THE EFFECT OF INVENTORY MANAGEMENT ON FIRM PERFORMANCE: CONTROLLING FOR KEY CONFOUNDING VARIABLES

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Abstract: **This study examined the effect of inventory management on firm performance and controlled for key covariate, namely company size, capital size, and industry. A quantitative research technique and a cross-sectional survey were employed to gather data for testing hypotheses. Data was collected on 165 Accra-based firms that met the selection criteria. A self-reported questionnaire was used to collect data. Pearson's correlation test and Confirmatory Factor Analysis (CFA) were used for analysis of the data. Results revealed that, inventory management had a positive effect on operational and marketing performance but not on financial performance. Company and capital size have a positive effect on inventory management. It is concluded that improving inventory management can cause an increase in firm performance in terms of operational and marketing performance, especially in the light of a marginal increase of resources.**

Keywords: **Inventory management, firm performance, company size, capital size, industry affiliation.**

I. INTRODUCTION

It is in the interest of all businesses to maximize revenue and profitability over time, but achieving sustained growth in any business is not without effort, especially in competitive markets. Manufacturing companies, in particular, face numerous challenges and would have to be successful in overcoming these challenges to achieve short- and long-term goals. Supply

Service's delivery and product development in many organisations depend on inventory. Similarly, every organization uses inventory, to some extent, and requires proper inventory management to be successful in its operation. These viewpoints provide the explanation for the evidence that inventory management predicts firm or organizational performance in both the services [1]; [2] and manufacturing [3]; [4]; [5] industries. Interestingly, this evidence has been provided in various countries, including Ghana [6]; [2], Kenya [3]; [7], Nigeria [8]; [5]; [4], and other non-African countries [9]. This widespread evidence suggests that companies can maximize their performance by increasing inventory management over time.

It is argued in this study that some companies can be better leverage inventory management to grow as they depend much more on inventory and more strongly require success in inventory management to deliver services or products. For instance, manufacturing companies use two categories of inventory. The first is inventory made up of administrative supplies, e.g. computers, printers, stationery, and other resources needed for administrative functioning. The second and possibly the largest inventory constitutes the one deployed in manufacturing as raw and supplementary materials. Inventory management would be more important in manufacturing firms because management of both categories is essential. On the other hand, services companies such as banks depend on inventory needed only at the administrative level and therefore, depend less on inventory management to succeed. Based on some studies therefore [3]; [4]; [5], the urgency of inventory management and its contribution to firm performance can be stronger in manufacturing firms. If so,

manufacturing firms have the opportunity to accord inventory management more importance and make the most of it to grow. Though the foregoing argument makes sense and is theoretical backed as indicated later in this paper, it has not been sufficiently empirically verified, especially in developing countries like Ghana.

The idea that inventory management requires a significant part of organizational funds is irrefutable. Needless to say, funds are always needed by the company to procure inventory and to compensate skilled employees to manage it. From the point of view of the Resource-Based View (RBV) and Dynamic Capabilities Approach (DCA), which are discussed in detail later in this paper, companies with higher resources have better dynamic capabilities and therefore, have a higher capacity to leverage inventory and its management. Thus, in the light of more resources and dynamic capabilities, a firm is in a better position to acquire and manage inventory towards its agility and growth. This being the case, some variables such as *firm size and operational capital* can affect the relationship between inventory management and firm performance. For instance, larger firms with higher operational capital are more likely to properly manage inventory for higher performance. This illustration has been empirically backed in previous research [10]; [11], but not in the context of Ghana.

It is therefore contended in this study that controlling for three variables in testing the effect of inventory management on firm performance can reveal interesting lessons for consideration in future research and organisations. These variables are *company size, operational capital size,* and *type of industry*. By capturing industry size as a control variable, we attempt to verify if manufacturing firms can better relish inventory management for having a relatively larger inventory base. This study is directed towards inventory managers and researchers, who are expected to find practical explanations for the impact of inventory management on firm performance, as well as more effective ways to increase organizational agility through inventory management.

II. LITERATURE

Empirical Review

Inventory (also known as stock) is defined as goods and materials that a business holds for the ultimate purpose of resale or repair [9]. The phrase purpose of resale or repair in this definition suggests that inventory can either be scheduled to be sold to some end users or channelled into production of some goods and/or services. In a brewery, for instance, maize and barley are parts of inventory that are channelled into the production of beer (the product) in the form of raw materials. The brewery can also keep a warehouse of maintenance equipment, which constitutes inventory for repair. Computers and other supplies (e.g. stationery) are inventory needed for administrative function.

The above illustrations suggest that inventory serves a wide array of purposes in different departments, e.g. manufacturing, repair and maintenance, administration, among others. Inventory can thus be said to be a means for facilitating operational activities that translate into effective production, marketing and sales of goods and services. The import of these arguments is that inventory can contribute to the agility and performance of a business. This deduction is supported across countries and sectors by empirical studies [3]; [4]; [5]; [2] that have affirmed the positive effect of a company's inventory size on firm performance. Ideally though, inventory would contribute to firm performance when it is well used and managed, a reason why inventory management has become an important business function in many organisations.

Inventory Management defined

Inventory management is the process of ordering, storing, and using a company's inventory, which mainly constitutes the raw materials [11], administrative supplies and finished products. Apparently, inventory management has three parts in practice, namely ordering, storage, and effective use of inventory. Ordering means sorting inventory into homogeneous groups for easy identification and tracking [3], [2]. In a brewery for instance, maintenance equipment can be classified as homogenous and kept in a specific store or area, likewise cereals (e.g. maize, wheat, etc.). Ordering includes scoring all homogeneous groups either to express their relative importance or to easily locate them in the warehouse. Hence, the purpose of ordering is to make inventory easy to track and identify in a warehouse where there is a cluster of materials and goods. Storage is a term used to describe warehousing of inventory [11]. The purposes of storing are to maintain or keep the level of stock needed to ensure continuous production or service delivery, maintain supplementary administrative supplies; avoid unexpected shortage of inventory, ensure security of inventory, and prevent wastage of raw materials and goods [7]; [2].

Use of inventory means applying it for the purpose for which it was acquired [11], but the focus on businesses would be to ensure that inventory usage is effective. Effective inventory use is a term used to describe using the right type of inventory to accomplish the right goal in the prescribed way [7]. Invariably, a beverage firm would have to apply the right raw material (e.g. barley) based on the recommended formula in producing malt drink. The foregoing explanations signify that ordering, storing, and use of inventory are important activities that individually and collectively contribute to inventory productivity.

Firm Performance defined

Firm performance has been defined as the extent to which a business or organisation achieves its profitability and efficiency goals [9]. It is a short-term measure because it focuses on measuring the current operational, marketing (including sales), and financial performance of the business in the current or previous financial year [12]. It is different from firm growth, which is a measure of how well the business improves its performance over time or into the future. To achieve positive growth though, satisfactorily high performance is necessary. As a result, performance and growth improvement is a common agenda for all businesses. Another way to conceptualise firm performance is to explain its traditional dimensions.

Several dimensions have been used to measure firm performance in the literature. Some studies have treated firm performance as merely the financial performance of the business [3], [11], [8], while others treated it as a construct of operational and financial performance [4]. The most common way firm performance has been conceptualised in the literature has been to define it as a construct of three dimensions, namely operational, marketing, and financial performance [9]. Since businesses involved in the current study have operational and marketing functions that are aimed at making the highest level of financial performance, we would want to conceptualize firm performance as a construct of operational, marketing, and financial performance.

Operational and Financial Performance

Operational performance is defined as the efficiency of operations that results from human-resource contributions, suitability of strategies and policies, effective execution of business policies and strategies, and monitoring and control of management activities [4]. It includes the impact of administrative activities and programs on the company's main goal of making financial gains. Marketing performance is a domain that measures marketing efficiency resulting from strategy formulation for market orientation, customer relationship management, and sales [12]. High marketing performance means effective market orientation, high-quality service/product delivery, a satisfactory customer relationship management, and high sales.

Financial performance is a measure of the degree of financial returns (net returns) that a business makes at a specified period of time [11]. It is therefore, a measure of how much net profit the business makes at a given time. For a business to make the profit, it desires; it must develop and implement the best operational policies and strategies that translate into high-quality service/product delivery and sales. This being the case, financial performance is contingent on operational and market performance. Arguably, market activities are based on strategies developed at the operational level; hence market performance is also dependent on operational performance.

Inventory Management and Firm Performance

For inventory management to make a positive effect on firm performance, it should be effectively carried out. Of course, a process cannot make its desired impact when it is poorly executed. This being so, it is worth knowing what factors make a business function like inventory management effective. To explain these factors, some theoretical adaptations must be made. The Resource-based View (RBV) of the firm is a theory that describes the strategic resources and the potential to deliver comparative advantage available to a firm [13]. It adds that resources available to the firm can be exploited in order to achieve a sustainable competitive advantage. The RBV assumes that a business's competitive advantage is based on its level of resources. Resources in this context stand for funds, people, and logistics. From the point of view of the RBV, the effectiveness of inventory management depends upon the level of these resources available to the firm. This is the case because inventory itself is part of the company's resources, and its proper management would depend on the amount of money available to procure and manage it.

Supporting the above assertion of the RBV is the Dynamic Capabilities Approach (DCA). In the context of the DCA dynamic capabilities is the capability of an organization to purposefully adapt its resource base [14]. Thus, a firm which has sufficient dynamic capabilities can blend its resources innovatively to achieve and improve a competitive advantage.

The DCA assumes that availability of resources must be coupled with the ability to use these resources if the business must be competitive. It can therefore be argued that a business must have qualified personnel which are capable of deploying and adapting the resources available to it in order to be competitive. From this perspective, the availability of resources and competent personnel within an organization is a recipe for high performance.

This study argues that inventory management can predict firm performance if the firm has a good resource base and the ability to manage and adapt available resources. This assertion is made in view of the fact that effective management of inventory is likely to result if the firm has ample resources and suitable competencies to manage inventory, which is a part. of the firm's resources. These arguments, coupled with several studies [9]; [7]; [4]; [8] that have confirmed the positive effect of inventory management on firm performance, forms the basis of the following hypotheses of the study:

H_{01}- Inventory management makes a significant effect on operational performance.

H_{02}- Inventory management makes a significant effect on marketing performance.

H_{03}- Inventory management makes a significant effect on financial performance.

The resources available to a firm can positively correlate with company size and operational capital size. Thus, a firm is likely to have more resources and a larger capital if it has more resources. As a result, capital size and company are variables that can affect inventory management and firm performance. It is possible that inventory management will make a stronger impact on firm performance if the firm has more capital and is of a smaller (manageable) size. A business may also find it difficult to manage its inventory if it belongs to a particular sector such as SMEs, where knowledge and information sharing between firms is poor. These illustrations imply that capital size, company size, and industry type are variables that can confound the relationship between inventory management and firm performance. In fact, some previous studies [9]; [11];[1] have confirmed this confounding impact. The following final hypotheses are therefore tested:

H_{04}: Capital size confounds the relationship between inventory management and firm Performance

H_{05}: Company size confounds the relationship between inventory management and firm performance

H_{06}: Industry type confounds the relationship between inventory management and firm performance

III.   METHODOLOGY

This study applies a quantitative research technique, specifically the correlational design, in order to test the hypothesised relationships. The study's population was inventory management staff in various companies in Accra, Ghana. We focused on firms whose management permitted us to collect data on their inventory management and performance.

There is no single, uniformly acceptable definition of small firms [15]. Firms differ in their level of capitalisation, sales and employment. Hence definitions which employs measures of size (number of employees, turnover, profitability, net worth, etc.) when applied to one sector could lead to all firms being classified as small, while the same definition when applied to a different sector could lead to a different result [15].

The study based its classification on Ghana Statistical Service industrial statistics which considers firms with less than 10 employees as Small Scale Enterprise and their counterparts with more than 10 employees as Medium and Large Size Enterprise.

There were 16 firms in all; 11 were small and medium-sized enterprises and 5 were large and multinational firms. Seven (7) of the small and medium-sized enterprises were services firms whereas 4 were manufacturing or product-oriented businesses. Three (3) of the large firms were services firms and the other 2 were manufacturing companies.

The accessible population of this study was inventory management staff who met the following selection criteria: (a) the individual must occupy the position of a manager or supervisor; (b) the participant must have worked in the company for at least 2 years to ensure that he or she has ample knowledge and experience with inventory management; (c) the individual must be able to understand questionnaire items and respond coherently in writing, for which he or she was expected to have acquired at least a diploma as the minimum educational qualification; and (d) he or she must be willing and available to respond at the time of data collection. The accessible population size of the study or the number of individuals who met these criteria is given as follows:

i.   *Multinationals and big firms* – services sector = 48 and manufacturing sector = 59

ii. *Small and medium-sized enterprises* – services sector = 26 and manufacturing sector = 32

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So, the overall accessible population size was 165. We decided to collect data on the entire population since it was not too large and to increase the chance of detecting significant relationships.

We measured two main variables and three control variables in order to respond to the research hypotheses. The main variables are Inventory Management and Firm Performance, which were both measured as latent constructs. The control variables are *company size* (the number of skilled human resources available), *operational capital size* (the net operational capital at the disposal of the organization), and *type of industry* (i.e. services or manufacturing). These control variables were measured as observable variables. Inventory management and firm performance were measured using standard items borrowed elsewhere [9]; [1]; [4]. These standard scales were adopted because they produced satisfactory psychometric properties in previous studies that applied populations similar to ours. Firm performance was measured in terms of three domains, i.e. *operational*, *market*, and *financial performance*. Our reliability analysis showed that the scales led to reliable data. More so, firm performance and inventory management produced Cronbach's alpha values of 0.87 and 0.91 respectively.

Data was collected by delivering questionnaires to respondents at the premises of their respective companies. Each respondent was required to complete the questionnaire within one day, but more time (not exceeding two weeks) was given to those who could not respond to the limited time. Prior to the administration of questionnaires, informed consent forms were sent to each participant to sign after management of each company had approved the study. Four field workers were hired to assist with data collection across all firms. Data was collected in 22 working days. Out of 165 questionnaires administered; 158 of them were completed and returned. Four (4) of the questionnaires returned had serious response and non-response errors and were therefore discarded. So, 154 questionnaires were analysed.

Data was analysed using SPSS (Statistical Package for Social Sciences) version 21. Before hypotheses were tested, descriptive statistics (mean and standard deviation) were used to summarize the data to identify outliers. We attempted to see if the data had outliers using the z-score approach, but we found no outlier in the data. Normality of the data was confirmed when we applied the Shapiro-Wilk's test through SPSS on the main dependent variable (firm performance) in accordance with [16]. Pearson's correlation test was used to assess the correlation between relevant pairs of variables. After, Ordinary Least Squares (OLS) regression analysis was used to test the hypotheses or effects. OLS was also used to test relevant assumptions such as independence-of-errors and collinearity. We applied the independent samples T-test to find out if the levels of company logistics and logistics management are different for services and manufacturing firms.

IV. FINDINGS

Findings

In this section, findings of the study are presented. Table 1 shows the correlation matrix of relevant variables. In this table, inventory management is positively correlated with operational performance (r = .310, p = .000, two-tailed) and marketing performance (r = .283, p = .000, two-tailed) but not financial performance (r = 0.112, p > .05, two-tailed) at 1% significance level. Thus, operational and marketing performance increase as inventory management improves. Inventory management is also positively correlated with firm size, capital size, and industry at 1% significance level. This finding implies that inventory management increases with firm size and operational capital. Operational performance is positively correlated with firm size at 1% significance level and capital size at 5% significance level. Based on these correlations, the effects reached are presented in Table 2.

Table 1: Correlation Matrix and Descriptive Statistics

Variable	#	Max	Mean	Std. Dev.	1	2	3	4	5	6	7
Inventory Management	1	57	45.18	6.09	1	.310**	.283**	0.112	.250**	.271**	.223**
Operational performance	2	15	12.47	2.04		1	.436**	.314**	.428**	.178*	0.134
Market Performance	3	20	16.44	2.55			1	.595**	0.115	0.122	0.046
Financial Performance	4	15	12.35	1.89				1	0.013	0.052	.205*
Capital size ('000)	5	10034	40909.00	2031.13					1	.255**	.300**
Company size	6	143	44.27	9.62						1	.326**
Industry	7	6	4.34	0.70							1

**Correlation is significant at 1% significance level

*Correlation is significant at 5% significance level

Table 2: Effect Estimates of Controlled and Uncontrolled Models

DV	Path	IV	Unstandardized (B)	Standardised (β)	S.E.	C.R.	P val.
UNCONTROLLED MODEL							
OP	<---	IM	0.104	0.310	0.026	4.036	***
MP	<---	IM	0.118	0.283	0.032	3.646	***
FP	<---	IM	0.035	0.112	0.025	1.399	0.162
CONTROLLED MODEL							
Main effects							
OP	<---	IM	0.072	0.211	0.025	2.836	0.005
MP	<---	IM	0.112	0.261	0.034	3.234	0.001
FP	<---	IM	0.027	0.086	0.026	1.053	0.292
Covariate effects							
IM	<---	Industry	0.957	0.112	0.72	1.329	0.184
IM	<---	Company Size	0.910	0.172	0.436	2.086	0.037
IM	<---	Capital Size	1.896	0.197	0.803	2.361	0.018
OP	<---	Capital Size	0.121	0.037	0.255	0.475	0.635
OP	<---	Company Size	0.68	0.379	0.138	4.914	***
OP	<---	Industry	-0.112	-0.039	0.226	-0.496	0.620
MP	<---	Capital Size	0.214	0.052	0.349	0.614	0.539
MP	<---	Company Size	0.111	0.049	0.189	0.586	0.558
FP	<---	Company Size	-0.113	-0.067	0.142	-0.792	0.428
MP	<---	Industry	-0.164	-0.045	0.309	-0.529	0.597
FP	<---	Industry	0.577	0.212	0.233	2.473	0.013
FP	<---	Capital Size	-0.075	-0.024	0.263	-0.284	0.777

***Effect significant at 1% significance level

NOTE: DV = dependent variable; IV = independent variable; S.E. = standard error; C.R. = critical ratio; FP = financial performance; MP = marketing performance; OP = operational performance; IM = inventory management

Table 2 shows effects of two models, the controlled (company size, capital size, and industry are controlled for) and uncontrolled (company size, capital size, and industry are not controlled for) models. With respect to the uncontrolled model, inventory management makes a positive effect on operational performance (β = 0.310; p = .000, C.R. = 4.04) and marketing performance (β = 0.283; p = .000, C.R. = 3.65) at 1% significance level. Inventory management however failed to impact financial performance of the firms (β = 0.112; p > .05, C.R. = 1.399).

In the controlled and ultimate model, inventory management makes a positive effect on operational and marketing performance. However, in this case, these effects are significant at 5% significance level. Also, inventory management fails to impact financial performance. It is therefore confirmed at the level of the CFA that operational and market performance increase when inventory management is enhanced, but there is no evidence that inventory management is associated with financial performance of the firms.

Among the control variables, capital and company size make a significant positive effect on inventory management at 5% significance level. Thus, the effect size accounted by inventory management on operational and marketing performance decreases when the covariates were controlled for. This finding indicates that inventory management is enhanced with increasing resources in the form of people and funds. It can also be observed that controlling for company size, capital size, and industry increased the p-values at which the IM-OP and IM-MP relationships are significant. Table 3 shows the model fit statistics associated with two models (controlled and uncontrolled models) in Table 2. So in exception of hypotheses 3 and 6, all hypotheses of the study are confirmed.

Table 3: Model Fit Statistics

Model	Description	Model fit statistics					
		Chi-square	p-value	RMSEA	TLI	GFI	AGFI
1	Uncontrolled	11.009	0.266	0.011	0.958	0.936	0.933
2	Controlled	18.101	0.409	0.002	0.991	0.971	0.990

NOTE: RMSEA = Random Mean Square Error of Approximation; TLI = Tucker-Lewis Index; GFI = Goodness-of-Fit Index; AGFI = Adjusted Goodness-of-Fit Index

In Table 3, the first model represents the uncontrolled model, while the second model stands for the controlled model. On the basis of best practices and recommendations in the literature [17]; [18]; [19], both models produce a good fit because they meet the following criteria with respect to the absolute fit indices: p-value > 0.05; RMSEA < .08; TLI > .90; GFI > .80; and AGFI > .90. This outcome of the analysis validates findings in Table 2.

5. DISCUSSION OF FINDINGS

This study confirmed the positive effect of inventory management on operational performance of the selected firms. This is to say that a firm is more operationally productive when inventory management in enhanced in practice. This confirmed association is supported by several studies in Ghana [6] and other countries and geographical regions [7]; [20]; [1]. This finding of the study have two main implications of interest. First, improved inventory management better contributes to ready access to logistics and other resources that functional departments need to succeed at the operational or administrative level. Firms can as a result benefit from taking steps to improve inventory management primarily by equipping the inventory department with more resources and empowering its employees (through regular training) to better carry out job roles.

In addition to the above, inventory management makes a positive effect on marketing performance. Thus, marketing efficiency improves as inventory management is made more effective in practice. This evidence is also backed by several studies conducted both in Ghana and elsewhere [9], [7]; [20]; [1] and affirms that firms can improve marketing performance in terms of sales, market share, service quality delivery, and customer satisfaction when inventory management is improved. Apparently, firms can leverage their inventory management department for higher marketing performance by using it to provide ready access to logistics needed by the marketing team and properly integrating with suppliers, contractors, and other stakeholders.

This study fails to make a positive effect on financial performance. Thus, we found no evidence to conclude that improving inventory management can lead to higher financial returns. This evidence refutes many studies [3]; [11]; [8], except in a few instances. This finding can however be attributed to the fact that some covariates (company size, capital size, industry) were captured in the CFA models. It has been observed that most studies [11]; [8] that confirmed the relationship between inventory management and financial performance failed to control for relevant confounding variables. Another factor that may have also accounted for this finding is the fact that a relatively smaller sample size of less than 200 observations was used. This explanation is more applicable because the correlation between inventory management and financial performance is not significant (see Table 1). More studies must therefore be carried out in future to provide a basis for assessing the generalisability of this result.

Capital and company size make a positive effect on inventory management. This implies that inventory management improves as the firm provides and deploys more resources in the form of funds and personnel. This evidence is also in line with some previous studies [9]; [7]; [20] and support our adaptation of the RVB and Dynamic Capabilities Approach. To explain, a company has more resources in the form of personnel and logistics when it has more funds. Availability of funds and personnel is a condition that boosts operational efficiency, including high performance in the inventory management department. This situation also encourages frequent training of employees and their satisfactory compensation, which can translate into higher dynamic capabilities and more effective inventory management. This being the case, firms can maximise the impact of inventory management on firm performance by providing more funds for enhancing the competence of employees through training.

Interestingly, controlling for the covariates reduced the effect sizes of capital size and company size on market and operational performance. This result is owing to the correlation of the controlled variables with inventory management and demonstrates the need for future researchers to always control for relevant confounding variables when testing the association between two variables. In line with [18], thorough literature review can be used to identify all potential confounding variables that underpin the population of a study.

6. CONCLUSIONS

This study found that inventory management makes a positive effect on operational and marketing performance. It is therefore concluded that increasing the level of inventory management, and its effectiveness can improve firm performance in terms of operational and marketing performance. Firms may as a result benefit from taking steps to improvement the effectiveness of inventory management. It is also confirmed that company size and capital size make a significant positive effect on inventory management. It is hence concluded that inventory management improves as resources are increased in terms of personnel and funds.

Controlling for company size, industry, and capital size reduced the effect sizes produced by inventory management on operational and marketing performance. This, coupled with the positive effect of capital and firm size on operational and marketing performance, suggests that organizational resources make a major impact on firm performance depending on how management controls them. Based on this assertion, it is recommended that management of firms increases the impact of resources on the effectiveness of inventory management by taking the following steps:

i. Management should be committed towards providing more funds for expanding and resourcing the inventory management department. Making funds available should be accompanied with providing adequate resources for the management at the inventory management department.

ii. Employees must be regularly trained in the inventory management department to plan and execute key corporate activities. In training employees, suitable methods and trainers must be used to ensure that training makes its maximum impact on employees.

iii. The budgetary allocation and number of personnel available to the inventory management department must be increased over time in response to changing organisational needs and market demands. In other words, management must ensure that resources available to the inventory management department are upgraded periodically to meet the firm's production capacity as well as market demand.

Limitations and Future Research Suggestions

This study suffers from a small sample size, which could have led to the insignificance of some of the effects. Future researchers are therefore expected to generate and apply larger samples in order to maximise the generalisability of the study's findings. Though this study attempts to control for some potential covariates, there are many more potential confounding variables that were not controlled for. This limitation suggests that results of this study are still vulnerable to alternative explanations. Future researchers are thus encouraged to control for more variables that underpin their population.

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