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A microeconometric analysis of factors affecting global value chain participation in Zimbabwe

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Abstract: Using firm-level data, this study explores the microeconomic factors affecting global value chain (GVC) participation in Zimbabwe. GVCs are important as a result of the fragmentation of global production across countries. As expected, firm size and credit financing are important determinants in fostering GVC participation. However, and quite surprising, foreign-owned firms in Zimbabwe participate less in GVCs when compared to domestically owned firms. Using data for 549 firms, this study postulates that if firm participation in GVCs is to be enhanced, access to credit for firms should be frictionless and firm growth-enabling environment and policies should be established. Summarily, the study postulates positive trade and financial linkages. Thus, access to credit and firm size are important in promoting intra-firm trade.

Subjects: Industrial Economics; Econometrics; International Economics

Keywords: global value chain; trade; microeconometric; probit; logit

1. Introduction

The global economy is continuously evolving with global value chains (GVCs) increasingly defining the contemporary wave in international trade (UNIDO, 2019). GVCs are mainly driven by large multinational companies in their quest for production efficiency, enhanced marketing and international relations (Gereffi, Humphrey, Kaplinsky, & Sturgeon, 2001). GVCs are a critical component of the current wave of increasing specialization both at the task and function levels of production entities. According to Gereffi and Fernandez-stark (2011), a value chain can be defined as "the full range of activities that firms and workers do to bring a product from its conception to its end use". GVCs entail unbundling of tasks and functions which opens up opportunities for developing country firms and workers to participate in the global economy without having to develop a complete product or value chain. Further, GVCs help small firms in developing countries to import knowledge and learn-by-doing (Hausmann, 2014). According to UNCTAD (2013), GVCs account for almost 80% of global trade, with 28% of the gross exports coming from foreign value added. Given its contribution to trade, the importance of GVCs cannot be underestimated. In 2010 alone, US $15 billion out of the total US$19 billion of world gross exports was related to international production networks of multinational companies.

PUBLIC INTEREST STATEMENT

This study advances that microeconomic factors play a significant role in explaining the probability of firms in participating in global value chains (GVC) participation. Particularly, the study suggests that the size of the firm is important in determining the chances of firms engaging in GVCs. In fact, the large the firm is, the greater the likelihood of it engaging in GVCs. Additionally, the study highlights that firms that have access to credit easily participated in fragmenting their production processes across countries. However, the study further argues that firm ownership is fundamental in GVC participation. Share ownership structures that are skewed towards domestic ownership reduces firm participation in GVCs.

The study, postulates that if firm participation in GVCs is to be enhanced, access to credit for firms should be frictionless and firm growth enabling environment and policies should be established

Most developing countries face the challenge of putting in place some pre-conditions for integration into GVCs which are not restricted to open trade and investment regimes. Development of human capital through education and training, developing infrastructure, improving the availability of capital, improving the business climate and scaling up the quality of institutions have also been identified as important factors in enabling integration into GVCs (OECD, 2013a). OECD work on Trade in Value Added (TiVA) and GVCs provides new empirical evidence on the internationalisation of production and countries' participation in international production chains (OECD, 2013b). It also provides broad guidance on how to enhance participation by undertaking reforms in the areas of trade, investment, innovation, skills and other structural policies.

In the GVC world, export competitiveness is undistinguishably linked to having access to competitively priced intermediate imports. Moreover, border costs such as import tariffs or inefficient custom procedures get amplified with production processes that involve multiple border crossings (OECD, 2013a). International rules, standards and regulations make GVC-related transactions easier. Foreign direct investment, which tends to be very sensitive to policy barriers, is a key vehicle of GVC participation. Efficient services play a pivotal role in facilitating GVC participation and in transforming it into more beneficial forms through process or product upgrading (OECD, 2013c). Orlic (n.d.) argues that reduction in trade costs, rapid advancing in ICTs facilitated coordination and monitoring of activities at large distance, falling barriers to trade and investments and large gaps in skilled and unskilled wages are among the key drivers of GVC participations. UNIDO (2019) summarily presented five key issues associated with GVCs from a macroeconomic perspective. According to UNIDO (2019), (1) GVCs are a major component of the global economy and their importance is increasing; (2) GVC participation hinges on low trade barriers and trade costs but also on domestic conditions; (3) GVCs have been regional rather than global; (4) GVC integration increases incomes and employment and is a driver of structural change; and finally (5) GVCs may have adverse environmental effects if participation entails laxer environmental protection laws.

Developing countries account for a very low share of backward and forward participation index as compared to the developed countries. These developing countries are facing important challenges in terms of integrating themselves into GVCs. Keane (2015) argues that the new wave of theories in GVC is a manifestation of the importance of intra-firm in driving international trade. Notwithstanding, the literature on the microeconomic determinants of GVC trade participation is nascent, particularly in developing Africa. This study, therefore, seeks to establish the fundamental factors that are affecting firms in Zimbabwe in GVC participations. Particularly, the study seeks to answer the following question: How do firm- and industry-specific characteristics affect the firm's participation in GVCs.

This paper makes an important contribution to the literature. It is the first paper to examine the factors affecting the GVC participation of firms in Zimbabwe during the multiple currency regime. The study is organized as follows: Section 2 discusses the theories of GVC participation at the microlevel. Section 3 develops the model and introduces the empirical approach used in the determination of factors affecting GVC participation. Section 4 presents and discusses the econometric results. Section 5 concludes and draws policy implications.

2. Literature review

2.1. Definition of global value chain

GVCs are defined as a set of intra-sectoral linkages firms and other sectors through which this geographical and organizational reconfiguration of global production is taking place (Bair, 2008). The concept of GVCs began with Porter (1985). Porter defines a value chain as a system of independent activities that a company performs to design, produce, market, deliver and support its products. The value chain is a visualization that resembles the production process of a product or a service all the way from raw materials through manufacturing, assembly, marketing, sales and distribution to the end customer. Value chain activities can be decomposed into primary and

support activities. Bair (2008) further describes the role of GVCs as a critical infrastructure of economic globalization and the integrative counterpart to the current processes of geographical dispersion, economic specialization and differentiation and risk externalization. GVCs entail a series of interconnected markets for goods and services through which commodities are produced outside the boundaries of the "final" firm. These networks rely on the unbundling, that is the slicing of tasks of different stages of the production process (Gestrin, 2013).

The most comprehensive definition of upgrading is provided by Humphrey and Schmitz (2000), who introduce three different kinds of upgrading within value chains, namely, process, product and functional upgrading. While process upgrading means more efficiency and reorganization in terms of the production system and transforming inputs into outputs, product upgrading refers to more sophisticated product lines and increased unit values. Finally, functional upgrading means acquiring new functions along the value chain, such as marketing or design. Upgrading is the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities (Kaplinksy & Morris 2001).

2.2. Global value chain theories

Theoretically, there are two unrelated theories that can be used to explain GVC participation. First, the fragmentation theory that focuses on the location of the production processes (Arndt & Kierzkowski, 2001; Jones & Kierzkowski, 1990) has become the fundamental theory international trade economists rely on in examining the determinants of GVCs. In this theory, production processes are fragmented or separated into multiple slices and located in different countries. Fragmentation makes sense when (1) there is production cost saving in fragmented production blocks, whereby the firm can benefit from differences in location (lower labour and production costs) between the original position and a new position, (2) incurred service link costs involved in connecting remotely located production blocks are lower and (3) the cost of network set-ups is smaller.

The new trade theory of Melitz (2003) and Helpman, Melitz, and Yeaple (2004) is based on product differentiation, monopolistic competition and firm heterogeneity. They provide a crucial way for understanding the decision of firms related to the creation of and integration into GVCs. Helpman et al. (2004) assert that firms are considered different in terms of efficiency and fixed and variable costs which provides an impetus in participation in international trade. In that regard, a few highly efficient firms are able to make sufficient profit to cover the trade costs required for overseas operations. Melitz (2003) and Helpman et al. (2004) articulate the impact of intra-sector firm heterogeneity on the decisions of a firm on how to service markets. Grossman and Helpman (2002) and Antras (2003) underscore the choice between procuring intermediate products via vertical integration and procuring them from independent suppliers (outsourcing). Heterogeneous producers of final products choose different organisational forms of intermediate products procurement that vary with respect to ownership structure and location (Antras & Helpman, 2004).

These two approaches, when combined, provide additional insights for GVC trade. The self-selection hypothesis applies whereby efficient firms are abler to join GVCs than other firms. Firm size is an important aspect of the notion of efficiency. Small- and medium-sized enterprises face, to a higher extent than large firms, resource constraints. Accordingly, the probability of small and medium firms joining GVCs as exporters or suppliers is lower than larger firms.

2.3. Empirical studies

Factors affecting GVC participation have been examined at both macro- and micro levels. Orlic (no date) finds that for firms in the Central Eastern and South-Eastern European (CESEE) countries, economies of scale and fixed cost together with the possession of industry standard certificates and access to credit are important factors for GVC participation. In addition, the author finds productivity to be an important factor for GVC for small firms but not for medium and large firms. In addition, research and development investment is also important for GVC. However, this was found to be important only in South East Europe and large firms only. Large firms can different

themselves through research and development and move up the value chain. Using firm-level data, Wignaraja (2015) finds that firm size (reflecting economies of scale) is a significant determinant in determining the probability of GVC trade participation in five Southeast Asian economies. It is noteworthy that it is only firms' size that matters; efficiency, particularly in investment in building technological capabilities and skills, and access to credit are important in increasing the probability of GVC participation. However, Rigo (2017) using a survey of firms drawn from 24 developing countries shows that it is GVC participation that leads to firms possessing a quality certification and foreign-licensed technology.

Harvie, Narjoko, and Oum (2010) empirically examined the factors affecting small and medium enterprise (SME) participation in production networks. Utilizing the results obtained from the ERIA[1] survey on SME participation in production networks in most of the ASEAN[2] countries, the authors find that productivity, foreign ownership, innovation efforts and managerial experience are fundamental factors in the determination of GVC participation. The study extends the analysis by examining the factors that enable SMEs to participate in GVCs and finds that firm size, productivity and foreign ownership to be critical.

3. Methodology

The theoretical model on the determinants of exporting applied to GVC developed by Roberts and Tybout (1997) is used. In this model, a firm's propensity to participate in a GVC depends on the firms' expected profits (π), which in turn are influenced by expected revenues and costs plus sunk GVC entry costs. The firm's expected profits are affected by firm-level characteristics which can either lower or increase costs.

The probit model to be estimated will be of the form:

$$P(y_i = 1 | x_i) = \Phi(x_i'\beta) = \int_{-\infty}^{x_i'\beta} \Phi(s)ds = \int_{-\infty}^{x_i'\beta} \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}s^2} ds \qquad (1)$$

$\Phi(\cdot)x_i$ is a $K \times 1$ matrix of explanatory variables, and β is a $K \times 1$ matrix of coefficients. y_i is a vector indicating GVC participation. y_i is the vector denoting GVC participation indicator, Φ is the cumulative distribution function (cdf) of the standard normal distribution, x_i' is the matrix of explanatory variables, β is a vector of coefficients and ξ is a vector of error terms. The variables in the model include firm size, experience, firm ownership, experience, access to credit and certification.

The general estimated model for Equation 1 is given as follows:

$$\Pr(Y_i = 1) = \beta_1 + \beta_2 size_i + \beta_3 size_i^2 + \beta_3 ownership_i + \beta_4 exper_i + \beta_5 credit_i + \beta_6 cert_i + \varepsilon \qquad (2)$$

where size is a measure of firm size, and $size^2$ is the square of firm size. In this study, we hypothesize that firm size increases the likelihood of participating in GVCs. Access to credit also increases with firm size. This is because the size of the firm is associated with economies of scale in production. However, as the firm continues to grow, we expect diseconomies to scale to set in which may affect GVC participation. We, therefore, expect a positive effect of firm size in levels and a negative effect of the square of the firm size. The squared value of firm size is to capture the non-linear effects of size.

Ownership is a dummy variable taking the value of 1 for foreign firms and 0 for domestically owned firms. For ownership, we hypothesize a positive relationship between foreign ownership and GVC participation. Firms that are in joint ventures with foreign firms are likely to have a favourable strategy that will enable them to perform better than those domestically owned in GVCs. However, the importance of foreign ownership depends on the ownership structure. In the case of Zimbabwe where the share structure is skewed towards domestic ownership, foreign parent companies may restrict the transfer of the firm-specific assets since they do not hold a significant controlling interest. In this scenario, we, therefore, expect ownership to be negatively related to GVC

participation. As such we also expect in this case ownership to be negatively related to GVC participation. Experience is a proxy of human capital and is measured using the years of experience of the general manager of the firm. Here, we associate human capital with productivity. As is indicated in the self-selection hypothesis, we expect highly productive firms to participate in GVCs. The more the experience the general manager has, the higher the likelihood of undertaking risky decisions and the more they can participate in GVC. As such we expect the experience to be positively associated with GVC participation. Credit is a dummy which measures access to credit with the value of 1 if the firms have received a loan from formal financial institutions and 0 if not. Firms with better access to credit are hypothesized to have a high likelihood of participating in GVC. Thus, we expect a positive effect of access to credit on GVC participation. Finally, cert captures technological capabilities and takes the value of 1 if the firm has an international standard organization (ISO) certification and 0 otherwise.

There are many ways of measuring GVC trade participation. Baldwin and Lopez-Gonzalez (2014) observe that GVC trade encompasses cross-border movements of goods, know-how, investment, services and people. In that case, it will be difficult to adopt this broad notion of GVC trade to empirical work. Data on cross-border trade, know-how, investment, services and people are not available in the context of Zimbabwe. Equation 1 is estimated using both the probit and logit models for robustness check.

3.1. Data sources
This study utilized cross-sectional data drawn from the World Bank Enterprise surveys. We use firm-level trade data and other firm-specific variables. GVC participation takes the value of 1 if the firm has exported (directly or indirectly) more than 10% of their sales and the firm's share of imported inputs is more than 10%; 0 otherwise. Firm size is measured using the actual number of workers employed by the firm. Further to capture non-linear effects of size on GVC trade participation, the squared value for firm size is used. Technological capabilities are captured by a dummy variable, which takes the value of 1 if the firm has a form of internationally agreed quality certification. Human capital is proxied by the number of years of experience of the general manager of the firm, while access to credit takes the dummy variable of 1 if the firm has a credit line from financial institutions. Last, foreign ownership takes the value of 1 if foreign ownership is 51% and above or 0 for domestic ownership.

4. Result presentation and discussions
This section presents and discusses the factors that affect GVC trade participation for Zimbabwean firms. Table 1 presents the correlation results through a zero-order pairwise correlation matrix.

The correlation matrix shows low values of zero-order pairwise correlation coefficients which suggests that multicollinearity is not a problem in the dataset. Table 2 presents the factors affecting GVC trade participation in Zimbabwe. A low R-squared might be an indication of the omission of important variables. However, that might also be a sign of a high degree of heterogeneity amongst the firms under investigation.

The results indicate that firm size, foreign ownership and access to credit are significant factors in explaining GVC trade participation. The coefficients for access to credit and firm size are positive and significant as expected. The coefficient of firm size squared is negative and statistically significant implying the existence of a non-linear relationship between firm size and GVC trade participation. These findings buttress the findings by Wignaraja (2015) who also found firm size and access credit to be important determinants in explaining supply chain trade participation in Southeast Asian countries. The firm size results postulate that economies of scale and fixed costs are fundamental variables at the initial stage of joining the GVC trade but less important with time for Zimbabwean firms. During the initial stages of operation, firm growth acts as a motivating factor in GVC participation.

Table 1. Correlation matrix

	gvcp	Credit	hcapital	Ownership	Tech	Firmsize	Firmsizesq
gvcp	1						
Credit	0.119***	1					
hcapital	0.070*	0.042	1				
Ownership	−0.155***	−0.022	0.047	1			
Tech	−0.061	−0.167***	−0.032	0.105**	1		
Firmsize	0.004	0.126***	0.069	0.011	−0.123***	1	
Firmsizesq	−0.014	0.107**	0.053	0.018	−0.089	0.992***	1

Significance levels: *$p < 0.10$, **$p < 0.05$ and ***$p < 0.01$.

Notes: gvcp = global value chain participation, credit = access to credit, hcapital = human capital proxy for experience, ownership is dummy for foreign/domestic ownership, tech = technological capabilities proxy for certification, firmsizesq = firm size squared and firmsize = firm size.

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Table 2. Microeconomic determinants of global value chain in Zimbabwe: empirical results		
	Probit	**Logit**
Access to credit	0.371*	0.679*
	(0.200)	(0.367)
GM's years of experience	0.010	0.017
	(0.007)	(0.013)
Foreign ownership	−0.586***	−1.080***
	(0.184)	(0.336)
Firm has ISO certificate	0.052	0.087
	(0.202)	(0.382)
Firm size squared	−0.000	−0.000
	(0.000)	(0.000)
Firm size	0.002**	0.004**
	(0.001)	(0.002)
Constant	−1.299***	−2.198***
	(0.416)	(0.774)
Pseudo R^2	0.085	0.081
Observations	549	549

Standard errors in parentheses.
$*p < 0.10$, $**p < 0.05$, $***p < 0.01$.
Source: Authors' calculations.

The coefficient on firm having an ISO certificate is positive but not significant in both models. The results indicate that having an internationally agreed quality certificate increases the probability of a firm joining the GVC trade. The same applies to the human capital proxied by the general manager's years of experience. For foreign ownership, the results indicate a significant negative effect of ownership on GVC participation. This is expected given that the firm ownership structure in Zimbabwe is skewed towards locals. This affects technology transfers as foreigners may withhold the transfer of firm-specific assets that eventually reduces firm competitiveness in foreign markets. This result is consistent for both models. What is surprising is that foreign-owned firm should be the major players in GVCs as they can connect with parent firms and other firms dotted across the world.

5. Conclusions, policy implications and recommendations

In this paper, we investigated the microeconomic determinants of GVC trade participation. Particularly, the study provides empirical evidence on the factors affecting GVC participation in developing countries using Zimbabwe as a case study. The study attempted to answer the question about what are the firm-specific and industry-specific factors influencing firm participation in GVCs in Zimbabwe.

In an attempt to establish the microeconomic factors affecting GVC participation, the results show that access to credit and firm size positively influence GVC trade participation. These findings corroborate the findings by Wignaraja (2015) that asserts that the size of the firm and access to finance promote GVC participation. However, foreign ownership tends to reduce the probability of participating in GVC. Important implications that can be drawn from this study are that provision of loans to firms increases the probability of firms in GVC participation. In other words, for firms to participate in GVCs, their access to credit should be improved. In addition, enabling conditions for firm growth are important in boosting firm participation in GVCs.

Three important recommendations follow from the study findings. These are (1) the access to credit by firms should be improved to participate more in GVCs. In addition, (2) identification of the

factors that affect firm growth and promoting such is paramount as this will resultantly lead to an increase in GVC participation. Finally, (3) firm ownership structure should be relaxed to enable foreign firm to inject firm-specific assets which will also increase competitiveness and the likelihood of participation in GVCs.

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Author Statement
Stein Masunda and Norman Mupaso
Stein Masunda—presented the background information to the study and conducted the empirical analysis
Norman Mupaso—drafted the literature review section, compiled the data and proof read the final document. The research reported in the study relates to a sizeable project on the same particularly in establishing the firm-specific factors affecting firms in engaging in the global value chain. These global value chains are dictating contemporary global trade.

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Notes
1. ERIA—The Economic Research Institute for ASEAN and East ASIA.
2. ASEAN—is the Association of Southeast Asian Nations.

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