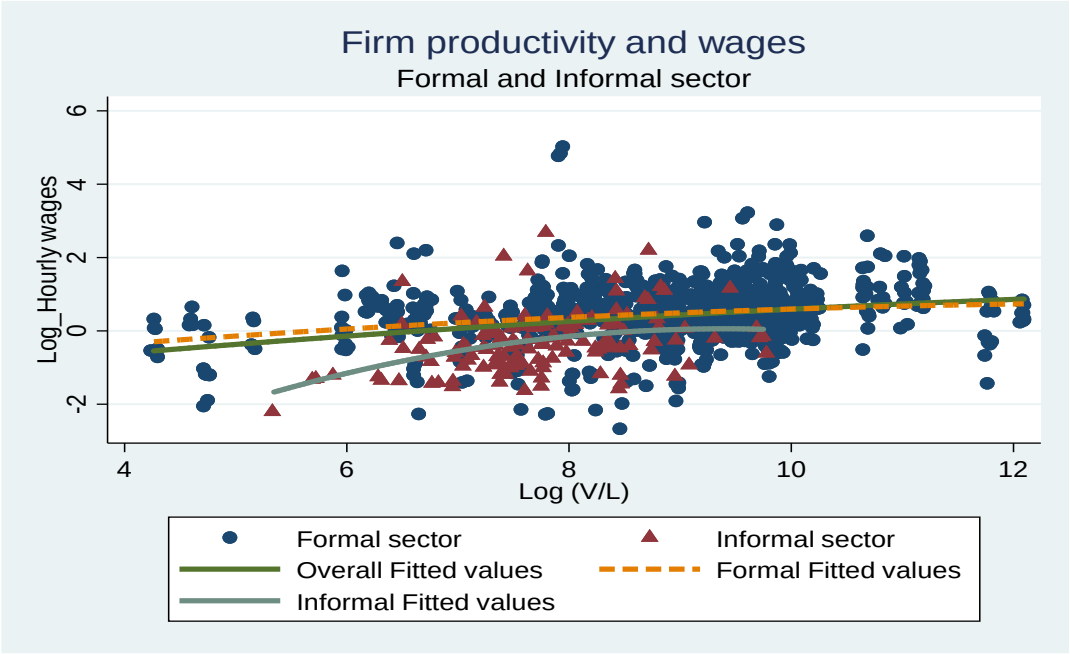
4.1.2 Capital Intensity, Productivity, and Wages

We take a further step to assess how the capital intensity and productivity at the firm level are linked to individual wages. Capital intensity is measured as the capital-to-labour ratio (K/L), where K is the value of machinery and equipment, and L is firm size. Theoretically based on the empirical literature, one would expect a positive association between wages and capital intensity. Based on the efficiency wage hypothesis, one would also expect a positive relationship between wages and productivity. Our measure of productivity is based on the value-added per worker (V/L - also known as labour productivity), where V is the value of output. Linking these two firm characteristics to firm size, literature has generally agreed that large firms are on average more productive and have higher capital intensity than small firms. It is therefore important to consider how capital intensity and firm productive link with wages.

Figure 3 present the plots for the relationship between wages, productivity and capital intensity in Panel A and Panel B respectively. One would expect, according to the literature, a positive association between wages and both firm productivity and capital intensity. The results in Figure 3, Panel A, shows that there is a positive relationship between firm productive and wages in both formal and informal manufacturing sector. This is indicated by upward sloping fitted lines. The relationship seems to be nonlinear in the informal sector. These results provide some insights that more productive firms pay higher wages relative to less productive firms.

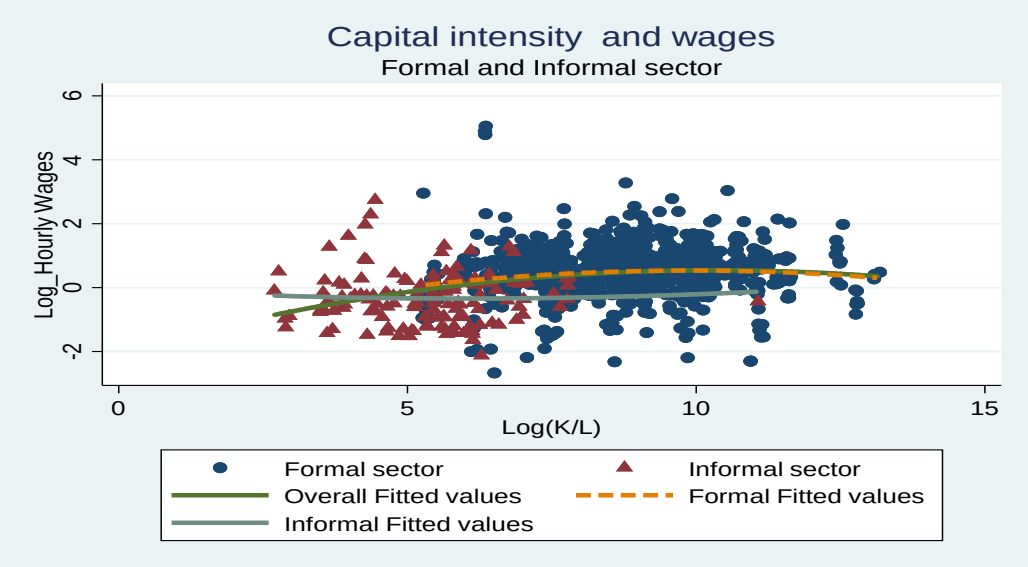
Figure 3: The relationship between firm productivity, capital intensity, and wages

Panel A



Source. Author calculations

Panel B



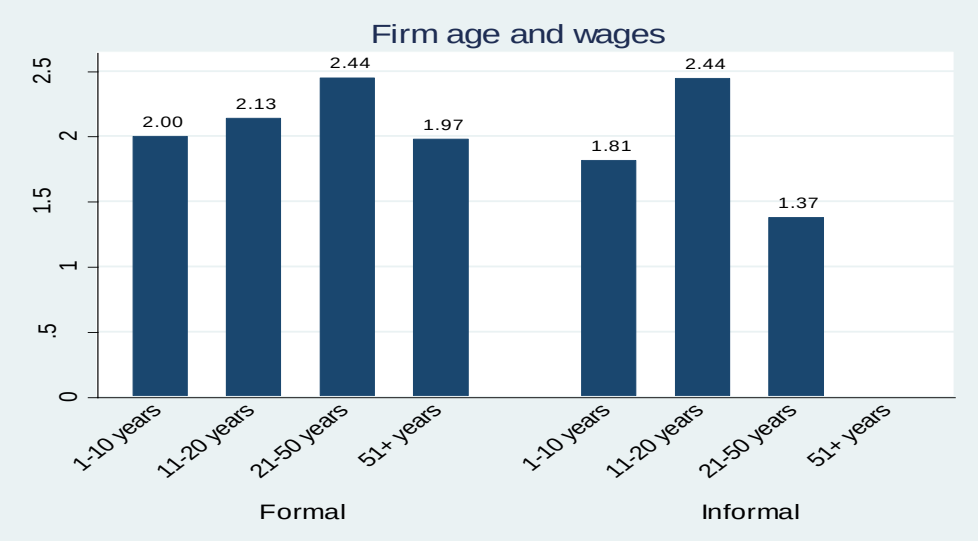
Source. Author calculations

Figure 3, Panel B, indicates a generally positive relationship between firm capital intensity and wages in the formal sector. However, there is a weakly observed link between capital intensity and wages in the informal sector. In both sectors, the relationship is weakly nonlinear. The relationships observed in Figure 3 are quite consistent with the relationship between firm size and wages illustrated in the above sections.

4.1.3 Firm Age and Wages

We further analyse the link between firm age and wages. According to the literature, we expect a positive relationship between firm age and wages. Older firms on average tend to pay higher wages than young firms. The empirical literature has also shown that older firms are on average larger than young ones. One would therefore expect a positive relationship between firm age and wages. Figure 4 presents the plots on the link between wages and the distribution of firms by firm age categories. From Figure 4 it is clear that the mean wages in the formal sector increase with age but a sudden decrease is noticed amongst firms that are 51 years and older. This relationship is also true for the informal sector case where we also notice an inverted U-shaped relationship between mean wages and firm age. According to literature (see Van Vuuren and De Hek, 2009), one possible explanation for this observed result is that as workers grow older the gap between age and worker productivity widens, that is, wages increase with age while worker productivity does not increase with age (at least at the same pace).

Figure 4: Firm age categories and wages



Source. Author computations

In summary, the descriptive diagnostic assessment has shown results to what is generally assumed in the literature that there is a positive relationship between wages and, firm size and firm productivity in the formal sector and the informal manufacturing sector. The descriptive results also show a non-linear relationship between wages and other firm characteristics such as firm age and capital intensity.

The observed link between wages and firm size may however be explained by observed differences between small and large firms (Bhorat et al., 2017) or by observed individual characteristics such as human capital characteristics. The argument is that small firms may be able to hire higher ability workers, thus paying them higher wages. We thus extend our analysis in the next section by using a regression approach to test the relationship between firm size and wages, controlling for observed heterogeneity.

4.2. Empirical Results

This section uses the empirical methods discussed in the prior section to rigorously test for the relationship between wages and firm size. This section aims to test for the significance of the relationship between firm size and wages and establish factors that drive such a relationship.

4.2.1 Human capital, individual, job characteristics, and wages

We first test for the importance of human capital, individual, and job characteristics in shaping the relationship between firm size and wages and the results are presented in Table 3. The

results correspond to specifications in equation (1) and equation (2). Columns 1-3 presents the baseline results for unconditional firm size wage premium for the overall sample, formal sector workers, and informal sector workers, respectively. In columns 4-6, we present the results for the firm size-wage relationships that have accounted for human capital. Lastly, we present the results for the full control of worker characteristics in columns 7-9, after adding controls for job characteristics.

The pooled results in column 1 indicate that firm size is positive and significantly associated with wages. This is shown by the average firm size coefficient of 0.122 (significant at 1 percent level). The same significant relationship is observed in both the formal and informal sectors (in columns 2 and 3) with a firm size coefficient of 0.05 and 0.239, respectively. Although the statistical significance is stronger in the formal sector, the informal sector firm size coefficient is higher. These results confirm our earlier results in Figures 1 and 2, that there is a positive association between wages and firm size and are in line with our theoretical predictions.

Having established a significant relationship between firm size and wages, we now turn our analysis to determine how human capital endowments and individual worker characteristics affect the firm size wage premium. In columns 4-6 we control for worker education, years of experience, training, age, gender and marital status. The argument in literature is that large firms, for example, are likely to employ more educated workers and thus we control for these factors to remove the contamination. The results show that after controlling for these variables, the firm size-wage effect remains positive and statistically significant in all the specifications in columns 4-6. The coefficients, however, are slightly reduced. For example, the overall coefficient reduces from 0.122 to 0.105 while for formal and informal reduce to 0.053 and 0.188, respectively. The reduction in the coefficient of the firm size seems to be driven by education, experience, and marital status in the formal sector but not in the informal sector. This is shown by statistically significant coefficients of these variables in column 5. In the informal sector, it is employee age that seems to be important in driving the relationship between firm size and wages.

The human capital theories suggest that differences in wages are attributed to differences in human capital endowments. The fact that after controlling for human capital endowments there still exist a firm size wage premium, calls the need to control for other characteristics such as job characteristics. In columns 7-9, we add the controls for the job characteristics. The idea is to account for the quality of jobs. The narrative from literature is that large firms are associated

with offering high-quality jobs, hence they may be paying higher wages due to the high quality of jobs they offer. We thus account for job quality by controlling for whether a worker receives job allowances and unionisation. The results suggest that job quality does not drive the relationship between firm size and wages. This is indicated by the fact that the firm size-wage coefficient in specifications in columns 8 and 9 did not change as compared to preceding specifications, except for the pooled sample in column 7. It is, however, important to note that both the coefficients of job allowance and union variables are strong, positive and statistically significant in the overall and formal sector specifications (columns 7 and 8). This suggests that unionisation plays a key role in the determination of wages although its impact on wages does not differ with firm size. Various studies in the literature suggest that workers covered by the union through collective bargaining earn higher wages (Oi and Idson, 1999; Soderbon et al., 2005). In Zimbabwe, unionisation is strong and has influential power to negotiate for higher wages.

Table 3. Firm size and wages, controlling for human capital, individual characteristics and job characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline			Human Capital			Job Characteristics		
VARIABLES	Overall	Formal	Informal	Overall	Formal	Informal	Overall	Formal	Informal
Firm size	0.119***	0.051***	0.231**	0.104***	0.051***	0.186*	0.092***	0.046***	0.191*
	(0.015)	(0.014)	(0.109)	(0.015)	(0.013)	(0.110)	(0.015)	(0.019)	(0.110)
Gender				0.312***	0.312***	0.110	0.310***	0.312***	0.160
				(0.049)	(0.049)	(0.208)	(0.060)	(0.062)	(0.236)
Age				0.018	0.008	0.083*	0.016	0.007	0.072
				(0.011)	(0.012)	(0.046)	(0.015)	(0.015)	(0.054)
Age squared				-0.000**	-0.000	-0.001**	-0.000**	-0.000	-0.001**
				(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Marital status				0.179***	0.176***	0.201	0.170***	0.163**	0.196
				(0.061)	(0.066)	(0.149)	(0.060)	(0.065)	(0.148)
2.Education level				-0.111	-0.088	-0.403	-0.095	-0.077	-0.534
				(0.105)	(0.109)	(0.306)	(0.137)	(0.143)	(0.438)
3. Education level				0.392***	0.412***	-0.190	0.349**	0.371**	-0.372
				(0.125)	(0.129)	(0.406)	(0.177)	(0.186)	(0.580)
Training				0.086	0.099		0.089	0.099	
				(0.062)	(0.062)		(0.061)	(0.061)	
Years of experience				0.019***	0.018**	0.086	0.017**	0.016*	0.092
				(0.007)	(0.007)	(0.057)	(0.008)	(0.009)	(0.059)
Years of experience squa				0.000	0.000	-0.003	0.000	0.000	-0.003
				(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)
Job allowance							0.198***	0.208***	0.112
							(0.040)	(0.042)	(0.136)
Union							0.224***	0.198***	
							(0.042)	(0.042)	
Constant	0.236**	0.475***	-0.273	-0.267	0.175	-1.258	-0.336	0.049	-0.473
	(0.095)	(0.111)	(0.264)	(0.329)	(0.373)	(0.943)	(0.671)	(0.726)	(2.134)
Observations	1,289	1,143	146	1,289	1,143	146	1,289	1,143	146
R-squared	0.108	0.028	0.033	0.237	0.174	0.151	0.255	0.191	0.152

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1 Depended variable is the log of hourly wages

4.2.2 Tenure, Capital Intensity, Labour Productivity and Wages

As stressed in the theoretical literature section (Black et al., 1999; Gerlach & Hubler, 1998) other possible explanations for observing a positive firm size wage premium are systematic differences in tenure among employees in young and old firms and the firm age. This explanation is taken into consideration in Table 4 (columns 1-3) by adding individuals' tenure at the current employer and the firm age. If variation in tenure lies behind the positive relationship between firm size and wages, the inclusion of variable tenure should make the coefficient for firm size insignificant or highly reduced, so as the inclusion of the firm age variable.

The coefficient of firm age is weakly statistically significant for the formal sector regression and the overall results as shown in Table 4. The coefficient for firm age squared is however not significant. This suggests a weak narration on the support that wages and firm age have an inverted U-shaped relationship as generally agreed in literature. The coefficient of tenure is positive and weakly significant for the formal and overall regression while insignificant for the informal regression. Tenure squared is insignificant except for the informal sector, refuting claims of a non-linear relationship between tenure and wages. However, the results show that the firm size coefficient is still positive with an increase in the coefficient value across all specifications. These results suggest that firm age plays a key role in driving the firm size-wage premium.

If firms systematically vary with firm size, estimating the effect of firm size on wages without taking into account the variation in labour productivity (value-added per worker) and capital intensity would bias the results. Specifically, a positive firm size wage premium would instead be due to systematic higher productivity in larger firms. Table 4, columns 4-6, presents results when labour productivity and capital-labour ratio are added to the specification.

In all the specifications we control for industry and location dummies. It can be argued that a positive relationship between firm size and wages may be due to differences in firm sectoral affiliation or regional location. Taking these into account we still observe a significant firm wage-size premium.

Table 4. Firm size, Tenure, Capital Intensity, Labour Productivity and Wages

	(1)	(2)	(3)	(4)	(5)	(6)
		Tenure			Capital Intensity	
VARIABLES	Overall	Formal	Informal	Overall	Formal	Informal
Firm size	0.108***	0.074***	0.135*	0.071***	0.039*	0.069*
	(0.017)	(0.021)	(0.078)	(0.017)	(0.022)	(0.042)
Capital-Labour ratio (log)				0.021***	0.0072***	0.051*
				(0.005)	(0.002)	(0.030)
Labour productivity (log)				0.116***	0.087***	0.421***
				(0.017)	(0.017)	(0.086)
Firm age	-0.003**	-0.004*	0.001	-0.000	-0.003	0.000
	(0.001)	(0.001)	(0.011)	(0.003)	(0.003)	(0.039)
Firm age squared	-0.000	0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)
Tenure	0.014*	0.013*	0.068			
	(0.007)	(0.008)	(0.044)			
Tenure squared	-0.000	-0.000	-0.004*			
	(0.000)	(0.000)	(0.002)			
Constant	-1.228***	-0.870***	-1.547*	-1.315**	-0.784	-2.694
	(0.249)	(0.292)	(0.926)	(0.724)	(0.798)	(2.342)
Observations	1,252	1,111	141	1,220	1,085	135
R-squared	0.268	0.211	0.176	0.219	0.208	0.225
Industrial dummies						
Location dummies	YES	YES	YES	YES	YES	YES
Human Capital and Individual	YES	YES	YES	YES	YES	YES
Job Characteristics	YES	YES	YES	YES	YES	YES
Firm Characteristics	YES	YES	YES	YES	YES	YES

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the log of hourly wages

The results in columns 1 and 2 show positive and significant coefficients for both capital-to-labour ratio and labour productivity. The hypothesis that larger firms may pay higher wages because of the existence of capital skill complementarities has been taken into consideration in Table 4. The results for formal and pooled estimations are in line with the capital skill complementary hypothesis that individual wages are positively correlated to the capital-labour ratio. This is also true for the informal firms where a positive relationship (that is significant at 10%) is reported. After controlling for capital-to-labour ratio and firm productivity, firm size coefficients remain positive and significant. The results also indicate a reduction in the coefficient of firm size in all specifications (when compared to the firm size coefficient in Table 3).

To this end, this study finds an unconditional firm size-wage of 12.2 % in the pooled sample, 5.5% in the formal sector and 23,9% in the informal sector. To get some flavour on what accounts for this firm size wage premium, three explanations have been examined. The first

explanation is that large firms pay higher wages to match the high human capital endowments of their workers. We control for human capital endowments and find that they help to explain the size wage premium. We then test for another hypothesis that large firms offer high-quality jobs and thus compensate with high wages. The problem in doing so is the possibility of endogeneity between wages and job quality. That is, high wages may be associated with high job quality, while high job quality may increase worker productivity and hence wages. Given our data, we are limited to control for this possible endogeneity. However, job quality did not explain major variation in firm-size wage relationships. Further, we test the hypothesis of the capital complementarity effect, by controlling for capital-labour ratios. The results indicate that capital intensity and firm productivity are important in shaping firm size wage premium. The results of this study indicate the importance of both supply-side and demand-side characteristics in explaining wages. The fact that we observe a significant firm size wage premium after controlling for human capital characteristics signifies that Zimbabwean labour markets are uncompetitive, and this may need to be explored further by testing other alternative hypothesises such as monitoring costs and firm ownership.

5. General Conclusion and Policy Implications

5.1. Summary of key findings

This study examines the relationship between firm size and wages in the formal and informal manufacturing sector in Zimbabwe. The study draws on a detailed firm-level employer-employee dataset for 2015 and the data contains detailed information on human capital, individual, job, and firm characteristics. The study methodically addresses a variety of possible explanations for a firm size wage effect. We first test the link between firm size and wages for the pooled sample for formal and informal sector workers. We then test this relationship separately for the formal and informal sectors.

The empirical results indicate a positive and significant association between firm size and wages in both the formal and informal sectors. These results confirm the theoretical and empirical literature, which suggest a positive relationship. We then control for a variety of human capital, individual, job, and firm characteristics to determine the source of the firm size wage relationship. Having first controlled for human capital and individual characteristics, the coefficients of the firm size reduced drastically for all the specifications. This suggests the importance of the supply-side in driving the firm size-wage premium.

The study further analyses the role played by various firm characteristics in explaining individual wages. We first control for firm age and test for the non-monotonic relationship between firm age and wages. The results show a weak linkage between firm age and wages in the formal sector. Although there is an insignificant relationship between firm and wages in the informal sector, the inclusion of firm age statistically increases the firm-size wage premium. The insignificance of the coefficient of firm age squared implies that there is no non-linear relationship between firm age and wages.

Further, by controlling for capital intensity and productivity, the results indicate a positive and significant association of these two variables with wages. This suggests that more productive and capital-intensive firms on average pay higher wages. However, the capital intensity relationship is very weak. After controlling for capital intensity and labour productivity the relationship between firm size and wages become insignificant for the formal sector. The firm-size effect seems to have been absorbed by labour productivity, suggesting that more productive firms are also relatively large in the informal sector.

Our results offer similar results with the other studies in the literature that has found evidence of firm-wage premium in developing and developed countries (see Schmidt and Zimmermann 1991; Velenchik, 1997; Strobl and Thornton, 2002; Manda, 2002; Soderbon and Teal, 2004).

5.2. Policy Implications of Findings

The results from this study suggest that both firm (demand-side) and individual (supply) characteristics play an important role in the determination of wages. In particular, the study finds a wage premium associated with firm size. Thus, there is a need for policy to promote the growth of small firms so as to enhance the wages of workers. The results have shown that in both formal and informal sectors, the largest categories of firms are associated with higher wages. Hence the need for policy to promote the growth and survival of large firms. One way to improve wages is through increasing the productivity and capital intensity of the firms. Besides this, wages can be enhanced through acquiring human capital skills (such as education and training) by workers. Workers are also encouraged to join a union as unionised workers are likely to earn more wages.

5.3. Suggestions for future research

Notwithstanding the potential contribution of this study to the literature of labour markets in developing economies, we conclude with a word of caution when interpreting our results. First, our study is based on the OLS estimates which succumb to the endogeneity problem. Second, the analysis is carried out using cross-sectional data which does not take into account different periods to account for different business cycle conditions. There is a need to test the relationship to show results that are heterogeneous across years. This helps to address the question of whether the effect of firm size on wages differs across years. The lack of the panel dataset has limited us to apply advanced techniques, such as the fixed effects, IV or GMM estimations, that takes into account some of the endogeneity. Thus, future studies could focus on sourcing a panel dataset for both formal and informal firms and workers to have plausible estimates. Further, there is a need to test for other alternative hypothesises such as monitoring costs and firm ownership which our data could not address.

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Appendices

Table A1: Average firm characteristics by firm size categories

	Formal Sector			Informal Sector	
	Firm size				
Variable	Small Mean	Medium Mean	Large Mean	Micro Mean	Small Mean
Capital-labour ratio (log)	8.89	8.72	8.54	5.39	5.44
Labour productivity (log)	8.11	8.83	9.07	7.59	7.95
Firm age (years)	27.85	38.39	50.28	8.63	9.77
Number of firms	38	73	57	94	28

Table A2. Firm size and wages, controlling for human capital, individual characteristics and job characteristics (categorical firm size variable).

VARIABLES	(2) Formal	(3) Informal
Firm Size		
5-19: Small		0.314**
		(0.147)
20-100: Medium	0.057	
	(0.072)	
100+: Large	0.122**	
	(0.052)	
Constant	-0.954***	-1.926**
	(0.250)	(0.763)
Observations	1,147	146
R-squared	0.187	0.163
Industrial dummies		
Location dummies	YES	YES
Human Capital and Individual	YES	YES
Job Characteristics	YES	YES

Table A3. Firm size, Tenure, Capital Intensity, Labour Productivity and Wages (categorical firm size variable)

	(2)	(3)	(5)	(6)
	Tenure		Capital Intensity	
VARIABLES	Formal	Informal	Formal	Informal
Firm Size				
5-19: Small		0.290*		0.169*
		(0.161)		(0.085)
20-100: Medium	0.086*		0.036**	
	(0.043)		(0.019)	
101+: Large	0.167**		0.087	
	(0.074)		(0.083)	
Firm age	-0.005	0.003	-0.002	0.002
	(0.003)	(0.011)	(0.003)	(0.038)
Firm age squared	0.000		-0.000	0.000
	(0.000)		(0.000)	(0.001)
Tenure	0.013*	0.052		
	(0.008)	(0.037)		
Tenure squared	-0.000	-0.003**		
	(0.000)	(0.002)		
Capital-Labour ratio (log)			0.007	-0.063
			(0.020)	(0.049)
Labour productivity (log)			0.100***	0.402***
			(0.017)	(0.087)
Constant	-0.655**	-1.922**	-	-3.982***
			1.711***	
	(0.289)	(0.896)	(0.308)	(0.955)
Observations	1,115	141	1,089	135
R-squared	0.204	0.175	0.223	0.268
Industrial dummies				
Location dummies	YES	YES	YES	YES
Human Capital and Individual	YES	YES	YES	YES
Job Characteristics	YES	YES	YES	YES
Firm Characteristics	YES	YES	YES	YES