Allocative Efficiency Within and Between Formal and Informal Manufacturing Sector Firms in Zimbabwe

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Abstract

This paper examines the extent and sources of resource misallocation between the formal and informal manufacturing sector in Zimbabwe by measuring capital and output distortions. Resources misallocation across firms occurs when resources from higher productivity firms are reallocated to lower productivity firms thereby reducing aggregate TFP. This issue is of great relevance to the Zimbabwean economy that has faced over a decade of weak or declining growth, a declining manufacturing sector and a rise in informality. By doing so, the study provides insight into the potential role that the informal manufacturing sector can play in aiding the revival of Zimbabwean manufacturing industry. To assess the extent of misallocation, the study applied the Hsieh and Klenow (2009) on recent Zimbabwean manufacturing firm-level data collected in 2015 under the "Matched Employee-Employer Panel Data for Labour Market Analysis in Zimbabwe" project. The data consists of 194 formal manufacturing firms and 132 informal manufacturing firms. The results show large resource misallocation in both the formal and informal sector. The results also revealed that if misallocation is corrected TPF gains of between 106% and 120% can be achieved and the informal sector benefit more. The results reveal a strong correlation between measures of misallocation and obstacles. The study reveal the importance of regulations, lack of financial access, power shortages and import competition to be key sources of resource misallocation.

Keywords: informal sector, misallocation, productivity

JEL classification: D24, O17, L60

2.1 Introduction and Motivation

The literature on the role of the informal sector in driving economic growth and efficient allocation of resources is contested in the international literature. The dualists model portrays the informal production sector as a backward traditional sector with high market frictions, low-productivity and a highly segmented labour market and should be eliminated if productivity enhanced growth is to be realised. On the other hand, the structuralists portrays the formal and informal sectors as two competitive and integrated economic systems. The informal sector is an important economic unit in most low-income countries whose promotion can trigger

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aggregate productivity and growth. In Zimbabwe, the informal sector co-exists with the formal sector since early 1990s and there are strong distribution and production linkages between the two sectors. The informal sector could thus play a key role in driving the recovery in economic growth and manufacturing within Zimbabwe.

This study aims to examine the potential role of the informal sector as source of future sustainable growth in in Zimbabwe. In particular, the study seeks to analyse the extend and sources of resource misallocations and its impact on productivity within and between the formal and informal manufacturing sectors. These issues are of particular importance to Zimbabwe - an economy that has faced over a decade of weak economic growth that has coincided with a decline in the importance of formal manufacturing, relative to informal manufacturing, as a source of employment and output (Davies et al., 2012; World Bank, 2012; CZI, 2012). The informal economy has expanded rapidly and is estimated to account for between 20% and 40% of the national economy and more than 70% of employment (CZI, 2012). With structural shift of resources from the formal to informal manufacturing sector, it is important to trace the impact on productivity and the extent to which market frictions hinder effective reallocation of resources within and across sectors. The study intent to fill an important gap in literature by establishing if a case can be raised against informal sector, a subject that continues to draw much debate but rarely been empirically tested. Little has been done on Zimbabwe to understand manufacturing sector productivity in terms of the impact and sources of allocative efficiency, particularly in the informal sector. It is undeniable that if resource misallocation is corrected aggregate productivity may increase without necessarily increasing technology or capital accumulations (Kalemi-Ozcan and Sorensen, 2012, Restucia and Rogerson, 2013). The study provides insight into the potential role that the informal manufacturing sector can play in aiding the revival of Zimbabwean manufacturing industry and the desirability of the structural change[2] experiencing Zimbabwe.

There are two broad sources of aggregate TFP growth; the first is technological growth and the second is improvements in the allocation of resources across firms and industries (Nguyen et al., 2016). The latter occurs when resources from lower productivity firms are reallocated to higher productivity firms. Rigidities or distortions that prevent such reallocation of resources therefore constrain aggregate TFP. Resource misallocation across firms and sectors may lead to lower aggregate productivity (Foster et al., 2008, Hsieh and Klenow, 2009). This study is

[2] This will also aid our understanding if labour has been moving in the right direction, that is, from less to more productive economic units.

much interested in TFP growth that arise as a result of efficient allocation of resource. Productivity disparities can occur among firms within the same industry and across sectors (Restucia and Rogerson, 2013). These gaps are a signal of allocative inefficiencies (that arise due to resource misallocation) that decreases overall productivity. Across-firm and between sector allocative inefficiencies occur when more productive firms obtain insufficient resources (labour and capital) to increase production, while less productive firms continue utilising resources instead of shrinking and eventually shutting down operations. When capital and labour move from less productive to more productive economic units, the economy can achieve growth without necessarily increasing capital. Correction of resource misallocation can thus be an essential source for growth, especially for emerging economies. This type of productivity-enhancing structural change is a critical source of overall growth. With resources moving from the formal to the informal sector in Zimbabwe, it is interesting to trace if these are misallocated as predicted by the dualists.

We ask two questions in this study: To what extend are resources misallocated between and within the formal and informal manufacturing sector? What are the sources of resource misallocation? The study quantifies both capital and output misallocation across manufacturing firms in the formal and informal sector. To assess inter-sectorial resource misallocation, formal sector firms' allocative efficiency is compared to informal sector ones. Understanding the efficiency between and within formal and informal manufacturing sector has a large bearing on firm survival and sustainability in achieving economic growth and employment generation (Lopez-Martin, 2015, Kalemi-Ozcan and Sorensen, 2012, Benjamin and Mbaye, 2012).

Our study uses recent Zimbabwean manufacturing firm-level data collected in 2015 under the "Matched Employee-Employer Panel Data for Labour Market Analysis in Zimbabwe" project. The data consists of 194 formal manufacturing firms and 132 informal manufacturing firms. Following the methods and procedures by Leo-Ledesma (2016) and Nguyen et al. (2016), the study derived overall measures of misallocation that affect output and factor markets prices by using the Hsieh Klenow (2009) model. Capital and output distortions are then regressed on firm characteristics and obstacles in both sectors. This allows us to answer the question on where do distortions that prevent efficient allocation of resources emanate from. This study argues that if informal sector firms have same access to finance as formal firms, then aggregate productivity and employment can be enhanced.

We make two key contributions and innovations to the literature on resource misallocation in this study. The first contribution is the incorporation of the informal sector in measuring resource misallocation in Zimbabwe. There is a large informal sector in the manufacturing sector in Zimbabwe. The second key contribution is the identification of different sources of distortions. Literature has shown that resource misallocation is huge in developing economies. What remains uncertain is the nature and source of these distortions. This study contributes to literature by determining the extent to which firm characteristics and obstacles hinder effective allocation of resources. Lopez-Martin (2015) showed that improvement access to credit for formal sector firms and reduction of informal sector size has large bearings on increasing aggregate productivity and employment[3]. Gelb et al. (2009) concluded that in countries with weak economic environment, informal firms are as likely as formal firms to increase their productivity to enhance growth[4]. Banerjee et al. (2003) and Restucia and Rogerson (2013) argues that credit constrains may prevent productive firms from operating, leading to selection and misallocation effects. Most studies have found access to finance, infrastructure, firm size, and regulations to be key drivers of misallocation (León-Ledesma, 2016; Syverson, C., 2011, Bartelsman et al., 2013; Leal, 2016).

The importance of understanding the role of factors driving misallocation is crucial for policy. For example, the improvement or removal of distortions may increase efficient reallocation of resources between firms and sectors which may trigger aggregate productivity without changes in factor inputs or firm technology[5]. Thus, countries with low technology have potential to increase their growth only if resources are efficiently allocated at micro-level (Hsieh and Klenow, 2009, Leo-Ledesma, 2016). This study is relevant given that the government had embarked on selective interventions policies[6] that aim at allocating financial credit and other benefits on certain firms and sectors of the manufacturing sector (RBZ, 2006).

The empirical evidence on misallocation and aggregate productivity has been well documented (e.g. Olley and Pakes, 1996, Foster et al., 2008, Hsieh and Klenow, 2009, Bartelsman et al.,

[3] In this regard, the informal sector is an inferior sector that should be eliminated to enhance growth. This is the prediction of the dualist school of thought.
[4] Contrary to Lopez-Martin and Mexico (2015), Gelb et al. (2009) have results in favour of informal sector, which they say forms an integrated part the economy and policies should be skewed towards improving its productivity.
[5] Resource misallocation is a result of more productive firms failing to obtain adequate resources (capital and labour) to increase production while low productivity firms continue expanding operations instead of downsizing. (Hsieh and Klenow, 2009, Guner *et al*., 2008). This circumstance may reduce the country's aggregate productivity and output levels. Hence, aggregate TFP does not only depend on TFP's of individual production units but also on how resources are allocated across production units. Therefore, aggregate TFP can be low because of resources misallocation (Leon-Ledesma, 2016).
[6] Selective policies have distortionary effects that affects efficient allocation of resources

2013, Syverson, C. 2011, Nguyen et al., 2016, Kalemi-Ozcan and Sorensen, 2012, Restucia and Rogerson, 2013). However, there is little attention on structural change consequences of allocative efficiency of small developing countries' economies. In addition, literature on informal sector productivity and misallocation has been marginal, yet the informal sector contributes significantly towards GDP and employment in most developing economies and has been rising in Zimbabwe. This study argues that the allocative efficiency consequences of the informalisation of the economy may not be as severe as would be predicted under the dualist framework in Zimbabwe.

The rest of the study is structured as follows: Section 2.2 provides background and literature review, section 2.3 presents empirical model specification and section 2.4 present data issues. Results will be analysed and discussed in section 2.5 while conclusions and policy implications will be discussed in section 2.6.

2.2 Background and Literature

This section first provides background, definition of informality and then an overview of formal and informal prepositions and misallocation concept. We then review literature on formal and informal sector productivity and efficiency differentials. Finally, we briefly present literature on misallocation that has used the Hsieh and Klenow (2009) methodology.

2.2.1 Formal and Informal Sectors in Zimbabwe

Zimbabwe is a low-income economy emerging from over a decade of long economic crisis. From 2000 to 2009, the Zimbabwean economy collapsed in the face of hyperinflation and severe macroeconomic imbalances. With the stabilisation 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, 2012), 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 growth of the informal sector in Zimbabwe can be traced to 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 formal sector to create jobs there was massive expansion of the informal sector. The informal sector gradually started growing by absorbing excess labour from the formal sector. Today the informal sector has a huge presence in Zimbabwe. The 2014 Zimbabwe Labour Market Profile (ZLMP) report have

shown an increasing trend in informal sector employment contrary to formal sector employment for the past decade. The report showed that the informal sector contributes about 20% of country's GDP. In addition, the informal sector plays a critical role in job creation. According to ZLMP (2014), the informal sector is estimated to contribute 52% of total employment in non-agriculture activities.

The informal manufacturing sector in Zimbabwe includes well organised and structured small firms that produce goods which compete with formal sector firms. Such firms operate within the textile, metal and wood industries. The main linkages between the formal and informal manufacturing sector firms is through production and distribution channel. Informal firms purchase some of their intermediates from the formal sector. At the same time, the formal sector firms purchase goods from the informal sector for resale. Hence, government policies on one the sector has major bearing effects on another. The government is in the process of formulating and implementing a wide range of economic policies to enhance economic growth, employment, industrial development and international trade[7]. The government expects the informal sector stimulate economic growth and development. But what is the potential of the informal (manufacturing) sector to generate sustainable growth? How does the large informal sector in Zimbabwe affect the aggregated total factor productivity? In the next section, we present some views of informal sector in the existing literature.

2.2.2 Definition of Informality

Terms such as hidden, unrecorded, unregistered, unorganized, unobserved, and black economy have been interchangeably used in referring to the informal sector (Chen, 2005; ILO, 2013). The 15th International Conference of Labour Statisticians (ICLS) in 1993 strive to ameliorate the vagueness associated with the term 'informal' by embracing international statistical definition (ILO, 2013). Under this, the informal sector firm is defined as a firm with no complete set of accounts that would provide a means of identifying flows of income and capital between the enterprise and the owner. This study uses an enterprise approach to define the informal sector firms. We define an enterprise informal if; the enterprise is not registered with the Registrar of Companies; it is small in terms of employment with at least one employee employed on regular basis and at least some output is manufactured for sale in the market.

[7] See Medium Term Plan (2011-2015), Industrial Development Policy (2011-2015) and National Trade policy (2012-2016), ZIMASSET (2013-2018)

2.2.3 Conceptual Framework

Two competing theories (namely the dualists and the structuralists)[8] on the nature of informal sector entrepreneurship and employment have received diverse credence over time. Early models in the 1950s and 60s depicted the informal sector as a traditional, backward sector with low-productivity (Chen, 2005; Potts, 2008; De Soto et al., 2000). A presentation by International Labour Organization (ILO) in Kenya in 1972 changed the negative perspective effect of informal sector on economic growth. The ILO (2012) presented the informal sector as an answer to unemployment and problems in developing economies, emphasizing its significance in catering to demands that the formal sector did not yet have the capacity to meet (Potts, 2008). Today, priori expectations among researchers and policy practitioners remain largely tilted against informality.

According to the dualistic school of thought, the informal sector arises to provide transitory involuntary employment for workers who are unable to find opportunities in the formal sector who will eventually move to the formal sector during economic booms-where jobs are more secure and regulated. The dualists argue that, due to their size, informal firms are unable to achieve economies of scale which significantly constrain on their productivity; small firms may also be less productive than large enterprises due to variations in access to credit, use of training, intensity of innovation, and quality certification (Gelb et al., 2009). This model portrays the informal production sector as a backward, traditional sector with low-productivity and high market frictions. On the other hand, the structuralists theory portrays the formal and informal sectors as two competitive and integrated economic systems. In this regard individual choose to operate between formal and informal sector based on their ability and preferences. The theory argues that large formal firms can be a source of inefficiency through misallocation of resources since they bare some extra cost which informal firms does not[9]. Structuralists emphasize the existence and importance of economic linkages between formal and informal economies, in a flexible production system to improve productivity. This school of thought feeds into a wider body of research that expects informalisation to improve economic outcomes. Intensiveness of labour in the informal production makes it a source of plentiful employment opportunities, which is arguably well-suited to the production structure of labour-abundant poor countries (Potts, 2008). In this regard, due to their flexibility the informal sector

[8] In addition to these, is the legalists school of thought which portrays the informal sector firms as entrepreneurs who operate informally in order to evade costs of formal registration and avoid government regulations and rules (De Soto et al., 2000).

[9] These includes cost such as taxation, social security cost-which the informal sector is not liable for.

firms can be more productivity than large formal sector firms. However, these theories are inconclusive on which model explains better on the labour and output markets in developing countries. It is therefore a matter of empirical analysis to determine this.

2.2.4 Empirical Review

There has been increasing literature on the implication of the informal sector on development (Gelb et al., 2009; Chen, 2005; La Porta and Shleifer, 2008; De Soto, 2000). Although several studies have been done regarding the importance of the informal sector, there is still no consensus on the role of this sector as a source of sustainable growth and its importance. Some studies are in support of the dualist theories (e.g. La Porta and Shleifer, 2014; La Porta and Shleifer, 2008; Báez-Morales, 2016; Fajnzylber et al., 2011; Benjamin and Mbaye, 2012). These studies have concluded that most informal sector firms are too small to sufficiently become efficient and productive. For example, informal sector employees averaged around four workers while formal sector firms can employ more than hundred workers (La Porta and Shleifer, 2014). Studies have shown that developing economies are cleaved, between non-productive and productive firms in the formal and informal sectors (Báez-Morales, 2016, La Porta and Shleifer, 2014; Fajnzylber et al., 2011).

Most studies have investigated formal-informal sector efficiency differences quantitatively by decomposing output gaps between the two sectors (e.g. Baez-Morales, 2016, La Porta and Shleifer, 2008). Echevin and Murtin (2009) used the Oaxaca-Blinder decomposition technique to assess the output gap between the informal and formal sector in Mali, Benin and Senegal using the employer-employee data sets. Their study found evidence of large output gaps between the formal and the informal sector. They also found evidence of low human and physical capital returns in informal sector in all these countries compared to the formal sector. They concluded that informal sector firms are less likely to be efficient than formal sector because they are unable to attract skilled labour endowments due to low wages and lack of capital endowments compared to formal sector. Using the stochastic frontier model to measure sectoral efficiency differences and Oaxaca-Blinder decomposition technique to explain these differences, Baez-Morales (2016) concluded that the productivity of informal firms is too low for them to compete with formal sector firms in Mexico[10]. They found firm's age, owner's level of education and financing to be key drivers associated with efficiency differences between the formal and informal sector. Consequently, the growth and persistence of the

[10] They used data on micro firms collected from the National Micro Firm Survey for 2008,2010 and 2011.

informal economy reflects misallocation of resources and growth policies should concentrate on reviving the formal sector. Huge productivity gaps are an indication of allocative inefficiencies between these sectors (McMillan and Rodrick, 2011).

A study by La Porta and Shleifer, (2008) provided a useful review of different prepositions on informal sector. Using data from World Bank Informal and Micro Surveys, they assessed the role of the informal sector in developing countries. Analysing labour productivity as measured by value added per worker, they found evidence that supports the dualists' view that the informal sector comprises of low labour productivity firms. The authors found large productivity gaps between the formal and the informal sector in developing economies and concluded that informal sector firms are less productive economic units as compared to formal firms. However, it remains unclear if moving resources from informal to formal firms could increase aggregate TFP, as insisted by the authors. The results of their study should be taken with caution before accepting them. The first reason is that they used value added per work as a measure for labour productivity. There is broad literature that has shown than disparities in revenue productivities reveal distortions differences rather than disparity in true productivity (Hsieh and Klenow, 2009; Foster et al., 2008; Asker et al., 2014). In addition, a study that compares formal and informal sector needs to assess disparities in both allocative efficiency and actual productivity in which resources are allocated. Within and between sector resource allocation is a function of government policies, markets and institution (Restuccia and Rogerson, 2008; 2017; León-Ledesma, 2016)

Other studies have used the stochastic frontier analysis to assess the technical efficiency of the informal sector (e.g. Kathuria et al., 2013; Mujeyi et al., 2016; Rajesh Rajai, 2007). Using data for formal and informal manufacturing sector in India, Kathuria et al. (2013) found that the formal sector firms are more significantly efficient than the informal sector firms. Her results are incline with the dualists' views of informality. In her study, she advocated for policy that reduce the informal sector size to realise overall growth. While these studies have been concentrating on technical efficiency, our study is more interested in allocative efficiency which is an important source of productivity especially in emerging economies (Busso et al., 2012; Lopez-Martin, B, 2015).

Gelb et al. (2009) used data from microenterprises surveys to compare productivity of micro formal and informal firms from selected Southern and Eastern African countries[11]. They found

[11] The survey was done in South Africa, Namibia, Botswana, Kenya, Uganda, Tanzania, and Rwanda

that informal micro firms were as much productive as micro formal firms in Eastern Africa. However, in Southern Africa informal sector firms were less productive than formal ones. Literature has generally showed that the informal sector is much bigger in Eastern Africa than Southern Africa. There survey did not include firms in Zimbabwe despite that Zimbabwe has the largest informal sector in the Southern Africa. They also concluded that in countries with weak economic environment, informal firms are as likely as formal firms to increase their productivity to enhance growth. Contrary to Lopez-Martin (2015), Gelb et al. (2009) have results in favour of informal sector, which they say forms an integrated part the economy and policies should be skewed towards improving its productivity[12] to achieve overall growth.

The economic performance of firms in both the formal and the informal sector may be hindered by obstacles which inhibit firms from operating efficiently. These includes labour market regulation and government policies (Ardagna and Lusardi, 2008). One of the most common obstacle facing informal sector firms is availability of capital and credit lines. Hendy and Zaki (2013) found credit constraints as the major contributor of productivity differences between the formal and the informal sector. The study confirms that firms in the formal sector are more capital intensive than informal ones. Capital endowments differences are largely explained by lack of access to credit by informal firms. On the other hand, most formal sector firms are constrained by labour market policies that hinders them from shedding off excess labour (McMillan and Rodrick, 2011). Instead of shrinking operations, low productivity firms continue employing labour, leading to 'zombie[13]' firms-an indication of major resources of misallocation (Caballero et al., 2008).

In Zimbabwe, studies on informal sector efficiency have been marginal. Mujeyi et al. (2016) evaluated the technical efficiency of the informal manufacturing sector firms in Zimbabwe. They used data collected in the informal metal manufacturing sector and estimated the stochastic frontier production function to provide an assessment of technical efficiency among selected firms and analysed factors that affect such efficiency. They found firms in the informal metal industry to be labour intensive and experiencing significant level of technical inefficiency. They argued that, the metal informal sector firms in Zimbabwe have scope to increase their capacity if they efficiently allocate available technology. In their study, they found location of enterprise, age of owner, firm age, owner level of education and experience

[12] The results of their study in compatible with the view of the structuralist school of thought.
[13] Low productivity firms that are artificially alive. Such zombie firms hinder resource reallocation and productivity growth.

to be main sources of (in)efficiency. While Mujeyi et al. (2016) looked only in the metal sector, our study covers all manufacturing sectors within the informal sector to provide a more comprehensive understanding and representation of the informal sector efficiency. In addition, our study is more interested in allocative efficiency rather than technical efficiency. Most studies have shown that allocative efficiency is an importance aspect to increase productivity and growth in developing countries (Restuccia and Rogerson, 2008;2017; Dias et al., 2016; Busso et al., 2012; Midrigan, and Xu D, 2014). Furthermore, unlike in Mujeyi et al. (2016), we also provide a comparison of the efficiency differences between the formal and the informal sector. Such comparison, will allow us to conclude on the role of the informal sector as a driver of growth. Other studies in Zimbabwe has predominantly focussed on nature and characteristics of formal and informal sector without an in-depth analysis on productivity and efficiency (e.g. MacPherson 1996, Mudavanhu et al., 2011, Luebker 2008). There is, therefore, a huge gap in literature on allocative efficiency that needs to be addressed in the context of Zimbabwe manufacturing sector.

There has been little empirical analysis of allocative efficiency disparities between formal and informal manufacturing sector firms. Such analysis has been constrained by non-availability of firm level micro data on the informal manufacturing sector which allows such comparisons. Given that much focus on allocative efficiency has been on the formal sector (e.g. Leal, J. 2016; Syverson, C. 2011; Guner et al., 2008; Busso et al., 2012; Midrigan, and Xu D, 2014) and the availability of the extensive data on Zimbabwe manufacturing sector firms we have, it is important to make same enquiry in the informal sector. In this study, we focus on assessing if there are any disparities in allocative efficiency between and within the informal and formal manufacturing sector and the likely sources of these differences (if any). Close studies that has assessed informal sector allocative efficiency include studies by Lopez-Martin, B. (2015) and Busso et al. (2012) in Mexico.

Busso et al. (2012) applied the Hsieh and Klenow (2009) model to assess resource misallocation and productivity between formal and informal sector using firm level micro data in Mexico. In their study, they found informal sector to be less productive than the formal sector, despite that the informal sector command a large share of production resources. Although their study shows the correlation between informality and productivity, it did not show the causation between two. They concluded that informality plays a significant role in resource misallocation by creating labour markets distortions that reduces total factor

productivity. They advocated for policies to eliminate the informal sector due to its productivity costs and fiscal problems of tax evasion.

Lopez-Martin (2015) carried out a study to determine the extent of misallocation in the informal sector in developing economies[14], using firm level data. He concluded that large aggregate productivity loses are because of large informal sectors in developing countries. He found that improvement in access to credit for formal sector firms and reduction of informal sector size has large bearings on increasing aggregate TFP, wages and employment. They found the informal sector as an inferior sector that should be eliminated to enhance growth. His study feeds well into body of literature that supports the dualist school of thought on to removal of the informal sector if full potential productivity growth is to be achieved.

This study extends the literature on the importance of resource misallocation and distortions on total productivity and output, in the wake of shrinking formal sector in Zimbabwe. Resource misallocation within and across firms and sectors has been considered as the major source constraining growth and had been the focus of much research (Restuccia and Rogerson, 2008;2017; Dias et al., 2016, Nguyen, 2016; Foster et al., 2008; Hsieh and Klenow,2009; Bartelsman et al., 2013; Syverson, C. 2011, Busso et al., 2012; Banerjee et al., 2003). Literature in this area has looked at the effects of distortions on firm size, financial constraints and government policies on resource misallocation and productivity (Leal, J. 2016). Thus, our study seeks to compliment such literature by including the informal sector, a sector that has been largely ignored in mainstream literature on resource misallocation. In their most cited paper, Hsieh and Klenow (2009) used manufacturing firms' data in China (1998-2005) and India (1987-1994) to analyse cross-country differences in misallocation and total factor productivity (TFP). They developed a model that identifies the extent of misallocation of resources from variation in marginal products of inputs-now known as the HK model. In their study, they argued that if misallocation of resources is removed completely marginal products for capital and labour for all firms will be equalised. Hence it is resource misallocation that brings disequilibrium in marginal products of factors of production. The results of their study showed evidence that supports resource misallocation in China and India and argued that manufacturing TFP can increase 30% to 50% in China and 40% to 60% in India if labour and capital are reallocated so that marginal products are equalised to the extend observed in US.

[14] His study was done for Mexico, Egypt, and Turkey. It was built upon the frameworks of occupational choice and industry equilibrium of Lucas (1978) and Hopenhayn (1992).

Their study, and other studies, show that resource misallocation can constrain productivity and growth especially in most developing economies

Most studies have applied the methodology of Hsieh and Klenow (2009) (HK model) to show the implication of firm size, distortions, and misallocation on productivity. Examples of such studies include Kalemli-Ozcan and Sorensen (2012) in African countries, Asker et al. (2014) in developing countries, León-Ledesma (2016) and Nguyen et al. (2016) in Turkey) among others. Hsieh and Klenow (2009) model depends on the assumption of market structure and calculations of specific distortions. This methodology allows us to analyse the importance and impact of capital and output distortions on allocative efficiency. Our study is part of literature that has used micro-data to assess the extent of resource misallocation in the manufacturing sector in Zimbabwe. Following the Hsieh and Klenow (2009) methodology, literature finds that countries can achieve large potential productivity gains and growth by correction for resource misallocation.

Kalemli-Ozcan and Sorensen (2012) assess capital misallocation in some African countries and some developed countries and revealed a great deal of misallocation in Africa and India than in developed countries. They argued that most developing economies in Africa are characterised by small unproductive firms that are usually liquidity constrained to invest in more productive technologies.

León-Ledesma, (2016) used firm-level data in a number of developing countries to measure misallocation using the HK model and the Olley and Pakes (1996) (OP) decomposition technique. He found access to finance, infrastructure, firm size, and regulations to be key drivers of misallocation. Their study also concluded that developing economies are cleaved, between non-productive and productive firms in the formal and informal sectors. Using OP technique, Bartelsman et al. (2013) investigated the impact of firm size on productivity and resource allocation in across US and selected European countries. The study found within industry productivity and size of firm to be correlated, with the direction of relationship varying across countries. The relationship was found to be stronger in more advanced economies. In some countries, small firms were more productive than large firms, raising questions to the dualists' notions that small firms are unproductive. These results were in line with Foster et al. (2008) and Syverson, C. (2011).

A large body of literature has studied duality and informality as source of poor productivity levels in developing economies. This literature is the predecessor to researches on

quantification of resource misallocation given the scope that development requires reallocation of resources from traditional informal sector to modern formal sector (Restuccia and Rogerson, 2017). However, in Zimbabwe, with shrinking formal 'modern' sector, resources are moving back to the informal 'traditional' sector. Following Foster et al. (2008), this study uses the concept of revenue-based and output-based total factor productivity (TFPR and TFPQ) to assess misallocation. Differentiating between TFPR and TFPQ is crucial in measuring actual productivity and resource misallocation. TFPR mainly shows idiosyncratic factor price and demand effects efficiency differences, while TFPQ depicts firm idiosyncratic costs components, both factor prices and technological fundamentals. Thus, difference in TFPQ and TFPR accounts for different factors in TFP calculations. Recent studies have extended the Hsieh and Klenow (2009) model by developing a decomposition technique for TFP within the HK model (Chen and Irarrazabal, 2013; Dias et al., 2016). This technique decomposes TFP into within- firm and between-firm components.

Most studies have analysed sectoral efficiency differences using broad sector data sets such manufacturing, service, and agriculture, hiding crucial resource misallocation that may occur, for instance between metal industry in the formal and informal sectors. Making a distinction between informal and formal manufacturing activities may have crucial implications in deepening our understanding of allocative efficiency and structural change. In addition, this allows to capture intersectoral allocative efficiency and within-industry misallocation.

2.3 Empirical Method

This study applied the widely used Hsieh and Klenow (2009) (HK model) theoretical framework to measure misallocation. The HK model is used to measure the extent to which distortions affect wedges between marginal products of capital and labour. The basic concept behind the HK model is that when input factors are efficiently allocated, marginal products of inputs should be equal across firms, as the theory of allocative efficiency predicts. Hence, dispersion of marginal products can be used as a measure of the extent of misallocation of production inputs. This model, therefore, allows one to quantitatively assess productivity losses arising as a result of disequilibrium in marginal products across firms. Accordingly, given the underlying assumptions under the HK model, the reason marginal products may not be equal across firms is the existence of distortions in the product and factor markets. As a result, variation of marginal products is a measure of such distortions (Dias et al., 2014; Hsieh and Klenow, 2009). Hsieh and Klenow (2009) deduce an overall measure of dispersion in marginal

products, TFPR, which is average weighted marginal revenue product of labour and capital. The variance of TFPR measures the aggregate effect of resource misallocation on productivity.

The HK framework assumes an economy with heterogenous manufacturing firms, operating under a monopolistic competition market structure. Assuming an economy with many industrial sectors,s, aggregate output is given by a Cobb Douglas production technology: $Y = \prod_{s=1}^{s} Y_s^{\theta s}$ where θ_s is the value-added share of the industry s, and $\sum_{s=1}^{s} \theta_s = 1$. Each industry output Y_s is the total of individual firm's production Y_{si}, with a CES technology, such that;

$$Y_s = \left(\sum_{i=1}^{Ms} Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

where Y_{si} is differentiated product of firm *i* in industry *s*, and Ms is the number of firms in each industry. Each firm produces a differentiated product using Cobb-Douglas production technology:

$$Y_{si} = A_{si} K_{si}^{a_s} L_{si}^{1-\alpha_s} \qquad (1)$$

where A_{si} is firm specific productivity (TFP), K_{si} and L_{si} are capital and labour inputs respectively. The key assumption is that firms in the same industry have same production technologies. Each firm maximise profits;

$$\pi_{si} = (1 - \tau_{Ysi}) P_{si} Y_{si} - w L_{si} - (1 + \tau_{Ksi}) R K_{si} \qquad (2)$$

where $P_{si} Y_{si}$ is firm's value added (firm's revenue less cost of raw materials), w and R are unit cost of labour and capital respectively. The term τ_{Ysi} shows firm specific distorts of output which reduces revenue (e.g transport costs, taxes corruption) and τ_{Ksi} denotes firm-specific capital distortions which increase cost of capital (e.g. access to credit, credit rationing)[15]

Following the Hsieh and Klenow (2009), the first order condition from profit maximisation can be used derive firm distortions and productivity as:

$$1 + \tau_{Ksi} = \frac{a_s}{1-a_s} \frac{w L_{si}}{R K_{si}} \qquad (3)$$

$$1 - \tau_{Ysi} = \frac{\delta}{1-\delta} \frac{w L_{si}}{(1-a_s) P_{si} Y_{si}} \qquad (4)$$

[15] The list of factors that causes distortions varies and is long. For example, inefficient financial markets may offer credits to selective producers based on non-economic factors, causing misallocation. Government may provide contracts, special taxes and subsides to selected firms. Labour regulations may restrict firms from firing and hiring, driving up the cost of labour in formal sector than in the formal sector.

$$A_{si} = \frac{(P_{si}Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{\alpha_s}(wL_{si}^{1-\alpha_s})} \quad (5)$$

Equation (3) shows the distortions in input choice relative to the optimal level of factor input. It shows that an establishment faces a high capital distortion (larger τ_{Ksi}) when the ratio of labor to capital is high benchmarked to the efficient allocation of input. It is worth emphasizing that τ_{Ksi} measures capital market distortion relative to labour market distortion. Thus, high capital distortion (larger τ_{Ksi}) should be interpreted as a low labour distortion, and vice versa.

Note that in our computation, following Hsieh and Klenow (2009), we use an establishment's total wage bill (including benefits) instead of employment to account for differences in the quality of labour across establishments.

Marginal revenue product of capital (MRPK) and labour (MRPL) are affected by distortions as follows:

$$MRPK_{si} = \alpha\frac{\sigma-1}{\sigma}\frac{P_{si}Y_{si}}{K_{si}} = R\frac{1+\tau_{Ksi}}{1-\tau_{Ysi}} \quad (6)$$

$$MRPL_{si} = (1-\alpha_s)\frac{\sigma-1}{\sigma}\frac{P_{si}Y_{si}}{L_{si}} = w\frac{1}{1-\tau_{Ysi}} \quad (7)$$

Based on Foster et al. (2008), we then make a crucial distinguish between two measures of productivity one in in monetary value (TFPR) and the other in physical units (TFPQ)[16];

$$TFPQ_{si} = A_{si} = \frac{Y_{si}}{K_{si}^{\alpha_s}(wL_{si}^{1-\alpha_s})}$$

$$TFPR_{si} = \frac{P_{si}Y_{si}}{K_{si}^{\alpha_s}(wL_{si}^{1-\alpha_s})} = P_{si}TFPQ$$

In this framework, in the absence of distortions TFPR should be equal across firms in the same industry. The argument is that (assuming monopolistic competition), lower productive firms produce less and charge high prices while higher productive firms produce more and charge lower price. Hsieh and Klenow (2009) argued that in the absence of distortions more labour and capital should be allocated to firms with higher TFPQ which will result in lower prices and have the same TFPR with small firms. Hence any difference in TFPR within the same industry denotes distortions. TFPR can be expressed as weighted average of marginal revenue products:

[16] Note that what we observe in the data are the MRPKi and TFPRi and not MPKi and TFPQi for every firm as we do not observe individual firm prices. This is the reason the HK make an assumption about market structure to infer prices as a function of firm productivity and distortions.

$$TFPR_{si} = \frac{\sigma}{1-\sigma}\left(\frac{MRPK_{si}}{a_s}\right)^{a_s}\left(\frac{MRPL_{si}}{w(1-a_s)}\right)^{1-a_s} \quad (8)$$

Substituting $MRPK_{si}$ and $MRPL_{si}$ in $TFPR_{si}$ we get a measure of TFRP at firm level as;

$$TFPR_{si} = \frac{\sigma}{1-\sigma}\left(\frac{R}{a_s}\right)^{a_s}\left(\frac{w}{1-a_s}\right)^{1-a_s}\frac{(1+\tau_{Ksi})^{a_s}}{1-\tau_{Ysi}} \quad (9)$$

In this framework, TFPR at industry level can be calculated as follows:

$$\overline{TFPR_s} = \frac{\sigma}{1-\sigma}\left(\frac{R}{a_s\sum_{i=1}^{Ms}\left(\frac{1-\tau_{Ysi}}{1+\tau_{Ksi}}\right)\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)}\right)^{a_s}\left(\frac{w}{1-a_s\sum_{i=1}^{Ms}(1-\tau_{Ysi})\left(\frac{P_{si}Y_{si}}{P_sY_s}\right)}\right)^{1-a_s} \quad (10)$$

Once $TFPR_{si}$ has been calculated for all firms, aggregate misallocation in the economy can be measured as the dispersion of its distribution across firms. In this study, we are interested in assessing how misallocation (as measured by variance of TFPR) varies between sectors (formal vs informal), industrial sectors (e.g. wood, clothing, metal) as well as firm size and within these groups. We, therefore, categorise firms not only by sector but also by industry and firm size they belong to.

From equation (9) and (10) and it can be shown that in the absence of distortions (i.e. when τ_{Ksi} = 0 and τ_{Ysi}=0) for all *i*, the right-hand side of (9) equals the right-hand side of (10), which means that TFPR do not differ for firms within the same industry. This implies that in the absence of distortions production resources will be allocated to more productive establishments with higher TFP and less to productive firms with lower TFP[17]. Contrary, with distortions, TFPR may not be equalised across firms-a symptom of resource misallocation. A firm with higher TFPR than average industry is taxed more, that is, it suffers from more obstacles than other firms. Hence, deviation of firm's TFPR from average industry TFPR represents distortions which indicates resource misallocation and allocative inefficiency. This can be represented as scaled TFPR $\left(\frac{TFPR_{si}}{\overline{TFPR_s}}\right)$. If the scaled TFPR for a given firm is greater than one it means that the firm is being taxed so that if distortions are removed the firm increases production. We use the scaled (log) TFPR as a measure of resource misallocation in our empirical analysis.

With both revenue and physical productivity for establishments in the sample, we can calculate industry level TFP. Since TFPR is regarded as the main source of distortions and TFPQ shows

[17] This reallocation of resources continues to a point where prices start lowering for firms with higher output and rising for firms with lower output until their TFPR is equalized.

the actual productivity, industry actual TFP can be found by average of firms' TFPQ weighted by firms' level deviations of TFPR from industry mean. It is also crucial to relate TFPQ to firms' distortions and productivities. Firms with lower TFPR than industry average (i.e. with fewer distortions) will have higher weight hence higher TFPQ than those with higher values of TFPR. Industry aggregate TFPQ is given by:

$$TFP_s^{act} = A_s = \left[\sum_{i=1}^{Ms}\left(A_{si}\frac{\overline{TFPR_s}}{TFPR_{si}}\right)^{\sigma-1}\right]^{\frac{1}{\sigma-1}} \quad (11)$$

As discussed above, in the absence of distortion (in an efficient economy) firm-level and industry TFPR will be equal such that the efficient level of industry TFP will be given by:

$$TFP_s^{eff} = \bar{A}_s = [\sum_{i=1}^{Ms}(A_{si})^{\sigma-1}]^{\frac{1}{\sigma-1}} \quad (12)$$

In equation (12) resources are reallocated from less productive firms to more productive ones, hence TFPQ will be highest. Therefore, deviation of equation (11) from (12) can be used to calculate output costs that occur because of distortions.

To calculate productivity loss due to distortions at industry level, HK used the ratio of actual TFP to the efficient level of TFP[18] as shown in equation (13);

$$\frac{TFP_s^{eff}}{TFP_s^{act}} = \left[\frac{\sum_{i=1}^{Ms}(A_{si})^{\sigma-1}}{\sum_{i=1}^{Ms}\left(A_{si}\frac{\overline{TFPR_s}}{TFPR_{si}}\right)^{\sigma-1}}\right]^{\frac{1}{\sigma-1}} \quad (13)$$

Equation (13) shows the gap between the distorted and efficient level of TFPQ. Aggregate productivity gains across all industries is a calculate using the Cobb-Douglas aggregator as:

$$\frac{TFP^{actual}}{TFP^{efficient}} = \prod_{s=1}^{S}\left[\sum_{i=1}^{Ms}\left(\frac{A_{si}\overline{TFPR_s}}{\bar{A}_s TFPR_{si}}\right)^{\sigma-1}\right]^{\frac{\theta s}{\sigma-1}} \quad (14)$$

In our model, if there is no misallocation, more productive firms should produce more output and should be large. If there exist size depended policies such that $TFPQ_{si}$ and $1+\tau_{Ksi}$ positively correlated or $TFPQ_{si}$ and $1-\tau_{Ysi}$ are negatively correlated, more productive firms will produce less than optimal and less productive firms will produce more than optimal. This

[18] Note that productivity loss (gains) is zero if $\frac{\overline{TFPR_s}}{TFPR_{si}}$ = 1 for all establishments. This is achieved if there are no distortions such that dispersion of $\frac{\overline{TFPR_s}}{TFPR_{si}}$ is zero.

entails that efficient distribution is more dispersed and spread out than the actual size distribution in the presence of distortions.

We extent the Hsieh and Klenow (2009) methodology by identifying likelihood sources of resource misallocation. To identify the firm characteristics associated with these distortions, we will regress the (log of) MRPK, τ_{Ksi} and τ_{Ysi} on the firm level characteristics across sectors. This allows us to understand if institutional obstacles are good predictors of distortions and whether they act as a tax or a subsidy. Variables incudes firm size, access to finance, electricity, manager human capital and age, age of firm and industrial sector. In addition, we will also estimate an aggregate model for the whole manufacturing sector. The role of informality as an additional explanatory variable can also be identified through the inclusion of an informal sector dummy in the aggregate model. The signs of the coefficients, including that of size, will allow the 'testing' of the dual theory of informality that predicts that small and informal sector firms are unproductive and reflect a misallocation of resources.

In conclusion, we employ the Hsieh and Klenow (2009) methodology in estimating allocative efficiency between and within the formal and informal manufacturing sector. The dispersion of output and capital distortion and scaled TFPR will help us to assess and compare the extent of resource misallocation across industries between and within the formal and informal manufacturing sector. We also estimate TFP gain that can be achieved if resources are efficiently allocated at industry level within each sector. We extent the HK model to trace the likelihood sources of distortions.

2.4 Data

The study is based on the new existing matched employer-employee dataset of Zimbabwean manufacturing firms that was collected in 2015 under the "Matched Employee-Employer Panel Data for Labour Market Analysis in Zimbabwe" project. Under this project 194 formal manufacturing firms and 1385 workers within these firms were interviewed in 2015. In addition, 132 informal manufacturing firms plus 174 workers within these firms were interviewed.

For the analysis in this study, we use the data on firms. Manufacturing firms were grouped into 2-digit industrial sectors. The sectors in the formal sector are: Food, Beverages and Tobacco, Wood, and Furniture; Metal, Machinery and Equipment, Textile and Leather, Chemical and Rubber. We have the informal sector data on the following sector only: Wood and Furniture;

Metal, Machinery and Equipment, Textile, and Leather. Our comparison of the formal and informal sector results will be based on industrial sectors that match both sectors.

As discussed above, for us to be able to calculate measures of distortions and TFP, we require data on total production, raw material costs, expenses, capital stock and labour inputs. In our analysis, labour input is measured by the wage bill[19] (rather than employment) to account for differences in human capital and hour worked (as in Hsieh and Klenow, 2009). Capital stock is measured by net book and market value of fixed assets, summed across vehicles, machinery and equipment, and land and buildings. Value added is computed as the difference between sales and cost of raw materials, overhead expenses, and energy costs (electricity, fuel, gas).

To implement the Hsieh and Klenow (2009) framework, we need information on elasticity of substation (σ), interest rate (R) and industry level of labour and capital share (α_s). There is little consensus in literature on which effective magnitude on this parameter. Some studies fix this at 5 (meaning more substitutability of input factors). Following the HK framework, we fixed this parameter at $\sigma = 3$[20]. We also set $R = 12.5\%$, this is the average interest rate reported in our data for the formal and informal firms. We calculate capital share by subtracting the industry mean of labour expenditure on value added at firm level from one (i.e. $a_s = 1 - \frac{wL_{si}}{P_{si}Y_{si}}$). In literature, most studies have widely used the US capital share which is set at one third. In our sample, we dropped all observation with negative values of value added, labour or capital. We left with a sample of firms with;

- Positive values of sales
- Positive values of labour costs, capital stock and raw material costs;
- Positive number of employment
- Non-missing observations for all other key variables
- Positive calculated value added.

In literature, access to credit and finance has been considered as playing a crucial role in explaining efficiency differences and misallocation. We include access to finance in our analysis on potential sources of misallocation. This is a dummy variable that takes value of one if a firm faces financial constraints and zero if not. Electricity shortages is another variable included in our analysis. Unequal distribution of energy among firms may have distortion effects on firms output and productivity. We also include firm age with the expectation that

[19]The sum of wages, bonuses, and benefits.
[20] This parameter does not alter our measures of distortions, but rather their effect on aggregate productivity.

older firms are likely to be more efficient than young ones. Table 2.1 below provides some key variables in our analysis.

Table 2.0 Summary statistics for key variables

	Formal Sector			Informal Sector		
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Value added per worker (log)	173	8.42	1.47	120	7.81	0.83
Value added per capital (log)	167	-0.60	1.88	119	2.27	1.33
Labour costs (log)	185	11.55	2.09	118	8.36	0.96
Firm Size (employment)	195	80.02	189.16	128	3.22	1.64
Firm age	191	35.98	20.68	122	9.11	6.96

The summary statistics in table 2.0 shows differences in firm size between the formal and informal sector firms, with formal sector having average employment of 80 as compared to informal sector of about 3. It also seems that firms in the informal sector are on average younger than those in the formal sector. However, value added per worker (worker productivity) is almost the same in the two sectors.

Tab 2.1: Prevalence of Obstacles in the formal and informal manufacturing sector

	% of firms that declare obstacle	
Variable	**Formal sector**	**Informal sector**
Regulations	13.27	29.77
Lack of financial access	6.33	47.33
Shortage of electricity	56.12	20.16
Import competition	67.35	49.62

Table 2.1 presents the proportion of firms within each sector that declare the given obstacles as constraining their businesses. The major difference in relative incidence of obstacles is on shortage of financial access. Only 6.3% of firms in the formal sector reports having challenges in accessing finance while 47.33 report the same incidence in the informal sector.

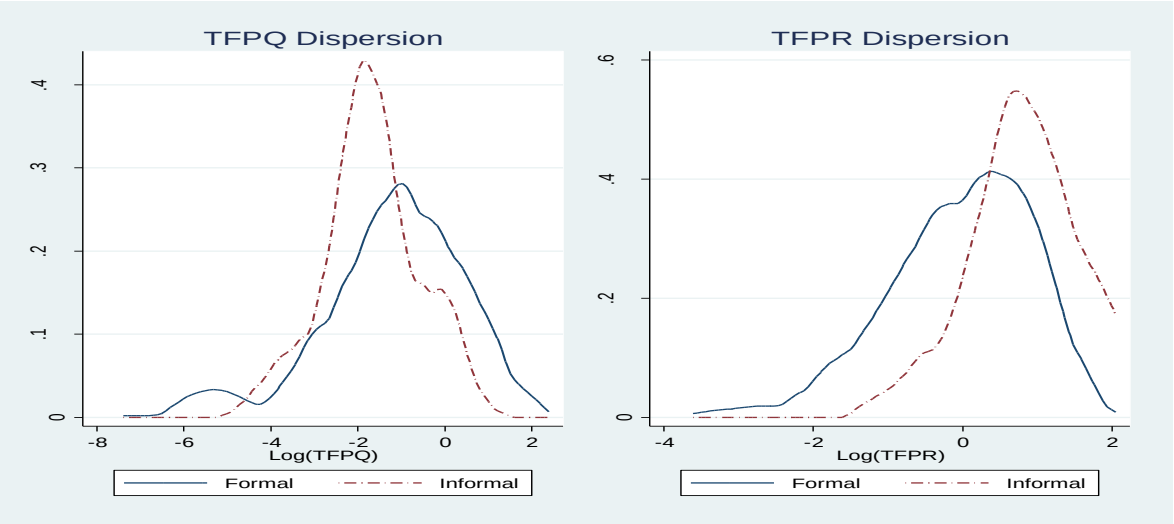
2.5 Results

This section presents results of the Hsieh and Klenow (2009) model applied to Zimbabwe manufacturing sector data, to analyse the extent of resource misallocation between formal and informal sector.

2.5. 1 Measuring Productivity and Distortions

Figure 2.1 shows the distribution of plant TFPR and TFPQ demeaned by industry averages for the formal and informal sector in Zimbabwe. TFPR and TFPQ distributions are respectively calculated as $log(TFPR_{si}/\overline{TFPR_s})$ and $log(TFPQ_{si}/\overline{TFPQ_s})$ and are weighted by industry value added share relative to the economy. The graph for TFPQ shows a thicker left tail with some lumps for formal sector firms as compared to informal sector firms. A significant proportion of firms survive regardless of low productivity. This shows the possibility of

Figure 2.1: Distribution of TFPR and TFPQ



Notes: The left panel plots the distribution of TFPQ, $log(TFPQ_{si}/\overline{TFPQ_s})$ for formal and informal manufacturing sector; the right panel plots the distribution of TFPR, $log(TFPR_{si}/\overline{TFPR_s})$ for formal and informal manufacturing sector. Distributions are weighted but industries share of value added

existence of policies and regulations that prompt firms in the formal sector to continue operating at low productivity levels rather than exiting or expanding operations. In particular, rigidity in labour market regulation has, of late, impedes firms from laying off 'excess' labour. This is due to high retrenchments costs associated with laying off workers, hence firms have an incentive to keep workers above optimal level than laying them off. In most of these firms, production is very low and workers can spend more than six months without earning salaries.

This scenario provides some evidence of the existence of "zombie" firms within the formal manufacturing sector in Zimbabwe, which impedes factor reallocation and aggregate productivity growth. Table 2.2 provides various measures of dispersion between the formal and the informal sector. It shows the standard deviation of TFPQ, TFPR, and two components of TFPR, output and capital distortions, the difference between the 75th and 25th percentiles and the difference between the 90th and 10th percentiles for the informal and formal manufacturing sector in Zimbabwe.

Table 2.2: Dispersion of TFPR and TFPQ

	log(TFPQ)	**log(TFPR)**	**log(MPKR)**	**log (1+ τ_k)**	**log (1- τ_y)**
			Formal		
sd	1,978	1,125	1,754	1,599	0,952
p75-p25	2,478	1,310	2,245	1,737	0,924
p90-p10	4,955	2,593	4,434	4,389	2,042
Corr. with TFPQ	1	0,869	0,828	0,515	-0,647
N	166	166	167	176	171
			Informal		
sd	1,106	0,771	1,363	1,441	0,729
p75-p25	1,256	0,769	1,782	2,139	0,621
p90-p10	2,846	1,933	3,315	3,821	1,809
Corr. with TFPQ	1,000	0,894	0,791	0,451	-0,585
N	112	112	121	119	113

Notes: For each firm i, in industry s $TFPRsi=\frac{P_{si}Y_{si}}{K_{si}^{a_s}(wL_{si}^{1-a_s})}$, $TFPQsi=\frac{(P_{si}Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{a_s}(wL_{si}^{1-a_s})}$, $1+\tau_{Ksi}=\frac{a_s}{1-a_s}\frac{wL_{si}}{RK_{si}}$ *and* $1-\tau_{Ysi}=\frac{\delta}{1-\delta}\frac{wL_{si}}{(1-a_s)P_{si}Y_{si}}$. *The statistics for log(TFPQsi) and log(TFPRsi) are deviations from respective industry means. S.D is the standard deviation, p75-p25 is the difference between the 75th and 25th percentiles p90-p10 is the difference between the 90th and 10th percentiles. N is the number of firms.*

The finding shows notable firm-level productivity heterogeneity across the two sectors. This shows that some firms can produce more output than others given same level of inputs. By looking at the standard deviation of TFPQ (1,978 for formal firms against 1,106 for informal firms), table 2.2 shows larger productivity dispersion in the formal sector than in the informal sector. In the formal sector, firms in the 90th percentile of the productivity distribution are 495 percent more productive than those in the 10th percentile, while the gap is 284 percent in the informal sector. In addition, descriptive statistics have shown that the mean of TFPQ is higher than the median. This, combined with information in table 2.2 provides some evidence that

many less productivity firms coexist with few productive firms in Zimbabwe and this is much striking the formal manufacturing sector.

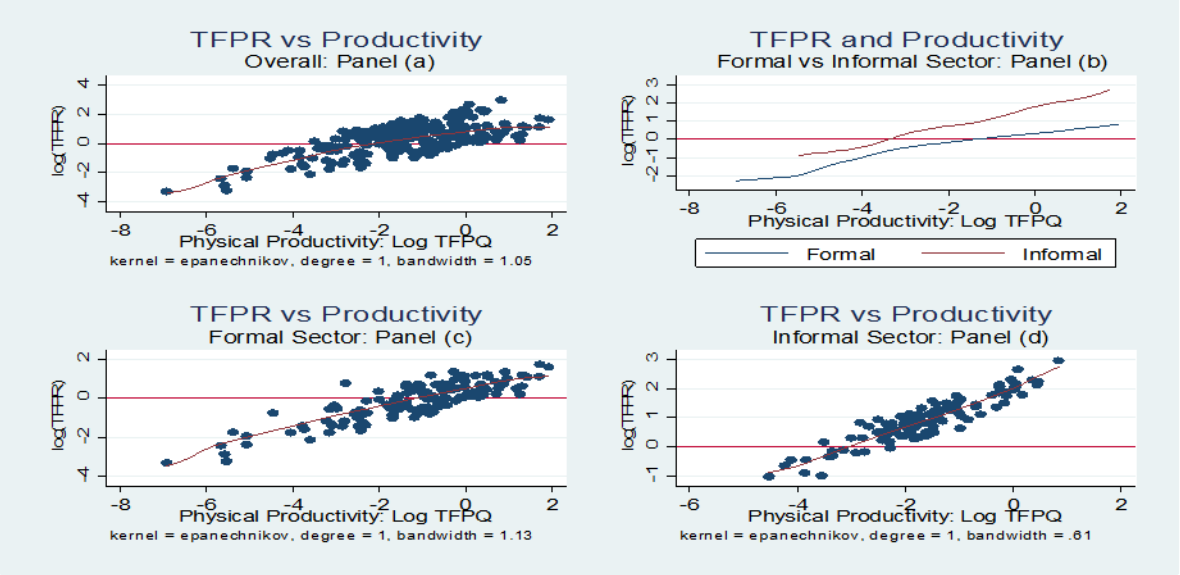
The reason for the coexistence of less and more productive firms is due to resource misallocation (Ciera et al., 2016). Dispersion in marginal products of factor inputs across producers has widely been used to assess the extent of resource misallocation (Hsieh and Klenow, 2009). Without distortions, marginal products of inputs should be the same for firms within the same industry and variation of marginal products should be zero as discussed above. Following Hsieh and Klenow (2009), I estimated the dispersion of TFPR (geometric mean of MPRL and MPRK demeaned by industry average) and interpret it as evidence of resource misallocation. The finding in figure 2.1 and table 2.2 shows TFPR dispersion within the formal and informal sector. Comparing ratio of the 90^{th} and 10^{th} percentiles of TFPR of 2,593 and 1.933 in the formal and informal sector respectively, the results show higher TFPR dispersion in the formal sector than the informal sector. These findings provide evidence of severe resource misallocation in the manufacturing sector in Zimbabwe and it seems more intense in the formal manufacturing sector. A possible explanation for these results is that policies and institutions play a central role in preventing more productive firms from growing while allowing less productive firms operating above their optimal size.

To explore the degree of resource misallocation in the Zimbabwean manufacturing sector, we calculate the correlation between TFPR and TFPQ. Results in table 2.2 reports a highly positive correlation between the TFPR and TFPQ in both sectors (0,869 in the formal sector and 0,894 in the informal sector). These results, in addition to negative correlation between TFPQ and 1-$\tau_{y,}$ reveal that high productivity firms are prone to huge idiosyncratic distortions.

2.5. 2 Distortions and Productivity

The results above have shown that variation of TFPR is quite large in both the formal and the informal sector. Distortions affect aggregate productivity negatively if they hinder growth of more productive firms relative to less efficient ones. They are costly if they are positively related to physical productivity (Ciera et al., 2016; Nguyen et al., 2016; Restuccia and Rogerson, 2008). To explore the relationship between distortions and productivity, in figure 2.3 I plot the local polynomial regression for TFPQ against TFPR.

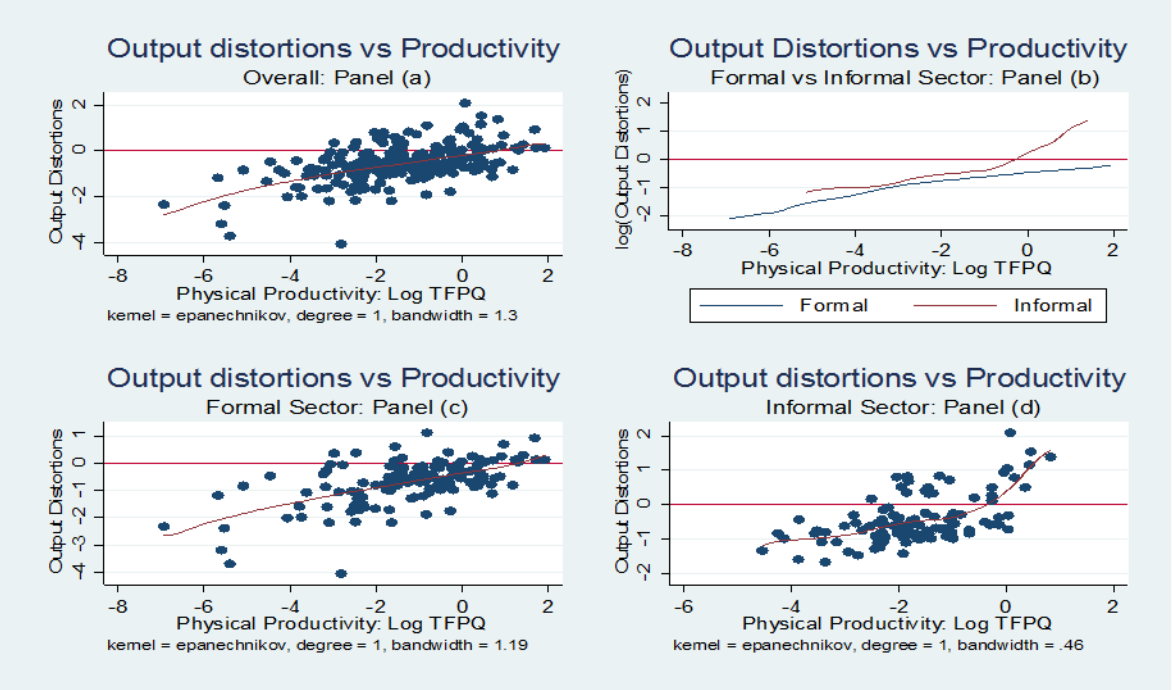
Figure 2. 3: Distortions vs Productivity



Notes: The plots show the relationship between TFPQ, $log(TFPQ_{si}/\overline{TFPQ_s})$ and TFPR, $log(TFPR_{si}/\overline{TFPR_s})$. Distributions are weighted but industries share of value added. Panel (a), shows for aggregate manufacturing sector. Panel (b) shows a comparison between formal and informal sector and panel (c) and (d) shows individual sector plots.

In an economy with no distortions the dispersion of $log(TFPR_{si}/\overline{TFPR_s})$ should be zero as discussed in above sections. Hence all firms would line along the zero TFPR line. Along this line, firms would only differ in their TFPQ. Results in figure 2.3 shows that TFPR is strongly increasing with TFPQ in all sectors. This suggest that more productive firms face high distortions that keep them from growing to their optimal level. Similar results have been found in developing countries (Ciera et al., 2016; Chen and Irarrazabal, 2013). To understand the sources and nature of distortions, it is important to decompose TFPR into capital distortions $log(1 + \tau k)$ and output distortions $log\left(\frac{1}{1-\tau y}\right)$. The relationship between these distortions and TFPQ are shown in figure 2.4 and figure 2.5. The results show that both capital and output distortions increase with firm productivity in all sectors. The results suggest that on average firms in both the formal and informal sector have negative values of output distortions. Negative values of $log\left(\frac{1}{1-\tau y}\right)$ implies that output distortions are large and are acting as tax on firms.

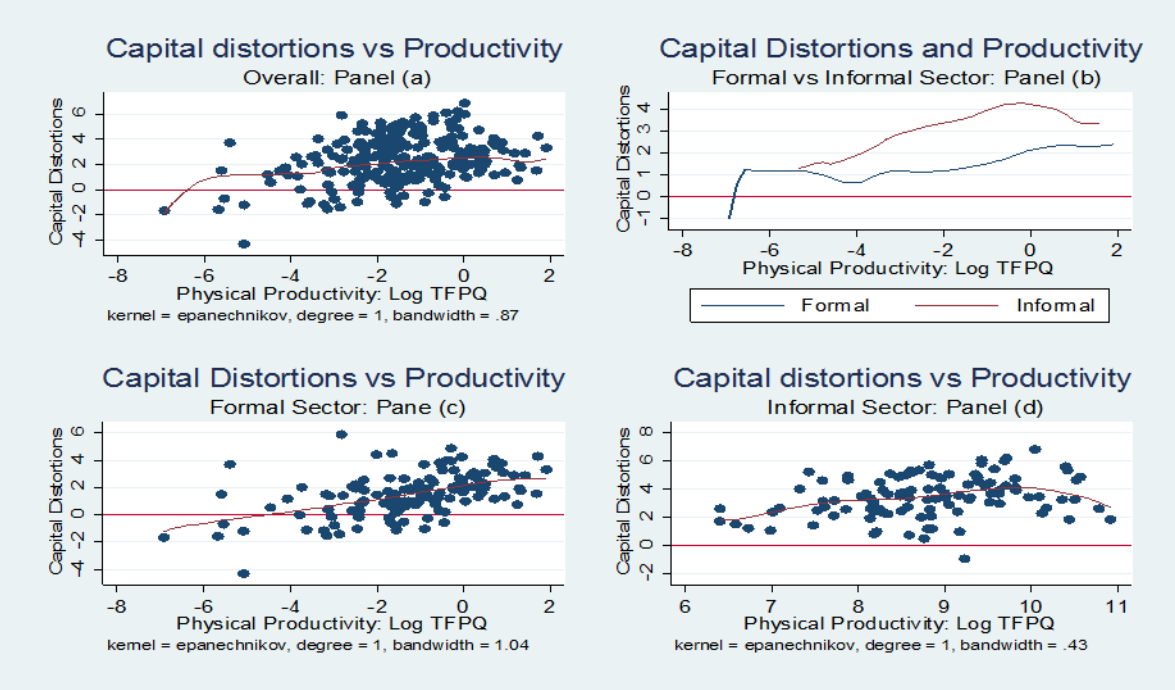
Figure 2. 4: Output distortions vs Productivity



Notes: The plots show the relationship between TFPQ, ($log(TFPQ_{si}/\overline{TFPQ}_s)$) and output distortions, log (1- τy). Distributions are weighted but industries share of value added. Panel (a), shows for aggregate manufacturing sector. Panel (b) shows a comparison between formal and informal sector and panel (c) and (d) shows individual sector plots.

These results show that productive firms face high output distortions which induce them to produce lower output than optimal while less productive firms produce more output than their optimal level in both sectors. In other words, output distortions are acting as tax on more productive firms and as a subsidy on less productive firms. This relationship between distortions and productivity is an indication of inefficiency allocation of resources and thus results in lowering aggregate TFP. The results in figure 2.5 show that on average firms have positive values of capital distortions. Again, this shows that capital distortions are acting as a tax on productive firms especially in the formal sector, in which the distortions monotonically increase with productivity.

Figure 2. 5: Capital distortions vs Productivity



Notes: The plots show the relationship between TFPQ, $log(TFPQ_{si}/\overline{TFPQ_s})$ and capital distortions, log (1+ τk). Distributions are weighted but industries share of value added. Panel (a), shows for aggregate manufacturing sector. Panel (b) shows a comparison between formal and informal sector.

Given the existence of huge resource misallocation in the manufacturing sector in Zimbabwe shown above, it is vital to assess potential gains in total factor productivity that can be realised if idiosyncratic distortions are eliminated. To calculate gains, the study compares actual level of output to a situation where there are no distortions, that is, a situation where variation in TFPR is zero. This is calculated as $\left(\frac{TFP_s^{efficient}}{TFP_s^{actual}} - 1\right)100$. Table 2.4 shows the gains achieved by equalising TFPR across firms. The results show that by efficiently allocating resources, aggregate TFP can be boosted by 106.1% for the entire manufacturing sector. In addition, these results indicate that elimination of distortions at firm level in the manufacturing sector would improve output by 113.1% in the formal sector and 119.4% in the informal sector.

Table 2.4 TFP gains from Reallocation of resources

	Total TFP Gains
All	**106,1**
Formal	**113,1**
informal	**119,4**

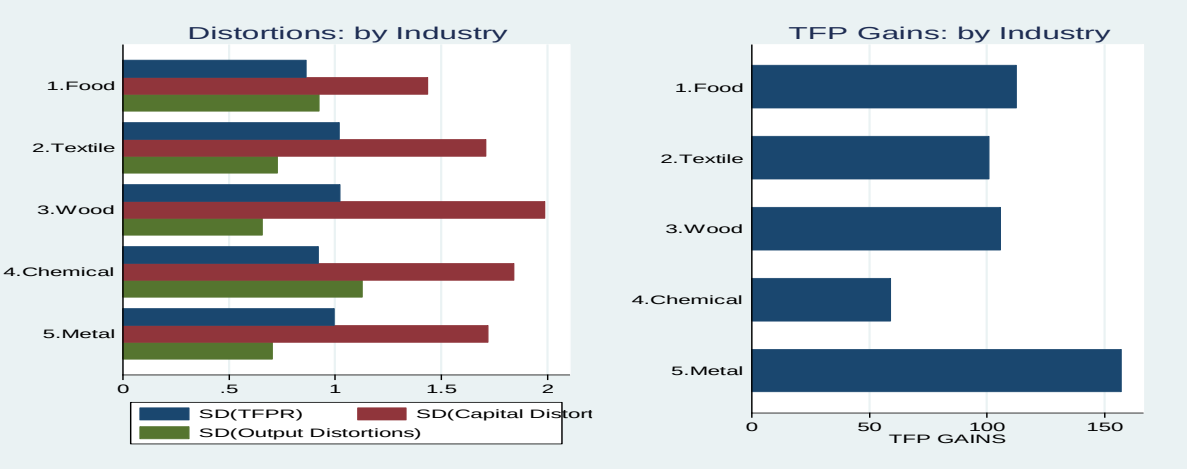
Notes: Entries are $\left(\frac{TFP_S{}^{efficient}}{TFP_S{}^{actual}} - 1\right) * 100$, *where* $\frac{TFP_S{}^{actual}}{TFP_S{}^{efficient}} = \prod_{s=1}^{s}\left[\sum_{i=1}^{Ms}\left(\frac{A_{si}\overline{TFPR_S}}{\bar{A}_S TFPR_{si}}\right)^{\sigma-1}\right]^{\frac{\theta s}{\sigma-1}}$ *and* $TFPR_{si} = \frac{P_{si}Y_{si}}{K_{si}^{a_S}(wL_{si}^{1-\alpha_S})}$.

Our analysis on potential gains has focussed on the removal of distortions within the manufacturing industries, separating from between industry productivity gains. Ciera et al. (2016), argued that removal distortions between industries may lead to higher TFP gains. In addition, our analysis has focused on static TFP gains. Efficiency resource allocation in the manufacturing sector may have important implications in the economy through its linkages with other sectors. Since there are strong linkages between the formal and the informal sector in Zimbabwe, correction of misallocation between formal and informal firms in the same industry may result in large TFP gains.

2.5. 3 Industry level of Misallocation

To explore the extent of misallocation, it is important to focus on industry level as aggregate outcomes may conceal significant differences in misallocation across industries. Figure 2.6 shows the dispersion of TFPR, capital distortions and output distortions by industrial sector. The right panel shows potential TFP gains achieved by efficient allocation of resources by industry. These results indicate that industry specific characteristics are linked to misallocation. The highly distorted sectors are the metal, textile, and wood sectors. Capital distortions mostly affect all industries. This provides some evidence that some industries are receiving some favourable policy treatment compared to others, which is a source of misallocation. In addition, figure 2.5 shows that TFP gains differ by industry sector. Elimination of distortions can increase TPF by about 50% in chemical industry as compared to about 150% in metal sector.

Figure 2. 6: Distortions by Industry



Notes: TFPR, TFPQ, capital distortions and output distortions are deviations from industry averages. Industries are weighted by shares of value added. Industry TFP gain are calculated as $\left(\frac{TFP_S{}^{efficient}}{TFP_S{}^{actual}} - 1\right) * 100$, *where* $\frac{TFP_S{}^{actual}}{TFP_S{}^{efficient}}$ *corresponds to equation (13).*

2.5. 4 Sources of Resource Misallocation

Thus far the study has been able to assess the extent of resource misallocation within and between formal and informal sector firms. The results above provide evidence of large resources misallocation both in the formal and informal manufacturing sector. Hence aggregate manufacturing productivity may can be boosted if resource allocation is improved. It is therefore important to identify specific factors that hinder effective allocation of resources so that suggestions can be offered on how to improve aggregate productivity. This section explores the likely sources of misallocation by regressing measures of misallocation (TFPR, capital distortions and output distortions) on obstacles facing firms and on firms' characteristics. Theoretically, a lot of factors (observed and unobserved) may influence misallocation. It is difficult to identify specific (policies and institutions) factors that contribute to misallocation (Restuccia and Rogerson, 2017). Our aim in this section is to unpack the potential sources of resource misallocation by analysing the impact of declared firm obstacles and firm-specific characteristics on misallocation.

The study utilises our rich data set which contains information of firm obstacles; these included challenges in accessing finance, lack of infrastructure, unfavourable labour and government regulations and import competition. Firms were directly asked if they suffer from such

constraints. These qualitative obstacle variables are dummy which take value of one if the firm reports that is suffers from such constraints and zero otherwise.

To investigate the role of firm-specific characteristics and obstacles facing firms in explaining resource misallocation, this study uses a regression approach. We regress available measures of distortions (lack of finance, shortage of electricity, regulations and import competition) that causes dispersion in TFPR, capital distortions (τ_ksi) and output distortions (r_y). We also included a dummy for informality which takes value one if a firm is in the informal sector and zero otherwise. The informality variable allows us the determine resource misallocation differentials between firms in the formal and informal sector. The model is specified as;

$$y_{is} = \gamma I + X_{is}'\beta + Z_{is}'\gamma + \varepsilon_{is} \qquad (15)$$

where y_{is} represents measures of misallocation (the dispersion of log(TFPR), log(τ_ksi) and log(τ_ysi) of firm i in industry s), I is a dummy variable for informality, X_{is} is a vector of firm distortions that causes resource misallocation, and these includes lack of finance, shortage of electricity, regulations and import competition, Z_{is} are firm characterises which includes firms size (measured by number of employees), firm age, firm industry and location, ε_{is} is white noise error term. We first run the specification in equation (15) on full sample. We then run the same specification on subsamples differing in terms of sector (formal and informal).

In literature, financial frictions are found to be a key contribution towards misallocation as it impedes the flow of credit to where it is used efficiently (Ciera et al., 2016; Dias et al., 2014; Restuccia and Rogerson, 2008), especially in poorly-functioning financial markets like Zimbabwe. In addition, lack of infrastructure is also thought as a major contribution to resource misallocation and following Ledesma (2016) and Kalemli-Ozcan and Sorensen (2012) we measure it with power shortages.

Following Ledesma (2016) we interpreted positive coefficients on TFPR as determinants of capital distortions relative to output distortions since high values of TFPR indicates that firm is using relatively lower capital than it would in the absent of frictions. On the other hand, a negative coefficient is interpreted as lowering TFPR such that output distortions are relatively high compared to capital distortions, that is, firm uses more labour relative to capital than optimal. In an efficiently operating system with no distortions, TFPR is the same for all firms within an industry, hence all coefficients should be insignificant for obstacles. The results in table 2.5 shows that informality is a positively and significantly correlated to with misallocation. This shows that on average firms in the informal sector faces higher aggregate

resource misallocation-measured by dispersion of log(TFPR) than those in the formal sector even when we control for all firm characteristics. These results confirm to our earlier results in figure 2.1 that informal sector firms are distorted than formal sector firms. These results provide a suggestion that formal and informal sector firms might be operating in different environments which seem to be more hostile to the informal sector firms. The specifications in table 2.5 differ in terms of firm controls we add.

Table 2.5. Correlation between obstacles and dispersion of TFPR

VARIABLES	(1) TFPR	(2) TFPR	(3) TFPR	(4) TFPR	(5) TFPR
Informality	1.76***	2.23***	1.56***	2.20***	1.60***
	(0.24)	(0.28)	(0.30)	(0.27)	(0.30)
Regulations	0.09	0.07	-0.05	0.16	0.05
	(0.24)	(0.23)	(0.22)	(0.23)	(0.22)
Import competition	-0.16	-0.34**	-0.43***	-0.41**	-0.46***
	(0.17)	(0.16)	(0.15)	(0.16)	(0.15)
Lack of financial access	0.05	0.10	-0.04	0.07	-0.03
	(0.28)	(0.28)	(0.26)	(0.27)	(0.26)
Lack of electricity	0.18	0.11	0.16	-0.07	0.04
	(0.17)	(0.16)	(0.15)	(0.16)	(0.16)
Firm Size (log_employmt)		0.38***	0.29***	0.40***	0.33***
		(0.07)	(0.07)	(0.07)	(0.07)
Firm age		-0.01**	-0.01	-0.01**	-0.01
		(0.00)	(0.00)	(0.00)	(0.00)
Constant	-0.91***	-1.61***	-0.73*	-1.54***	-0.93**
	(0.17)	(0.27)	(0.40)	(0.26)	(0.41)
Observations	276	270	270	270	270
R-squared	0.26	0.33	0.45	0.38	0.46
Location control	NO	NO	NO	Yes	Yes
Industry control	NO	NO	Yes	NO	Yes

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

In addition, the results in table 2.5 shows that firm size is positively and significantly correlated to resources misallocation. These results show that large firms on average face large resource misallocation. However, firm age is negatively correlated to dispersion of TFPR. This suggest that young firms on average face larger resource misallocation than older ones. This might be as a result of high capital costs relative to older firms as young firms often lack credit history and insufficient collaterals. Lack of finance and electricity shortages seem to be insignificant in explaining resource misallocation, while import competition is negatively correlated to resource misallocation once we control for firm size and age. The results on import competition

is not surprising as the competition firms face from imports may increase their efficient allocation of resources hence leading to reduction in TRPR dispersion.

To better understand the sources and impact of resource misallocation, we decompose the aggregate measure of misallocation (log(TFPR)) into factor markets distortions (log(*τ_ksi*)) and output distortions (log(*τ_ysi*)). We then regress firm-specific characteristics and obstacles on capital and output distortions. For factor market distortions, a positive coefficient implies higher capital distortions (*τ_ksi*). This means that distortion acts as tax on capital relative to labour. On the other hand, a negative coefficient on capital distortions shows that firm suffer more from output distortions relative to capital distortions. The results for capital distortions regressions are shown in table 2.6.

Table 2.6. Correlation between obstacles and dispersion of capital distortions

VARIABLES	(1) *τ_ksi*	(2) *τ_ksi*	(3) *τ_ksi*	(4) *τ_ksi*	(5) *τ_ksi*
Informality	2.31***	3.23***	3.15***	3.31***	3.23***
	(0.29)	(0.33)	(0.39)	(0.34)	(0.39)
Regulations	-0.05	-0.12	-0.08	-0.18	-0.17
	(0.29)	(0.28)	(0.28)	(0.29)	(0.29)
Import competition	-0.29	-0.51***	-0.52***	-0.47**	-0.48**
	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
Lack of financial access	-0.03	0.02	0.16	0.01	0.15
	(0.34)	(0.33)	(0.33)	(0.33)	(0.33)
Lack of electricity	0.51**	0.37*	0.44**	0.42**	0.49**
	(0.20)	(0.20)	(0.20)	(0.20)	(0.21)
Firm Size (log_employmt)		0.52***	0.57***	0.53***	0.57***
		(0.09)	(0.09)	(0.09)	(0.09)
Firm age		-0.01	-0.00	-0.01	-0.01
		(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.19***	-0.10	-0.94*	-0.22	-0.98*
	(0.20)	(0.31)	(0.49)	(0.32)	(0.51)
Observations	293	285	285	285	285
R-squared	0.27	0.36	0.38	0.36	0.38
Location control	NO	NO	NO	Yes	Yes
Industry control	NO	NO	Yes	NO	Yes

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

These results show that firms in the informal sector suffer from large capital distortions as compared to formal firms. In other words, informal firms incur a tax on capital relative to labour. These results are not surprising as informal sector firms (because of informality) incur

large costs in accessing capital, making then using little capital relative to labour than they would otherwise use in an efficient situation. Surprising, electricity shortages that was insignificant in TFPR model is now positively and significantly correlated to capital distortions. Power shortages act as tax on capital relative to labour. This means that lack of electricity is a disincentive for firms to invest in capital equipment hence use less capital relative to labour than in situations where there are no power shortages. In addition, this may be the fact that firms that suffer from power shortages incur extra capital costs through buying substitutes of electricity such as generators.

Table 2.7 displays the results for output distortions. Note that for output distortion (*τ_ysi*) a positive coefficient implies lower distortions, that is, the distortions act as a subsidy to size, while negative coefficient shows that distortion act as a tax on size which prevents firms from growing to optimal size.

Table 2.7. Correlation between obstacles and dispersion of Output distortions

	(1)	(2)	(3)	(4)	(5)
VARIABLES	*τ_ysi*	*τ_ysi*	*τ_ysi*	*τ_ysi*	*τ_ysi*
Informality	-0.87***	-0.92***	-0.20	-0.88***	-0.25
	(0.21)	(0.25)	(0.25)	(0.23)	(0.25)
Regulations	-0.04	-0.02	0.08	-0.11	-0.03
	(0.20)	(0.20)	(0.18)	(0.19)	(0.18)
Import competition	-0.11	-0.02	0.12	0.06	0.16
	(0.14)	(0.15)	(0.13)	(0.14)	(0.13)
Lack of financial access	-0.12	-0.14	0.13	-0.10	0.12
	(0.24)	(0.25)	(0.23)	(0.23)	(0.22)
Lack of electricity	0.12	0.13	0.10	0.33**	0.24*
	(0.15)	(0.15)	(0.13)	(0.14)	(0.14)
Firm Size (log_employmt)		-0.15**	-0.05	-0.17***	-0.09
		(0.07)	(0.06)	(0.06)	(0.06)
Firm age		0.01**	0.01	0.01	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.91***	1.00***	-0.25	0.90***	0.00
	(0.15)	(0.24)	(0.35)	(0.23)	(0.35)
Observations	282	276	276	276	276
R-squared	0.11	0.14	0.34	0.26	0.39
FIRM CONTRLOS	NO				
Location control		NO	NO	Yes	Yes
Industry control		NO	Yes	NO	Yes

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

The results in table 2.7 shows negative correlation between informality and output distortions. This provides evidence that informal sector firms suffer more from output distortions as compared to formal firms. A negative correlation between firm size and output distortions (in specification (2) and (4)) implies that output distortions act as a tax that prevent large firms from producing more output than they would in an efficient economic system and at the same time small firms uses more resources than they would in the absence of misallocation. However, all other obstacles are not correlated to output distortions except for electricity shortages once we control for firm location, i.e. in model (4) and (5).

While the above econometric specification provides some insights about the determinants of misallocation and the correlation between informality and misallocation, it does not provide evidence of whether obstacles affect misallocation in the same manner for firms operating in the formal sector versus those operating in the informal sectors.

Table 2.8. Sectorial differences on the impact of obstacles on TFPR

	(1)	(2)	(3)	(4)
	Formal Sector		Informal sector	
VARIABLES	TFPR	TFPR	TFPR	TFPR
Regulations	0.10	0.07	0.06	0.08
	(0.40)	(0.38)	(0.17)	(0.16)
Import competition	-0.18	-0.63***	-0.04	0.12
	(0.23)	(0.21)	(0.16)	(0.17)
Lack of financial access	1.00	0.24	-0.33**	-0.22
	(0.67)	(0.60)	(0.15)	(0.15)
Lack of electricity	0.33	0.21	-0.34**	-0.38**
	(0.24)	(0.23)	(0.17)	(0.17)
Firm Size (log_employmt)		0.37***		0.05
		(0.09)		(0.18)
Firm age		-0.01		-0.01
		(0.01)		(0.01)
Constant	-1.01***	-1.08**	1.14***	0.67**
	(0.24)	(0.51)	(0.13)	(0.30)
Observations	166	165	110	105
R-squared	0.03	0.33	0.08	0.23
Location control	NO	Yes	NO	Yes
Industry control	NO	Yes	NO	Yes

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

Given that formal sector firm and informal sector firms operates in relatively different environments, it is interesting to compare how obstacles impacts on misallocation within these sectors. Table 2.8, 2.9 and 2.10 provides the results of firm-specific characteristics and obstacles on misallocation for a comparison between formal and informal sector. The key idea is that some obstacles may be more prone to certain sector, for example lack of finance may affect informal sectors more than formal sector firms because of informal sector firms have constraints in accessing formal means of finance. In addition, formal sector firms and informal sector firms might be different (for example in terms of size), such that pooling them together might result in hiding important implications of distortions on misallocations within these two sectors. Table 2.8 shows that there are systematic differences on the impact of obstacles on misallocation (dispersion of TFPR) for firms operating in different sectors. For example, import competition and firm size seem be significantly correlated with TFPR for firms in the formal sector only. On the other hand, shortage of electricity and lack of financial access is correlated with TFPR for firms in the informal sector.

We also decompose TFPR into capital and output distortions as we did above. Table 2.9 shows correlation between obstacles and capital distortions for formal and informal sector firms. Again, the results show differences on impact of obstacles on capital distortions between formal and informal sector firms.

Table 2.9. Sectorial differences on the impact of obstacles on capital distortions

	(1)	(2)	(3)	(4)
	Formal Sector		Informal Sector	
VARIABLES	*τ_ksi*	*τ_ksi*	*τ_ksi*	*τ_ksi*
Regulations	-0.62	-0.78	0.63**	0.46**
	(0.47)	(0.48)	(0.25)	(0.23)
Import competition	-0.08	-0.27	-0.84***	-0.35
	(0.26)	(0.27)	(0.25)	(0.23)
Lack of financial access	1.25*	1.28*	-0.47*	-0.11
	(0.75)	(0.73)	(0.24)	(0.21)
Lack of electricity	0.82***	0.86***	-0.34	-0.54**
	(0.27)	(0.28)	(0.26)	(0.24)
Firm Size (log_employmt)		0.53***		0.64**
		(0.11)		(0.25)
Firm age		-0.00		-0.04***
		(0.01)		(0.01)
Constant	0.92***	-1.28**	3.97***	3.42***
	(0.26)	(0.61)	(0.20)	(0.39)
Observations	176	174	117	111
R-squared	0.07	0.24	0.18	0.45
Location control	NO	Yes	NO	Yes
Industry control	NO	Yes	NO	Yes

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

The results in table 2.9 shows that lack of access to finance and shortage of electricity are positively and significantly correlated with capital distortions in the formal sector while they are negatively correlated with capital distortions for firms in the informal sector. These results imply that lack of finance and electricity shortages increases capital distortion for firms operating in the formal sector, that is, they act as tax on capital relative to labour. Firms in the formal sector are using relatively little capital than they would in the absence of misallocation. On the other hand, the two obstacles lower capital distortions for firms in the informal sector, meaning that firms in the informal sector are relatively using little labour relative to capital than they would under efficient economic system. Furthermore, the results show that large firms are associated with large capital distortions which act as a tax on capital relative to labour in both the formal and informal sector. The positive and significant coefficient of regulations for informal sector firms implies that regulations increases capital distortions for informal

sector firms.

Finally, table 2.10 displays the results for output distortions for formal and informal sector firms. These results reveal that import competition is positively associated with size distortions for formal sector firms while negatively associated for firms in the informal sector. Recall that a negative coefficient suggests that moving from a firm with no obstacle to the with declared obstacle increases the output distortions (it acts as a tax that limits firm expansion). The results in table 2.9 and 2.10 reveal the importance of decomposing the aggregate measure of misallocation (TFPR) into its components. Some obstacle variables that were insignificant in explaining aggregate misallocation are now significant in explaining capital distortions. For example, regulations, lack of financial access and shortages of electricity are now significant in explaining capital distortions.

Table 2.10. Sectorial differences on the impact of obstacles on output distortions

	(1)	(2)	(3)	(4)
	Formal Sector		Informal Sector	
VARIABLES	*τ_ysi*	*τ_ysi*	*τ_ysi*	*τ_ysi*
Regulations	-0.06	-0.20	0.24*	0.16
	(0.29)	(0.29)	(0.14)	(0.15)
Import competition	0.12	0.35**	-0.33**	-0.28*
	(0.17)	(0.18)	(0.14)	(0.15)
Lack of financial access	0.17	0.41	0.07	0.12
	(0.48)	(0.48)	(0.13)	(0.14)
Lack of electricity	0.10	0.25	0.18	0.13
	(0.18)	(0.19)	(0.15)	(0.15)
Firm Size (log_employmt)		-0.12		0.21
		(0.08)		(0.16)
Firm age		0.00		-0.01
		(0.00)		(0.01)
Constant	0.88***	0.91**	0.43***	0.51*
	(0.18)	(0.44)	(0.12)	(0.27)
Observations	171	170	111	106
R-squared	0.00	0.16	0.09	0.17
Location control	NO	Yes	NO	Yes
Industry control	NO	Yes	NO	Yes

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

2.6 Conclusion

This study assesses the extent of resource misallocation between and within the formal and informal manufacturing sector in Zimbabwe. The study applied the widely used Hsieh and Klenow (2009) models to measure resource misallocation using firm-level data collected in 2015 under the "Matched Employee-Employer Panel Data for Labour Market Analysis in Zimbabwe" project. The key contribution of the study is the inclusion of the informal sector into the resource misallocation analysis. The informal sector in Zimbabwe is huge and contributes significantly towards employment and GDP. We measure misallocation using dispersion of TFPR, capital distortions and output distortions.

The results show evidence of large degree of idiosyncratic distortions to both output and factor markets in both the formal and the informal sector in Zimbabwe as indicated by large dispersion of these measures of misallocation. In both the formal and informal sector, distortions act as a tax, their existence constraints the growth of firms especially large and more productive firms. Misallocation is found to be relatively higher in the informal sector than in the formal sector. The study revealed that by efficiently allocating resources, aggregate TFP can boost by about 106%. Looking at the correlation between productivity and measures of distortions, the study shows that compared to frictionless markets more productive firms suffer more from distortions as compared to less productive firms in both sectors, causing them to produce lower than optimal while less productive produce more than their optimal level resulting in inefficient allocation of resources and thus lower aggregate productivity.

The results also reveal that strong correlation between measures of misallocation and obstacles that firms declared to affect their business operations. We reveal the importance of regulations, lack of financial access, power shortages and import competition to be key sources of resource misallocation. Lack of financial access and shortage of power appears to be quantitatively important in the informal sector when explaining aggregate misallocation. By specifying regressions for each sector, we reveal that obstacles impact differently on misallocation between the formal and informal firms. Given the existence of some productivity overlaps between the formal and informal sector firms and given that informal sector suffers more from resource misallocation, elimination of obstacles in the informal sector can booster its productivity and competitive and hence can be a source of potential growth. Given the structure organisation, and production of the informal sector in Zimbabwe it seems that the informal

sector in Zimbabwe lies within the structuralists views of thoughts and hence its promotion (through elimination of obstacles) has a great potential of increasing growth and employment.

The results provide a path to understand the type of institutions and obstacles whose correction can boost important productivity gains and increase potential growth. These results entail that the Zimbabwe economy can achieve substantial growth by reducing misallocation in both sectors. Thus, policy measures that focus on output and capital markets to eliminate distortions can reduce misallocation and bolster aggregate TFP in Zimbabwe. Resource misallocation usually arise due to poor economic policies that prevent expansion of productive firms and promote survival of less efficient firms. Eliminating misallocation is a difficult task that needs all policy levers. Structural policies may play a critical role in reducing misallocation. Future research in this area needs to look at how misallocation between and within the formal sector revolve over time by using panel data sets and assess its sources in more depth. In addition, future studies can compare misallocation in Zimbabwe and other regional countries manufacturing sector.

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