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Aims and Scope

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Contents

DETERMINANTS OF TECHNICAL EFFICIENCY OF HOSPITALS IN KENYA: 2012-2016

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ABSTRACT

Background: Health care is a basic human right and in the Kenyan constitution, it is the responsibility of the state to provide (GOK., 2010).The government has faced challenges of affordability, quality, availability and timely provision of health care services. Materials and Methods: The study used output oriented VRS_TE DEA model. In estimating the determinants, random effect panel regression model was used. The variables were; log of size, bed occupancy, catchment population, teaching status, average length of stay as independent variables and technical inefficiency as the dependent variable. The data was collected from the hospitals" published data, and government statistics. Results: There was a general decline in efficiency between 2012 and 2016. VRS_TE (0.9012) was higher than CRS_TE (0.8042). The hospitals were heterogeneous in their operations. There was no hospital which was consistently efficient throughout the period. The average length of stay had significant negative relation with technical efficiency. Conclusion: Technical efficiency is negatively related with the average length of hospital stay. The hospitals should reduce the length of hospital stay through early discharge for stable cases and institute home care for follow-up and to handle the non-life threatening cases through home care.

Keywords :DeterminantsTechnical efficiencyOutput oriented VRS_TERE panel regression.

Introduction

Health care is a basic human right and in the Kenyan constitution its provision is the responsibility of the state (GOK., 2010). Where the state cannot adequately provide for it for reasons of fragile health system and associated financing problems, the poor and vulnerable have borne the greatest burden of the health care provision. The health care system in Kenya consists of 9000 health facilities mainly divided into private (Faith based, Non-governmental organizations, Trusts, Foundations and other private for profit) and public (government & Parastatals). The government oversees the running of 42 percent of health facilities (3780) the private sector for profit operates 15 percent (1350) and the not-for profit non-governmental organizations 43 percent (3870) of the health facilities respectively. The entire private sector including the not for profit organizations constitutes 58 percent and employs 50 percent of the total health professionals in Kenya (KDH, 2014). Most of these private health facilities are beyond the financial and location reach of the 70 percent of the poor population residing in urban informal settlements and rural areas as they either charge market or cost recovery fee (KDH, 2014). The main health service provider for 70 percent of Kenyans remain the underfunded, understaffed, and ill equipped public health facilities (African Health Observer-AHWO, 2009).

The distribution and macro-organization of the health facilities in Kenya follows from the Health Sector Strategic Plan (GOK, 2014). Under this policy framework, the health sector operates under a hierarchical system (World Bank, 2014). The health posts are at the bottom of the pyramid, followed by the Community dispensaries, which are the largest in number and the entry point into the health system. These are followed by the Health Centers, Health clinics and the District and Sub-District Hospitals and the provincial hospitals at the apex of the provincial administration of health care. At the top of the pyramid are the five national teaching and referral hospitals; Kenyatta National Hospital, Moi Teaching and Referral Hospital, National Spinal Injury Hospital, Mathari National Teaching & Referral Hospital, and Kenyatta University Teaching and Referral Hospital. The former eight provincial administrative units were responsible for delivering all government services including health. With the devolved system of government in 2013, health services were devolved to the counties giving rise to a slight reorganization where the district and provincial hospitals were elevated to county referral hospitals and among other administrative and financing reorganizations (Chuma & Okungu, 2011; MOH, 2014).This paper addresses the problem of inadequate availability of affordable, accessible, appropriate and timely health care to the over 70 percent of middle and low income Kenyans not covered by any medical schemes. This population solely depend on publicly provided health care services. The public sector controls 42 percent of the health facilities and employs 50 percent of the health professionals. These public health facilities are underfunded, heavily dependent on donor support, understaffed with inadequate health supplies, and equipment. In the recent past, this sector has witnessed several industrial disputes, go slows and strikes concerning scheme and terms of service. Devolution was intended to take services closer to the people. However, due to the teething problems, this transition has had several administrative, financing and perception challenges.

Technical efficiency is the use of inputs to obtain maximum possible output for a given technology set (Farrell, 1957). Technical efficiency can be input-oriented meaning using minimum level of inputs to produce a stipulated level of output for a given technology. This approach is also known as the "input-saving" approach (Farrell, 1957). In this approach, output levels remain unchanged while input quantities are reduced proportionately until the efficiency frontier is reached (Farrell, 1957). On the other hand, the output-oriented approach also known as "output-augmenting" approach, seeks to address maximization of output from a given set of inputs and technology. As the input bundle remains unchanged, the output level increase until the efficiency frontier is reached (Farrell, 1957). In this context, firms" efficiency is measured relative to an estimated efficiency frontier (Charness, Cooper, & Rhodes, 1978).The objective of this study is to analyze the determinants of technical efficiency of the county referral hospitals in the Lake Region Economic Block of Kenya for the period 2012-2016. The technical efficiency scores are estimated using the output-oriented variable returns to scale DEA model (Banker, Charnes, & Cooper, 1984). The relationship between technical efficiency and its determinants was estimated by the random effect panel regression model. The period 2012-2016 was chosen as it marks the transition from the centralized provision of health care services to the devolved provision of health care services as provided under the 2010 constitution (GOK., 2010). The study purposively sampled fourteen (14) county referral hospitals (level 4 and 5) out of the 47 county referral hospitals. The purpose was to compare the hospitals in the counties forming the Lake Region Economic Block (LREB). This is due to the fact that the region has shared health and other development goals for shared prosperity. The study used hospital and government published date from individual hospitals" published records and theeconomic Survey The paper is organized as follows: section 1 discusses the background, while section 2 materials and methods. Section 3 and 4 presents the results and limitations respectively, while 5 is the conclusion.

2. MATERIALS AND METHOD
2.1. Methods

The study of efficiency is based on the theory of production. This theory postulates that a production unit in its production process transforms a set of inputs $x \equiv (x_1,...,x_n)$ into a set of output $y \equiv (y_1,...,y_n)$, given a technology set $T = \{(X^t, Y^t) : X^t \text{ can produce } Y^t)\}$ Where $X^t = (x_1, x_2,..x_n) \in \Re^n_t)$ denotes a non-negative $n \times 1$ vector of inputs and $Y^t = (y_1, y_2,...,y_n) \in \Re^m_t$ denotes a non-negative $m \times 1$ vector of outputs (Jehle & Reny, 2011). Such production technology set T can be expressed using two equivalent forms: the input requirement set, $L(Y) = \{x : (x, y) \in T)\}$ and the output requirement set (Jehle & Reny, 2011). This transformation is achieved through a production function $f(x)$. This function defines the maximum output obtainable from a given set of inputs (Coelli, Rao, O'Donnell, & Battese, 2005). This function $f(x)$, defines the theoretical limit on the possible values of the output. Given the firm's production plan as (y^0, x^0) this plan is considered to be technically efficient if $y^0 = f(x^0)$ (Coelli et al., 2005).

2.2. The Models
Technical efficiency is estimated using the output oriented variable returns to scale model of Banker et al. (1984). This model is given as: $MinQ_h = \sum_{i=1}^{m} v_i x_{i0} - \mu_0$

(i) Subject to: $\sum_{I=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_r y_{rj} - u_0 \geq 0$ (i.e all DMUs lie on or below the frontier)

$$\sum_{r=1}^{s} u_r y_{r0} = 1$$

Minimize the inputs used in producing a given level of output, subject to the difference between the weighted sum of inputs and outputs being greater or equal to zero.

$u_r, v_i \geq 0$, and μ_0 is free in sign. (Cooper, Seiford, & Tone, 2006).

y_{rj} (r =1,...,s) is the observed amount of, r^{th} output produced by the, j^{th} hospital, u_r is the weight attached to output y, x_{ij} (i =1,...,m) is the observed amount of the, i^{th} input for the, j^{th} hospital, and v_i is the weight attached to the inputs, i, n is the number of hospitals in the sample and, h, is the hospital being evaluated in the set of, j=1,...n. hospitals. This relative hospital efficiency is bounded between 0 (completely inefficient) and 1 (technically efficient) i.e. $0 \leq \theta_h \leq 1$. The relationship between the efficiency/inefficiency of the hospitals and its

determinants is estimated using the random effect (RE) panel regression model given as:

$$y_{it} = \beta_j \sum_{j=2}^{k} x_{jit} + \alpha_i + \delta_t + \mu_{it},$$

(ii). (Baltagi, 2013) Technical inefficiency of the hospital at a point in time is a function of a vector of observed explanatory variables (determinants), the hospital specific effect, the individual time effect and the error component (unobserved individual cross section and time series errors).

a_i are assumed to be random variables rather than fixed constants, thus the variations across entities are assumed to be random and uncorrelated with the predictor or independent variables included in the model (Pesaran, 2015). If the μ_i can be assumed to be random, then the loss of degrees of freedom due to

too many parameters in the fixed effect model is avoidable. Therefore the $\mu_i \sim \text{IID}(0, \sigma_\mu^2)$, ($v_{it} \sim \text{IID}(0, \sigma_v^2)$,

and the μ_i are independent of the v_{ii}. The x_{ii} are independent of the μ_i and the v_{ii} for all i & t (Baltagi, 2013).

δ_t, is the individual time effect, a_i is the entities specific effect, x_{jit} is k vector of explanatory variables, β_i

are the slope coefficient of the explanatory variables and μ_{it} is the combined cross section and time series error component. With these assumptions, the RE allows the time-invariant variables to play a role as explanatory variables (Baltagi, 2013).

The estimated empirical panel regression equation is given as:

$$Ineff = \alpha_i + \beta_1 LSIZE + \beta_2 TEASTAT + \beta_3 BOR + \beta_4 ALOS + \beta_5 CPOP + \delta_t + \mu_{it} \qquad (3)$$

Technical inefficiency depends on the individual hospital effect log of bed size, teaching status, bed occupancy rate, average length of stay, catchment population , individual hospital time dependent effect and the error term. LSIZE is the natural log of beds taken as proxy for hospital size, TEASTAT is a dummy variable taking the value of 1 if the hospital is a teaching hospital and 0 if not, BOR is bed occupancy rate, ALOS is the average length of stay in a hospital as an in-patient, and CPOP is the

hospitals catchment population. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the coefficients to be estimated, i represents the

particular hospital, t, represents time, a_i is the individual hospitals" fixed effect, δ_t is the time effect and μ_{it} is the combined cross section and time series error component (Baltagi, 2013).

2.3. Variable Description and Measurements
Size is measured as the log of total beds in a hospital. Teaching status as a variable is a measure of whether the hospital serves as a teaching hospital. It is measured as a binary variable taking the value one (1) if the hospital is a teaching hospital and zero (0) if not. Teaching hospitals are therefore characterized as large with multiplicity of departments for teaching purpose. Teaching status of the hospital affects efficiency through the various professionals and teaching departments. This could have a positive effect on efficiency if this status improves the facility, equipment and staff composition of the hospital. It could however, have a negative effect on efficiency if it leads to over focus on teaching at the expense of

patients. Besides in the absence of adequate equipment, and professionals, the case loads could overwhelm the system thus leading to negative effect. Average length of stay (ALOS) measures the average number of days a patient stays in hospital in a given period (total inpatient days of care/discharges +deaths). This measure could be low due to early discharges as a result of patients" inability to pay or pressure from those on admission waiting list or long due to delayed settlements of hospital charges. This measure could be affected also by the hospitals case mix. Bed occupancy rate (BOR) is a measure of the utilization of the available bed capacity and is expected to positively affect efficiency. It defines the percentage of bed occupancy per given period of time (a year). This measure may give misleading results in cases where „floor" admissions exist and the hospital registers more than 100 percent occupancy. Catchment population is composite external environmental variable comprising of population density, poverty, health indicators, and service utilization. In most of the reviewed studies, it is aggregated as a single variable. This variable determines the health care needs and the case mix. The larger the population, the more complex are the health care needs, and the greater is the pressure on given hospital resources. Hence catchment population was expected to be negatively correlated with efficiency (Chang, 1998).

Table 1 summarizes the empirical literature on the determinants of technical efficiency. The purpose of this summary is to identify the geographical spread of the studies, the methodology and the findings so as to identify the gap to be filled by the current study.

Table-1. Empirical literature review on determinants of technical efficiency.

Author	Country	Method	Findings
Asbu, Masri, and Naboulsi (2020)	South Africa	Tobit Regression	Positive relationship between size and technical efficiency
Cheng, Tao, and Cai (2015)	China	Tobit Regression	Size, and average length of stay were reported to be negatively correlated with technical efficiency.
Mwihia, M'imunya, Mwabu, Kioko, and Estambale (2016)	Kenya	Tobit Regression	Size and average length of stay are negatively correlated with technical efficiency
Ali., Debela, and Bamud (2017)	Ethiopia	Tobit Regression	Negative correlation between technical efficiency and teaching status
Kirigia. and Asbu (2013)	Eritrea	Tobit Regression	Positive relationship between technical efficiency and average length of stay
Dutta, Bandyopadhyay, and Ghose (2014)	India	Two-stage generalized least square Regression	Negative relationship between technical efficiency and average length of stay
Xenos, Nektarios, Constantopoulos, and Yfantopoulos (2016)	Greece	Tobit Regression	Negative relationship between average length of stay, bed occupancy rate and technical efficiency
Andrews (2020)	New Zealand	Truncated Regression	Negative relationship between technical efficiency and average length of stay
Mujasi, Asbu, and Puig-Junoy (2016)	Uganda	Tobit Regression	Positive correlation between bed occupancy rate and technical efficiency
Ahmed et al. (2019)	Bangladesh	Tobit Regression	Positive correlation between bed occupancy rate and technical efficiency
Jing, Xu, Lai, Mahmoudi, and Fang (2020)	China	Tobit Regression	Positive correlation between bed occupancy rate and technical efficiency
Bobo et al. (2018)	Ethiopia	Tobit Regression	Positive relationship between catchment population and technical efficiency

The reviewed studies used largely the Tobit regression model, however few of them used truncated regression and two stage generalized least square regression. These empirical studies reviewed showed efficiency scores clustered in the range of 0.4 to 1. The efficiency/ inefficiency score is located between a

maximum (1) and a minimum (0), hence it is not a binary variable. OLS would be inappropriate where there is panel effect (Biorn, 2017). There have been no documented studies in Kenya, comparing the efficiency of the county referral hospitals. Regional benchmarking and resource sharing would be the way forward in public health provision given that health resources are scarce and the counties are exclusively zoned off from each other. This gap has no documented study to provide the much needed empirical evidence necessary to inform policy. This paper fills this gap by estimating the relationship between hospital efficiency and its determinants in Kenya. The current study used the panel regression estimated by GLS and the ML due to the presence of the panel effect, and that fact that efficiency lies in the range 0 to 1.

2.4. The Conceptual Framework
The conceptual framework in Figure 1 shows the relationship between the inputs, the production process, and the outcomes. The production process is an integrative system of these component parts.
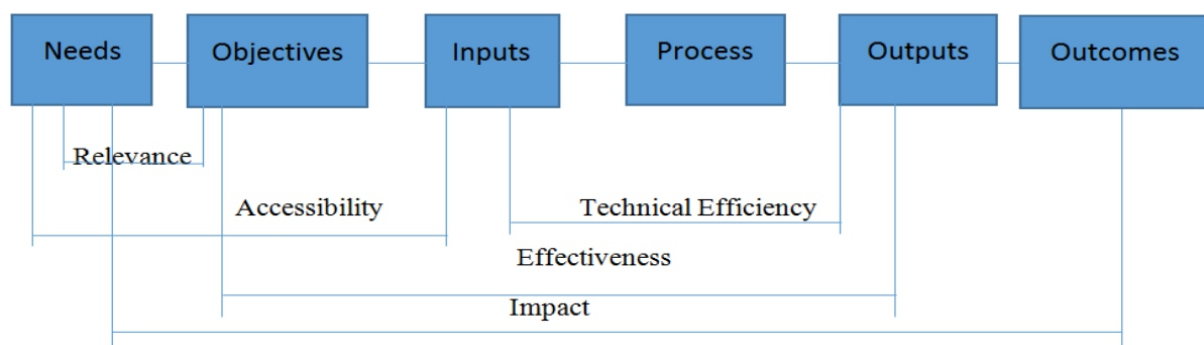
Figure-1. Conceptual framework.

Source: Modified from Sloan and Hsieh (2017).

Health production is best described by the process in Figure 1 which shows that production is an interaction of different parts put together to achieve an overall health systems‟ goal of a healthy population free from disease and its burdens (Sloan & Hsieh, 2017). The analysis of technical efficiency looks at a component part of this whole process as it relates inputs to outputs through a production process defined by a given technology set and the determinants of this efficiency to inform efficiency enhancement plans.

3. RESULTS
3.1. Descriptive Statistics
Tables 2 consolidates the descriptive statistics of the variable used in the estimation of technical efficiency and its determinants. Average length of stay is positively skewed with a negative kurtosis. Bed occupancy rate is negatively skewed with positive kurtosis. Catchment population is positively skewed and has positive kurtosis. The above measures of skewness and kurtosis fall within the acceptable limits of +2 and -2 (Ryu, 2011).

The estimated efficiency results show that there were no hospitals which were continuously efficient throughout the entire five years. This means that, there were no distinguishable technological leaders in the sampled hospitals. The spread of new technology therefore occurred smoothly and without a definite pattern across hospitals. The results also show that the annual mean TE_VRS scores (0.90121) are higher than the TE_CRS scores (0.80436). This difference arises because CRS compares the efficiency

of each hospital in relation to all the efficient hospitals in the sample, whereas the VRS compares the efficiency of each hospital in relation to only the hospitals in the sample which are operating at the same scale as the focal hospital. The VRS computes efficiency with scale efficiency, while CRS scores may be masked by scale inefficiencies. These results of the TE_VRS are similar to those of Kirigia, Emrouznejad, and Sambo (2002) which reported technical efficiency of 0.936. The differences in the results with other studies, in Kenya, could be due to the fact that the reviewed studies focused on Specific County and on the lower level health facilities (clinics) which were also small in size.

Table-2. Descriptive statistics.

Descriptive Statistics	N	Min.	Max.	Mean		Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic	Std. Error	Statistic	Std. Error
BEDS	70	124	365	218.37	9.257	77.448	.716	.287	-.746	.566
Outpatients	70	9600	46375	17788.29	1096.545	9174.357	1.968	.287	2.883	.566
Medical Staff	70	53	350	139.86	9.897	82.804	1.359	.287	0.399	.566
Deliveries	70	1108	4068	2399.87	108.076	904.230	.191	.287	-0.405	.566
Bed Occupancy Rate	70	.6287	.9897	0.8799	0.0103	0.0859	-.784	.287	.296	.566
Hospital Size	70	2.0934	2.5623	2.3140	0.0178	0.1487	.297	.287	-1.060	.566
Average Length	70	4	13	8.16	.263	2.204	.004	.287	-.734	.566
Catchment Pop	70	585582	187268	1028212	37639	314909	1.110	.287	.852	0.566
Inefficiency= (1/TE scores)-1	70	0.0000	0.47	0.1242	0.0122	0.1017	0.867	.287	0.877	0.566
VRS_TE	70	0.68	1	0.8978	0.0091	0.0764	-0.459	0.287	0.224	0.566

3.2. Summary of Mean Efficiency Scores

Table-3. Five year mean Efficiency and Output Slacks per Hospital for 2012-2016.

Hospital	CRS_TE	VRS_TE	SCALE
1	0.8407	0.84504	0.9949
2	0.96694	0.97102	0.98712
3	0.9292	0.93876	0.98966
4	0.74126	0.89052	0.8279
5	0.6875	0.96118	0.71412
6	0.8111	0.86526	0.98278
7	0.50886	0.8652	0.5944
8	0.66562	0.92626	0.71752
9	0.93934	0.9523	0.98606
10	0.9247	0.92666	0.99784
11	0.70544	0.81582	0.8638
12	0.81948	0.88354	0.9298
13	0.76582	0.81996	0.92568
14	0.95508	0.95548	0.99958
Mean	0.80436	0.90121	0.89365

Figure 2 shows the distribution of the annual mean across the county referral hospitals for the period 2012-2016.
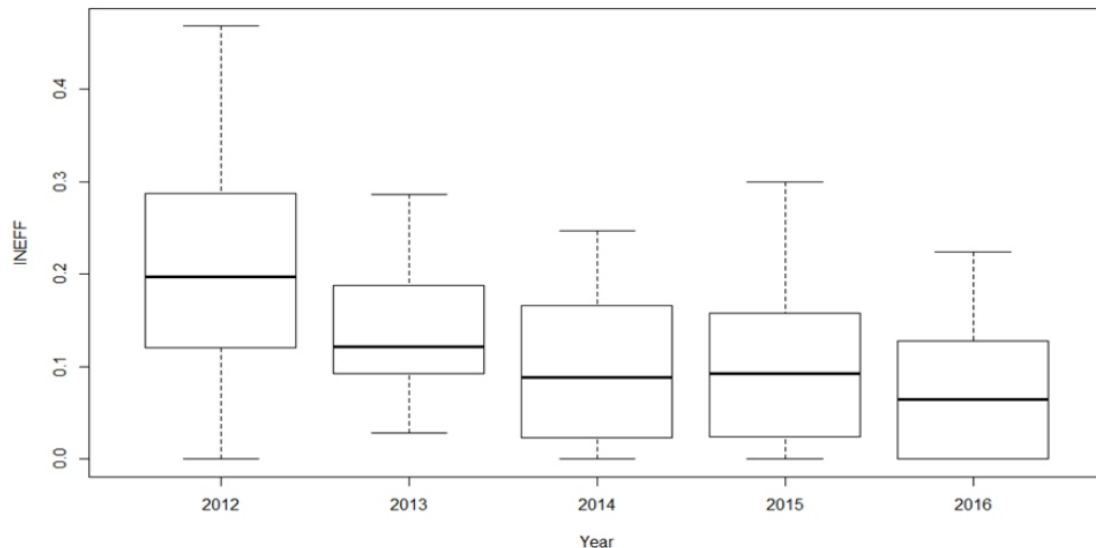
Figure-2. Box plot of annual inefficiency across hospitals.

Figure 2 is a box plot of the above trends of inefficiency across time (2012-2016). It is a summary of the annual inefficiency across the fourteen county referral hospitals. It shows that there was overall skewness in efficiency scores and a general decline in inefficiency where the mean inefficiency in 2016 was below that of 2012, 2013, 2014 and 2015 and a general increase in skewness of inefficiency in 2015. 2015 marked the expiry of the mandate of the transition authority and the commencement of the full devolution of the health care services to the county governments. There were issues of staff takeover and the general apprehension of the medical professionals regarding the ability of the county governments to handle health care provision. There were also pending issues of staff terms and conditions of service which were carried over from the central government. These challenges were to be handled by county governments with little experience in managing health services and resource constrained as most of the resources were disbursed from the central government, with challenges of timely disbursements. These issues continued into 2016, which witnessed a nationwide industrial unrest.

3.3. Correlation Analysis
Table 4 shows the Pearson correlation matrix between the variables used in determining how hospital and external environmental variables affect efficiency

Table-4. Pearson correlation matrix.

Variables	TEASTAT	BOR	LSIZE	ALOS	CPOP	INEFF
TEASTAT	1.0000					
BOR	0.439** (0.000)	1.0000				
LSIZE	0.686** (0.000)	0.418** (0.000)	1.0000			
ALOS	−0.015 (0.9000)	−0.262* (0.028)	0.065 (0.594)	1.0000		
CPOP	0.582** (0.000)	0.299* (0.012)	0.572** (0.000)	−0.065 (0.594)	1.0000	
INEFF	−0.154 (0.203)	−0.058 (0.632)	0.017 (0.889)	0.446** (0.000)	−0.273* (0.022)	1.0000

Note: ** Correlation significant at the 0.01 level, * correlation significant at the 0.05 level (2-tailed).

The matrix shows that there is no statistically significant correlation between inefficiency and teaching status, bed occupancy rates, hospital size, and captive population. Average length of stay had significant positivecorrelation with inefficiency while CPOP had significant negative correlation with inefficiency. In terms of teaching status and other independent variables, there is significantly positively correlation with, bed occupancy rates, hospital size, and captive population. Bed occupancy rates are positively and significantly correlated with hospital size and captive population. The rates are significantly negatively correlated with average length of stay. Size is significantly positively correlated with captive population while the relationship with ALOS is not statistically significant. Average length of stay has insignificant correlation with captive population.

Table 5 shows the variance inflation factor and tolerance for multi-collinearity analysis.

Table-5.Multi-collinearity analysis.

		Coefficients^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.450	.241		-1.872	.066		
	TEASTAT	-.050	.041	-.188	-1.217	.228	.454	2.204
	BOR	-.159	.146	-.134	-1.084	.283	.707	1.415
	LSIZE	.165	.105	.241	1.564	.123	.455	2.197
	ALOS	.020	.005	.444	4.016	.000	.885	1.129
	CPOP	-1.017E-007	.000	-.315	-2.345	.022	.599	1.670
a. Dependent Variable: Inefficiency.								

The results from Table 5 show that multi-collinearity is not a serious problem as the variance inflation factor is below the threshold of 5.

The Augmented Dickey-Fuller test for unit root showed that all the variables are stationary in levels. The results are: Dickey-Fuller = 4.3073, Lag order=2, p-value=0.01. Given this result, the study therefore estimated the model in levels, except size of hospital which is proxied by the natural logarithm of bed size.

Table 6 Presents the model robustness tests which are essential before the model can be used for estimations.

Table-6. Estimation tests.

Test	Test Statistics
ADF Test (Stationarity)	ADF=-4.3073, Lag order=2, p-value =0.01
Hauseman Test	Chi^2(1)=0.40466, p-value=0.5247
Breusch-Godfrey/Wooldridge Test (Autocorrelation)	Chi^2 (4)=9.7067, p-value=0.04567
Breusch-Pagan Lagrange Multiplier Test (for cross sectional dependence)	Chi^2 (1)=33.628, p-value=6.72e-09
Breusch-Pagan/Cook-Weisberg test (heteroskedasticity)	Chi^2(1)=0.51, Pr>Chi^2=0.4764
F- test for individual effect	F(1,54)=35.733, p-value=1.851e-07

From Table 6 the Hauseman test, showed that for this analysis, the random effect model gives better estimates as the p-value>0.05. Breusch-Godfrey/Wooldridge test for serial correlation in panel models showed that there is serial correlation in idiosyncratic errors. The Breusch- Pagan Lagrange multiplier test for random effect showed there is significant panel effect hence OLS would be inappropriate. The Breusch-Pagan/Cook-Weisberg test for heteroskedsticity showed that heteroskedasticity is not a

problem (Wooldridge, 2012).

Table 6 presents the model estimations using the random effect estimates chosen based on the Hauseman test results indicated in Table 6.

3.4. Determinants of Technical Efficiency

Table-7. Random-effect ML regression estimates.

Variables	Coefficient	Std. error	Z-value	Pr(>|Z|)
BOR	−0.1113	0.1882	−0.59	0.555
ALOS	0.0198*	0.0040	4.99	0.000
CPOP	−1.26e-07	6.96e-08	−1.80	0.071
TEASTAT	−0.0389	0.0482	−0.81	0.419
LSIZE	0.0885	0.1149	0.77	0.441
Cons	−0.0229	0.3045	−0.08	0.940
Sigma_u	0.0617	0.0151		
Sigma_e	0.0620	0.0060		
Rho	0.4977	0.1379		
Log-likelihood =82.8112				
LR Chi^2(5) = 32.06 p>Chi^2=0.000				

Note: LR Test of Sigma_u=0 Chi^2(01)=18.15, p>Chi^2=0.000
*significant at 0.05 level

The results presented in Table 7 show that there is significant negative correlation between efficiency and average length of stay (ALOS). The results further shows that 49.77 percent of the variance is due to difference across panels (rho = 0.4977).

4. LIMITATIONS

The study is however limited by the fact that DEA can only classify a group of hospitals as efficient or inefficient relative to an estimated frontier. It does not tell us the ranking of these efficient hospitals among themselves. This frontier depends on the sampled hospitals, changing the composition of the hospitals in the sample may change the efficiency scores. Data availability and accuracy is an issue in the continent and Kenya is not an exception. Thus there was aggregation of data to define certain variables. This may yield results that may not be accurate and reduce their policy relevance.

5. CONCLUSION

Therefore, efficiency is negatively related with ALOS. However, the length of stay in hospital is affected by the ability of the patient to clear the required hospitalization charges. There are cases where patients are detained for failure to clear the bills. Conversely there are cases where relatives pressurize for early discharge for fear of high bills especially in non-life-threatening emergencies. The finding in this study of the negative relationship implies that these hospitals should explore ways of reducing length of hospital stay such as, managing the non-critical cases at home and making financial arrangements for patients to clear bills in instalments once discharged. The home care option would prove effective as

patients are cared for in familiar environment. This could be done by engaging more community nurses for regular follow up.

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A QUALITATIVE ANALYSIS OF THE IMPEDIMENTS TO BUSINESS INNOVATION AND INFORMATION MANAGEMENT IN NIGERIA: A POLICY STANCE

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ABSTRACT

The ability of the Nigerian business sector to actively engage in innovative activities is germane to sustainable national growth and development. While the government has the primary responsibility to formulate policies that can mitigate societal problems and sustain economic stability, the business sector in the country has continued to experience government failure to implement previously formulated policies. The current study attempted to investigate the impediments to Nigerian Business Innovation and Information Management through the lens of a qualitative approach. The authors conducted a guided oral interview through the WhatsApp platform which was created to gather all impediments to the survey from the field officers who took an active part in data collection in six geopolitical zones in Nigeria. Subsequently, data gathered was analysed through Atlas. Ti version 8 software and the findings were presented by the regional spread. The study revealed that there are benefits in conducting a national business innovation survey, and these include input into effective planning, formulation, and implementation of relevant policies for sustainable development in the country. The outcome of the survey helps to benchmark the results with what obtains in other African countries. Key impediments include the firm's unwillingness to declare turnover because of the fear of an increase in tax policy and poor collaboration between the government and the industry. It was recommended that the government should come up with policies that will encourage business activities in the country and improve the relationship between the government and the industry.

Keywords : Impediments Business Innovation Management PolicyNigeria.

Introduction

The ability of the Nigerian business subsector to actively engage in innovative activities is germane to sustainable national growth and development. Likewise, government at all levels has the primary responsibility to formulate policies that can mitigate societal problems and sustain economic stability (Akinyede & Elumah, 2017; Tochukwu, Nwafor-Orizu, & Eze, 2018) as well proffering possible action plans to achieve formulated goals and objectives. Undelikwo and Enang (2018) added that a society that does not have and does not make a conscious effort to cultivate a culture of collection and utilization of accurate data at the various levels of government would ultimately not appreciate the value of

participating in a national survey exercises and ultimately stand a chance of not accepting its outcome. These scholars further argued that business performance and innovation activities could promote economic growth and development and are critical sources of information that can serve as input into government policy formulation (Asmat, 2016). The government's inability to execute favourable fiscal policies and policy inconsistencies have undermined the development of business activities in the country (Eniola & Entebang, 2015). Naudé, Szirmai, and Goedhuys (2011); Ofili (2014) shared the same sentiment when they reasoned that one of the problems with developing countries is the inadequate policy and institutional environment for entrepreneurs to thrive and thus suggested that the government should come to terms with the relevance of innovation and implement innovation-friendly reforms that could provide policies that will encourage the development of the nation's business subsector. Eniola and Entebang (2015) highlighted some Government actions to facilitate the growth of business activities in the country. The study of Egberi and Monye (2015) revealed that government policies helped to promote peace and security for business to thrive, develop the skills of business personnel through seminars and workshops, skill acquisition centres and sponsorship to specialized centres of which was possible via the involvement of all stakeholders in its policy implementation. Literature has shown that societal problems can be identified through research activities, and consequently, strategies can be formulated from research findings from such research and experimental development (Akinyede & Elumah, 2017).

2. STATEMENT OF THE PROBLEM

According to Alabi, David, and Aderinto (2019) Nigeria has formulated several policies and frameworks to facilitate the performance and growth of the business sector. Unfortunately, these policies and frameworks appear to have been largely implemented poorly. The Nigerian business associations and firms within the business, subsector have had to contend with various economic irregularities due to poor government policy formulation and implementation and, as such, are unwilling to collaborate with the government on policy issues that affects their businesses (Akinyede & Elumah, 2017; Hoffmann & Melly, 2015). The National Centre for Technology Management (NACETEM), an agency of the Federal Ministry of Science and Technology observed these impediments from the results of its pilot survey of the 'Nigerian Business Innovation' and thus identified a need to investigate policy issues associated with sustainable business innovation management in the country, through the lens of the qualitative analysis approach. Therefore, this study seeks to investigate the impediments to Nigerian business innovation and information management through the lens of qualitative analysis. It is expected that the outcome of this study will not only identify the impediments but also suggests how policy can be used to drive sustainable business innovation activities in the country.

3. METHODOLOGY

The survey instrument: WhatsApp platform was created for data collection in three geopolitical zones in Nigeria (North Central, South-East, and South-South) on the impediments facing the conduct of a national business innovation management. Subsequently, field workers who took an active part in the administration of the main survey was interviewed through this platform and their experiences subsequently gathered in this study. The questions raised in the survey instrument (questionnaire) was adapted from the OECD's Oslo Manual. The instrument was divided into eleven parts. Part 1: Information on the general enterprise information and operations; part two focused on innovation, part three: activities to support innovation, part four: public financial support for innovation activities, part five: sources of information or ideas for innovation, while part six: co-operative arrangements for innovation, part seven: objectives and effects of innovation, part eight: innovations with environmental

benefits, part nine: intellectual property rights and licensing, part ten: uptake of information communication technologies for innovation and the last part eleven: focused on non-innovators. All concern authorities and associations were contacted before the commencement of the survey to enhance the response rate.Data collection: The data gathered in this research was sourced through the qualitative approach. That is, through guided oral interview method. The questionnaires were administered to both service and manufacturing firms in the three geopolitical zones in Nigeria. Common issues recur, and main themes were identified to summarise all the views that have been collected. Some of the themes that emerged were doubt of benefits from the government, retrieval problem, the scare of tax, strong apathy for filling the questionnaire, and nonresponse.Data Analysis and presentation of results: The discussion on the WhatsApp platform among the field workers was imported to Atlas. Ti version 8 software for analysis. Quotations were coded, and network diagrams were drawn to show the issues raised and challenges encountered during the survey. The results of the qualitative analysis were presented based on zonal responses.

4. RESULT

4.1. Reporting the Impediments to Business Innovation in Nigeria

The field workers were asked if there are any challenges they faced on the field during the data collection. The majority of the respondents said the firms' complaints on the bulkiness of the instrument. Next to the complaints about the instruments' bulkiness is that the firms are not willing to disclose the annual turnover and business registration number as requested from the questionnaire. More so, the fieldworker discovers that the respondents were too busy to attend to such a survey. Also, one of the associations is discouraging the firms registered under them to fill the questionnaire. There is an issue of the wrong address or no signpost to identify the firm in their location. Also, the respondents have strong apathy to complete the questionnaire because of the situation in the country. Themes that were identifies were shown in Figure 1, and some of the excerpts are highlighted below.

4.1.1. Respondents are not Cooperating

Participant: However, the process is very challenging as some people are not cooperating

North West zone

Participant: There is this firm that I took my time to interact with the manager, and I was so sure that Der was not anything stopping him from completing d questionnaire, to my greatest surprise he called me few days after to tell me that he is sorry he cannot fill it as his MD instructed him not to

Participant: Honestly d responses am getting lately from almost all d firms I distributed is not encouraging at all Participant: others sometimes ignore my calls

South West zone

4.1.2. The Respondents are too Busy to Fill the Questionnaire.

Participant: I discovered that because of the bulkiness of the questionnaire, you have to sit with the respondents to get accurate responses. Furthermore, in most cases, they are too busy to sit with the enumerators.

North West zone

Participant: Dey now tell me on d phone Wen I call to ascertain d completion of d questionnaires that I should come n collect it, that it is not filled and maybe When next d agency is conducting such survey, they might be interested, but for now, they are too busy

South West zone

4.1.3. Complaint on the Complex and Bulkiness of the Questionnaire

Participant: I discovered that because of the bulkiness of the questionnaire

North Central zone

Participant: Complaint about the bulkiness of the questionnaire

North West zone

Participant: Secondly. many complain that the questionnaire is very voluminous and that they do not have the luxury of time to fill it even after much persuasion

South-South zone

4.1.4. Some Firms Do Not Want to Have Anything to Do with the Government

Participant: Some will tell you anything from the government they do not need

North Central zone

4.1.5. Firms Do Not Want to Associate with Nigeria

Participant: If you approach some places, they will tell you they are not ready to accept it because they do not want to be Nigerians

North Central zone

4.1.6. Firms Doubt Any Benefits from the Government

Participant: The truth is they do not believe in anything coming from d federal govt anymore

Participant: This is also a result of not having any trust it believes in federal govt. Cos if they genuinely believe/trust d federal govt, they will make out time to fill it

South West zone

4.1.7. Firms Want Benefits from the Government Before they Fill the Questionnaire.

Participant: In my discussion with a company, I was asked: "In what way are we going to benefit from this"? I asked if he is aware of the proposed increase in tax levied on companies? He said yes... I told the manager that our findings could help change the policy if our survey is adequately attended to... That was when they started listening.

Participant: We must find a way of convincing them. God help us all.

South West zone

4.1.8. Lack of Trust on the Mission

Participant: Lack of trust in our mission

North West zone

4.1.9. Manufacturing Firms becoming too Challenging to Comply

Participant: Manufacturing is becoming difficult

South-East zone

4.1.10. Misplacement of the Questionnaire Given to the Firm

Participant: have a question of what is expected of us….in a case where a company did not fill the survey and claimed they could not find it? They are are not interested in partaking in the exercise and could not find the copy given to them.

South West zone

4.1.11. Not Willing to Disclose Their and Business Registration Number

Participant: Good sirs, the exercise is still ongoing smoothly by His grace, but this issue of annual turnover some places no matter the kind of English you speak to them, they will never disclose or write it.

Participant: The issue of turnover is another challenge as many CEOs are afraid to disclose or exposed their turnover mostly because of the fear of TAX; some would even reduce the annual turnover to the minimal amount possible.

North Central zone

4.1.12. One of The Firm's Association Complicating the Survey Asking Members to Disregard the Questionnaire

Participant: You are advised to disregard the above research document being circulated the association is not aware of it.

Participant: No wonder I met some my questionnaires unfilled and returned at the security posts.

Participant: Den it is not just Oyo chapter cos I also got a similar reaction from some firms.

Participant: Funny, Nigeria! Do they need the association to complete the questionnaire? If it were to be money, would they

consult "the association" before they collect it? Funny, though, but not discouraged. WE SHALL GET THERE!

South West zone

4.1.13. Respondents Doubt If the Survey Will Benefit the Business Sector

Participant: Since NACETEM had done this kind of survey before, what policy did we formulate, and how did business enterprises benefit from it?

Participant: Some places may even ask what is the importance of this to them and so on

North Central zone

4.1.14. Retrieval Was Difficult

Participant: Unfulfilled promises you have to come to some offices five times like that, and even you came, that is when they will remember your deals with them.

North Central zone

Participant: Most of those that eventually filled the survey I distributed are those who ignored my calls and messages most... Though they did not attend to it until I revisited them after three weeks of distribution

South West zone

4.1.15. Scare of Tax

Participant: The exercise is going on well at the moment; however, most of the organizations are scared of tax, that is why they always skip the *annual turn over* section.

North Central zone

Participant: There are some challenges sir, some rejected us under the pretence of thinking we are taxing personnel in disguise.

North West zone

4.1.16. Scared of Filling the Questionnaire

Participant: Another is scared of filling the form; I do not talk tire.

South-East zone

4.1.17. Some Firms Do Not Want Their Information To Be Disclosed

Participant: Good afternoon sir, my experience is when I give them they assure me that is going to be filled but going back there again, I will be given empty form and do not like their information to be disclosed.

North Central zone

Participant: This is the same issue been encountered here in pH, at first contact the client will accept to fill the form and will request to read through and make consultation b4 filling the form, in most cases, they will ask you to come back later to pick up the form, at your return, you will find out they have not attended to the form when you probe further why they have not completed the form they will not even tell you any reasonable excuse, while some will tell you that the questionnaire is demanding very confidential information they cannot release.

South-South zone

4.1.18. Some Want Incentives before Filling the Questionnaire

Participant: I just finished negotiation with an MD on how much I am to pay to have him fill the form.

South-East zone

4.1.19. Strong Apathy to Complete the Questionnaire Because of the Situation in the Country

Participant: Blc of things happening in the country some will tell you they are not ready to give any information Participant: Challenges are many, some do not want to respond

North Central zone

Participant: Strong apathy to complete the questionnaire

North West zone

4.1.20. Timing on the End of the Year Report

Participant: Specific challenges encountered: Complaints about the timing concerning organization end of year reports preparations.

North West zone

4.1.21. Want Money and Not Questionnaire to Fill from Government

Participant: Some after filling it, you have to correct some errors; some will tell you they need money, not a questionnaire, and so many issues, in all this is a very difficult exercise.

North Central zone

4.1.22. Wrong Address/No Signpost

Participant: Good afternoon, my experience yesterday and today show that possibly because of tax, some firms use their home addresses, making it invalid addresses. A total of 5 among 12 visited today was affected.

Participant: When searching for more firms/enterprises, in story building particularly with many firms/enterprises (some may not even have signboard), gaining entrance at the security post is all that is needed, rather than taking the lift, I walked the staircase from one floor to the other, by that if I do not know, now I know all the firms/enterprises and asked if they have ten or more staff.

South West zone
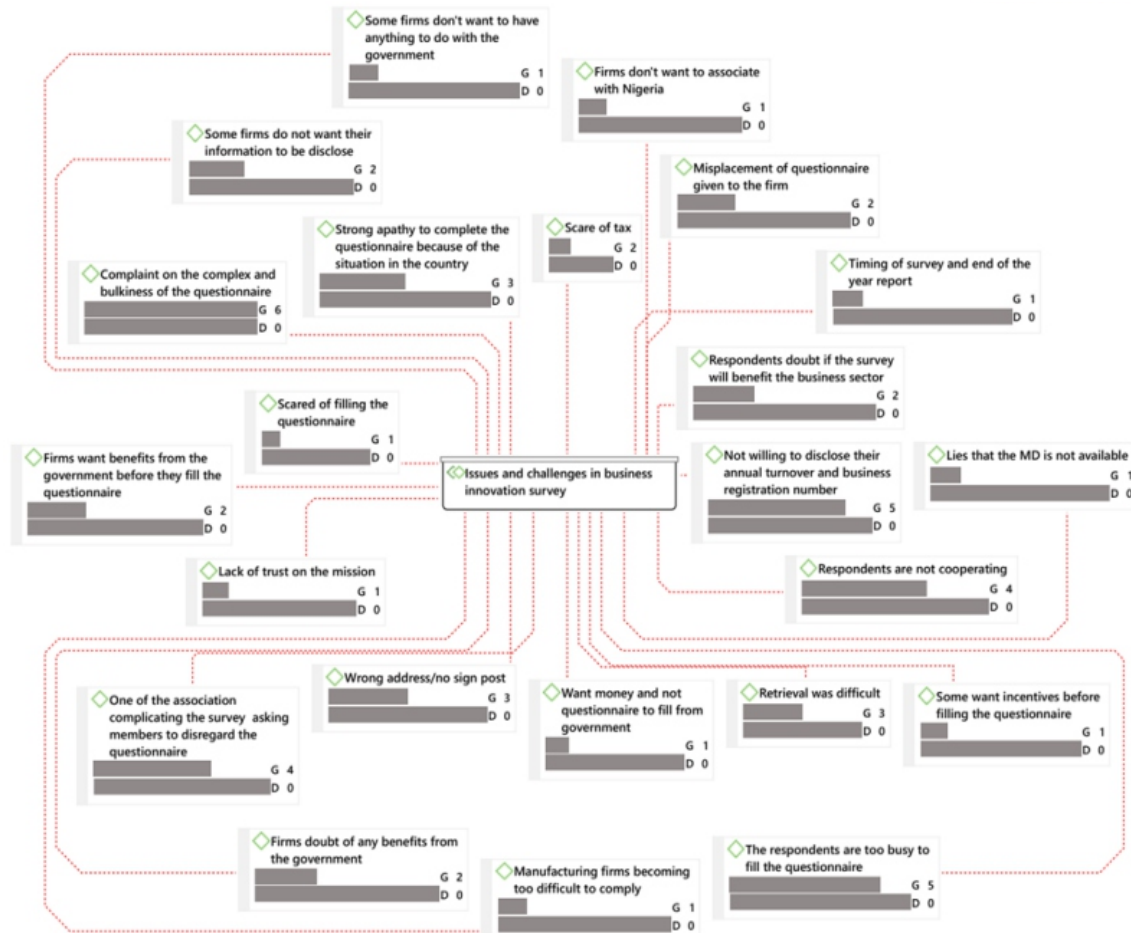
Figure-1. Network Diagram Showing the Impediments in Business Innovation Survey in Nigeria.

5. DISCUSSION

Figure 1 summarised the key impediments to national business innovation survey in Nigeria. The impediments are comprising poor cooperation between the firms and the government due to failure to implement previously formulated policies. This tallies with the findings of Tochukwu et al. (2018), Rasheed (2020). There was also issuesof unwillingness to disclose key information such as annual turnover, misplacement of the research instruments which leads to the administration of another copy, fear of completing the questionnaire due to companies stringent policies on the release of confidential information to non-members, the security issues in the country also posed a huge threat to the conduct of the survey. Ofili (2014) in his study, challenges facing entrepreneurship in Nigeria has equally reported a number of these issues. They are suggesting that business activities in Nigeria have been known for managing a series of impediments before their products can get to the market as many such companies were not willing to open their entrance gates for visitors due to fear of unknown. In addition, many were sceptical if their companies will even benefit from the outcome of the survey in the areas of policy implementation. Hence, many were demanding what they stand to gain by filling the questionnaire. This is inconsonant with Oparanma (2015); Mwai (2019) who have highlighted some of the issues. There was the issue of trust that is; the companies did not trust the government for anything due to the past experience of their failure to implement policies that will benefit the companies, the role of the business association was another major barrier to the survey, this means that many of the firms responded to the

survey instrument after told to do so by their business association. Otherwise, many were not willing to participate in the survey.

6. CONCLUSION AND RECOMMENDATIONS

Findings from our survey indicated that there are benefits of a national business innovation survey, and this includes input into effective planning, formulation and implementation of relevant policies for sustainable development in the country. The outcome of the survey helps to benchmark the results with other Africa countries. Another important finding from the survey is the need for introduction and incorporation of the word 'innovation' into the National Science and technology policy in Nigeria; this will helps in the policy review. Nonetheless, key impediments include firms unwillingness to declare their turnover because of the fear of an increase in Tax policy. Key recommendations from the survey include the need for government to come up with policies that will encourage business activities in the country. Our study also recognized the need for a strong collaboration between the government and the firms so that subsequent surveys can easily be attended to and its outcome can serve as input into the development of sustainable business policies in the country.

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THE IMPACT OF BRAND IMAGE ON LAPTOP PURCHASING INTENTION —THE MODERATING ROLE OF CONSUMER ETHNOCENTRISM

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ABSTRACT

This paper aims to analyze the influence of laptop brand image on the purchasing intention of Chinese college students, and it further looks at the moderating role played by consumer ethnocentrism in the above causality, which helps to bridge the research gap in the domain. Employing the brand image theory and consumer ethnocentrism theory, and based on large-sample questionnaire surveys, this study reveals that brand image positively affects college students' purchasing intention of laptops, regardless of domestic or foreign laptop brands. What is more, besides playing a direct role in affecting purchasing intention, consumer ethnocentrism also plays a significant moderating role in affecting the effects of brand image on purchasing intention. It is found that high ethnocentric college students may not buy foreign laptops, even though the brand image of foreign laptops is superior. Overall, this paper has made important suggestions and implications for both corporate managers and policy makers.

Keywords: Brand imageConsumer ethnocentrismPurchasing intentionLaptopCollege studentsModeration effects.

1. INTRODUCTION

In recent years, the continuous increase in the number of college students and their rising consumption power are driving the consumption market of Chinese college students. According to Ministry of Education of the People's Republic of China (2018), the total number of Chinese general undergraduate and junior college students in 2017 is 43 million, and this number is growing at an annual rate of 2.7 percent. In addition, due to China's emerging economy, Chinese college students have strong purchasing power. IRsearch Consulting Group (2016) reported that the Chinese college student consumer market scale has exceeded 400 billion RMB in 2014, and this number was expected to increase at an annual rate of 5 percent. With the deepening process of internationalization, college students can now purchase laptops among domestic and foreign brands with a wide range of consumption needs, such as price, appearance and brand reputation. In other words, the competition between different laptop brands is growing more cut-throat. A well-communicated brand image can help to establish the position in the market, outstand in the competition, and improve the performance of the brand overall (Bian & Moutinho, 2011).

When consumers purchase commodities, in addition to brand image, consumer ethnocentrism also plays a significant role. Prior studies show that consumer ethnocentrism could adversely affect the sales of foreign products and even cause the boycott behavior against foreign brands (Lee, Lee, & Li, 2017; Souiden, Ladhari, & Chang, 2018). As to Shimp and Sharma (1987), people with high consumer ethnocentrism would suppose that buying foreign products can hurt the economy of the home country since it increases the sales profit of foreign investors. Inaddition, high ethnocentric consumers have strong preference of buying domestic products rather than foreign ones. There are several previous studies focused on the influence of consumer ethnocentrism on the purchasing behavior of consumers in developed countries. For instance, Wang and Chen (2004) stated that consumers in developed countries tend to have a higher quality perception of domestic than foreign products. For instance, in Germany, high consumer ethnocentrism can be a "safeguarding" for the domestic companies of Germany when these companies marketing their own products (Evanschitzky, Wangenheim, Woisetschläger, & Blut, 2008). Nevertheless, there are quite a few researches regarding the influence of consumer ethnocentrism on the relationship between brand image and purchase intention of consumers in developing countries, so the importance of consumer ethnocentrism in the consumers' purchasing process should be valued by both domestic and foreign companies in China.

Previous literatures tend to focus on the direct impact of brand image in affecting consumers' purchase decision in different industries. This research contributes to complement the theories regarding the status of college students' consumer ethnocentrism and enrich the researches about the influence of brand image, consumer ethnocentrism as well as its moderating effect on consuming decisions of Chinese college students consumer group from the perspective of laptop brands. Additionally, it makes up the deficiency that few researches empirically compare the differences between college students who buy domestic brand laptops and those who buy foreign brand laptops. Furthermore, this study also contributes some suggestions to the laptop companies in China based on the findings, which are effective for both domestic and foreign companies to grasp the college market.

2. LITERATURE REVIEW
2.1. Brand Image
Brand image has been recognized in many literatures as an essential field of consumer behavior and marketing (Lee, Leung, & Zhang, 2000; Ogba & Tan, 2009; Plumeyer, Kottemann, Böger, & Decker, 2019), while there is no uniform definition of brand image (Bian & Moutinho, 2011). Conventionally, from the psychological perspective, brand image refers to perceptions about a brand as reflected by the brand associations held in consumer's memory (Keller, 1993); these associations could originate from customers direct experience or from information obtained on a market offering or due to the impact a pre-existing association with an organization had on consumer (Ogba & Tan, 2009). Similarly, as to Biel (1992), brand image is a combination of attributes and associations related to a brand in consumers' mind. In addition, from the symbolization perspective, Nöth (1988) stated that commodities are studied as signs whose meaning is brand image. As for enterprises, brand image is an exclusive and targeted brand atmosphere created by enterprises to meet market demands Xue (2018). Further, Liang (2015) proposed that brand image is a manifestation of consumer personality, such as mascot. This study adopts Biel's definition.

It has shown in many researches that brand image can have a great impact on consumer behavior in different industries. Positive brand image evolves when individuals have a unique, favourable and strong association of the brand, which impacts attitudes towards the brand and drives consumer

behaviour (Johansson, Koch, Varga, & Zhao, 2018). Within Chinese mobile phone market, brand image has positive impact on customer expression of loyalty and commitment to market offering (Ogba & Tan, 2009). In other words, brilliant brand image can make consumers purchase the products of the same company over and over again, and the companies can gain stable passengers in the market. Furthermore, as for Chinese sportswear market, Tong and Li (2013) empirically proved that positive brand personality, which is an essential aspect of brand image, enjoys positive strong purchase intentions in China regardless of whether it is domestic or foreign and whether the product is made domestically or overseas. Similarly, in the sneakers market, Mai (2013) pointed out that building a positive brand image is extremely significant for companies to increase the purchase intention of consumers for sneakers. In addition, the importance of brand image on the consumers' purchase intention can also be affirmed in other industries. For instance, as to different brands of watches, the better the brand image is, the more consumers identify with the product; accordingly, the stronger the willingness of consumers to buy the watches (Tian, 2014). Also, the impact of brand image on the purchase intention of consumers can be also applicable to interpret consumers' consuming behavior for cosmetic brands. Nevertheless, Peng (2017) analyzed the impact of brand image on consumers' purchase intention in the Chinese study abroad training industry from four dimensions which are corporate image, service image, user image and symbolic image; and she found that user image had no huge impact on consumer purchase intention. So this study proposes the following hypotheses:

Hypothesis 1. Brand image has a positive impact on Chinese college students' purchase intention of laptop brands.

Hypothesis 2. Brand image has a positive impact on Chinese college students' purchase intention of domestic laptop brands.

Hypothesis 3. Brand image has a positive impact on Chinese college students' purchase intention of foreign laptop brands.
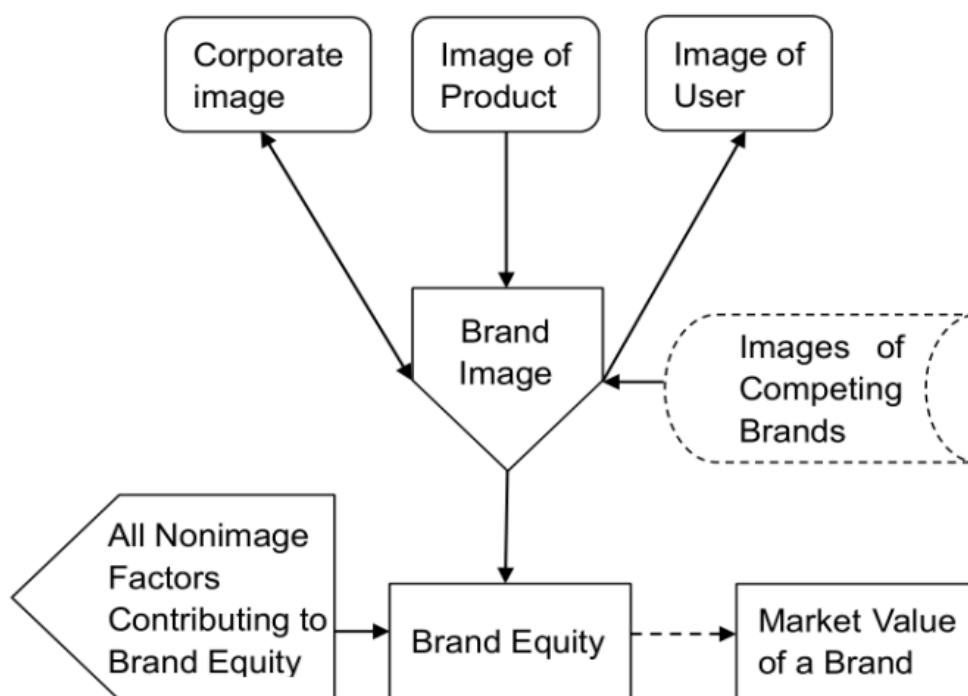
Figure 1. The three components of brand image (Biel, 1992).

As to Biel (1992), brand image can be described as having three components influenced by soft and functional attributes: the image of provider of the product or service, or corporate image; the image of users; and the image of product or service (See Figure 1). First of all, corporate image means the sum of perceptions about an organization reflected in the associations held in consumer memory (Keller, 1993) Notably, these perceptions are composed of emotional, functional and symbolic components (Cian & Cervai, 2014). Corporate image is the key to companies to attract and retain consumers. Andreassen and Lindestad (1998) proposed that corporate image is the primary path to customer loyalty and customer satisfaction. Thereby, good corporate image can stimulate consumers to buy commodities. Second, product image is a physical object which can satisfy the emotional needs of consumers (Wang, 2011). However, Yang and Sun (2013) defined this term as an external representation of product brand and consumers' overall perceptions on product brand, including internal quality image of the product. According to Yang (2006) positive product image can raise the company's profile and enhance brand image, therefore increase customer loyalty. As a result, favorable product image enhances consumers' purchase intention. Third, user image refers to the soft attributes such as personality and the hard attributes showing some fundamental information of users such as age and occupation (Biel, 1992). Many consumers usually link one brand to specific users (Cao & Fu, 2012). These specific users are also named reference group. Bearden and Etzel (1982) found that reference group can influence on product and brand purchase decisions. So if the users of the product have similar soft and hard attributes, such as lifestyle and income level, the product will attract more potential consumers to purchase. Based on the theories above, this study proposes the following hypotheses:

Hypothesis 2a. Corporate image has a positive impact on Chinese college students' purchase intention of domestic laptop brands.

Hypothesis 2b. Product image has a positive impact on Chinese college students' purchase intention of domestic laptop brands.

Hypothesis 2c. User image has a positive impact on Chinese college students' purchase intention of domestic laptop brands.

Hypothesis 3a. Corporate image positively influences the college students' purchase intention of foreign laptop brands.

Hypothesis 3b. Product image positively influences the college students' purchase intention of foreign laptop brands.

Hypothesis 3c. User image positively influences the college students' purchase intention of foreign laptop brands.

2.2. Consumer Ethnocentrism

Consumer ethnocentrism is the beliefs held by consumers about the appropriateness, indeed morality, of purchasing foreign made products (Shimp & Sharma, 1987). In this regard, foreign products can be big trouble to ethnocentric consumers and countries, since they could cause countries to teetering on the edge of recession and reduce domestic employment opportunities. Also, ethnocentric consumers suppose that it is immoral to purchase products from other countries. Hence, ethnocentric consumers, especially developed country consumers, are more likely to focus on the strengths of domestic products and to neglect the positive attributes of foreign products (Shimp & Sharma, 1987; Wei, 2008). On the other hand, the representation of consumer ethnocentrism can be fluid in developed countries. For example, Wei (2008) noted that Japanese consumers evaluate homemade products more favorably than foreign products, no matter how superior the foreign products are. Additionally, the impact of consumer ethnocentrism in developing countries may vary with domestic economic development. Reardon,

Miller, Vida, and Kim (2005) stated that in the newly transitioning economy, ethnocentrism can raise consumers' negative views on advertisements of foreign products, and thus indirectly increase their negative views on foreign brands. In existing literatures, there are several differences between developed country consumers and developing country consumers on their purchase behavior of domestic products. In developed country, consumers love domestic products mainly due to the products' higher quality (Yen, 2018). Contrarily, in developing countries, consumers prefer imported products to domestic, even high ethnocentric consumers may not suppose domestic products are of higher quality than imported ones (Wang & Chen, 2004). China, like other developing countries, consumer ethnocentrism is low (Ding, 2017). Many Chinese consumers evaluate foreign products with specific attributes, such as brand image (Yen, 2018)and price (Wei, 2008). Some Chinese people desire famous international brands with symbolic meanings (e.g. wealth and status) to feel satisfying about themselves (Tong & Li, 2013). In developing countries, consumer ethnocentrism can raise the positive effects of perceived quality and perceived brand image on the willingness to buy domestic products (Yen, 2018). In addition, the influence of consumer ethnocentrism on consumer willingness to purchase varies with industries.

For example, Xu, Xu, Chen, and Wang (2017) empirically demonstrated that the growth of consumer ethnocentrism can increase consumers' willingness to pay for infant formula in China. Nevertheless, Chinese consumers' ethnocentrism has no significant impact on consumers' intentions to buy either domestic or foreign sportswear brands (Tong & Li, 2013). So this study proposes the following hypotheses:

Hypothesis 4. Consumer ethnocentrism has an impact on Chinese college students' purchase intention of laptop brands.
Hypothesis 5. Consumer ethnocentrism has a positive impact on Chinese college students' purchase intention of domestic laptop brands.
Hypothesis 6. Consumer ethnocentrism has no impact on Chinese college students' purchase intention of foreign laptop brands.

2.3. The Moderating Effect of Consumer Ethnocentrism

As mentioned above, favorable brand image may influence consumers' willingness to purchase. However, consumers with distinct levels of consumer ethnocentrism may have different purchase decisions when buying domestic and foreign products. First, consumer ethnocentrism may affect the relationship between brand image and consumers' purchase intention of domestic products. As previously noted, consumers in developing countries have more willingness to buy imports because of high quality and fashionable brand image (Wang & Chen, 2004). However, following the similar line of thought, as for high ethnocentric customers, purchasing imports is immoral and it could even reduce sales of domestic products. Therefore, even though some foreign products have a more attractive and shinning brand image compared with domestic products, high ethnocentric customers would have a sense of responsibility to purchase domestic products. On the contrary, low ethnocentric consumers may prefer to buy imports which have a more fashionable brand image.

Moreover, when consumers face foreign products, consumer ethnocentrism may negatively moderate effect on the influence of brand image on consumers' purchase intention. In China, consumer ethnocentric sentiment is rising (Ding, 2017). In other words, consumer ethnocentrism is becoming one of the significant factors that influence Chinese consumers' consuming behaviors. Additionally, the

consumer ethnocentrism of young people varies with Asian countries. For example, Chinese consumers, especially young college students, are more ethnocentric than Koreans (Han, 2017); whereas Japanese people generally feel more confident about domestic products than imports (Wei, 2008). Moreover, compared with older people, young Asian consumers are more individual in making purchase decisions (Han, 2017). Thus, high ethnocentric consumers, especially young Chinese people, can be firmly not buy foreign products due to the strong sense of responsibility for supporting domestic products. Therefore, this study proposes the following hypotheses:

Hypothesis 7. Consumer ethnocentrism moderates the effect of brand image on Chinese college students' purchase intention of laptop brands.
Hypothesis 8. Consumer ethnocentrism positively moderates the effect of brand image on Chinese college students' purchase intention of domestic laptop brands.
Hypothesis 9. Consumer ethnocentrism negatively moderates the effect of brand image on Chinese college students' purchase intention of foreign brands.

2.4. Chinese College Students' Purchase Behavior

Many previous researches mainly focus on the influence of perceived price, brand image and consumer ethnocentrism on Chinese young people's purchase intention, whereas few researches show the moderate effect of consumer ethnocentrism on college students' purchase behaviour. Compared with old people, young people (age 20 to 30) are more brand-sensitive and they generally have lower than consumer ethnocentrism older people, because they grew up with much more family income and advertisements of both global and local brands (Wei, 2008). Although the Chinese youth think patriotism is extremely important, they seem not to consider patriotism or consumer ethnocentrism as a main factor that influence their purchase decisions (Tong & Li, 2013). According to Ran (2010), Chinese undergraduate students and other adults have more consumer ethnocentrism than high-school students, and the price difference between foreign goods and domestic goods plays a positive moderating role between consumer ethnocentrism and purchase intention of domestic goods. Consistently, Cai (2009) empirically proved that perceived price negatively influences undergraduate students' purchase intention of laptops, while brand image positively affects undergraduate students' purchase intention of laptops. In addition, since Chinese young people are sensitive about brand (Wei, 2008), strengthening a brilliant brand image in college students' eyes is very significant for enterprises to gain the specific market of young people. So brand image can influence the Chinese college students' purchase intention, while consumer ethnocentrism may not have a moderating impact for the Chinese college students' purchase decisions. This study aims to analyze the influence of brand image and consumer ethnocentrism on Chinese college students' purchase intention of laptops as well as its moderating effect. Figure 2 shows all the hypotheses and assuming relationships.
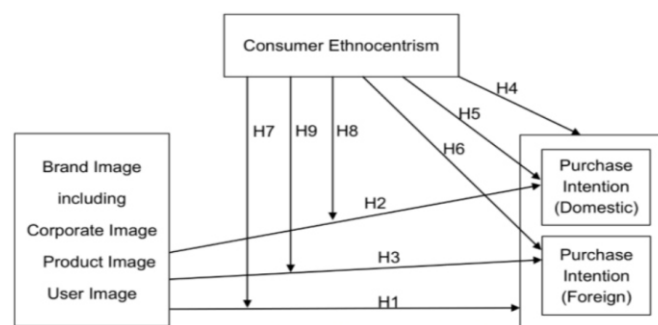
Figure 2. Hypotheses and assumption relationships.

3. METHODOLOGY
3.1. Data
This study uses literature survey, descriptive and explanatory research methods to collect data and design the self-administered questionnaire. Descriptive research is to portray accurate profiles of persons, events or situations (Saunders, Lewis, & Thornhill, 2010). This method can also be used to describe the characteristics of the market and thereby make some specific hypotheses. In the explanatory research, this study applies quantitative method to analyzed data. Since the research subjects are Chinese college students, the questionnaire is designed with Chinese. This questionnaire consists of four parts. The first part includes the demographic questions regarding gender, academic degree, age and monthly disposable income of respondents and the names of 20 domestic and foreign laptop brands to choose from. Respondents are asked to choose the laptop brands that they are using at present, so that this study can obtain the latest and real brand image of laptops. If they do not find appropriate options, they can enter the name of their laptop brands. The second part is to measure brand image with three dimensions of corporate image, product image and user image. Specifically, each dimension consists of three items which are modified from Biel (1992) and Wang (2018). The third part and the fourth part focus on the purchase intention and consumer ethnocentrisms respectively. Each part includes three items, which are revised from Yen (2018). All items are described with a five-point Likert scale. The five options are "strongly disagree", "slightly disagree", "normal", "slightly agree" and "strongly agree", which are assigned with 1, 2, 3, 4 and 5 respectively. To ensure the accuracy of answers and not make respondents feel confused, each part is separated with a specific name. In terms of secondary research, literature survey methods are used to do literature review from many academic websites, such as Emerald, Springer and JSTOR, and then develop research hypotheses and design the questionnaire.

The research objects of this study are Chinese college students. This group includes junior college students, bachelors, masters and doctors. Additionally, this study adopts online questionnaire, which can be distributed widely, save a lot of time, and make the data be quantified easily, although it may also produce some invalid data if the respondents are careless. After collection, this study applies SPSS (24.0) as an instrument to do reliability test, factor analysis, correlation analysis and regression analysis to examine and compare the data. Eventually , 446 questionnaires were recycled and there are 70 invalid questionnaires, which include: 1) the respondents do not choose or enter the name of laptop brands; 2) the answers of questionnaire are almost the same and it seems that the respondents fill them at random. The effectiveness rate of questionnaire is 84.3%.

3.2. Measurement of Variables
3.2.1. Control Variables
For control variables, the characters of respondents are measured by gender, academic degree, age and monthly disposable income. These variables are recognized as other variables that can influence the purchase intention of consumers in addition to the brand image product and the level of consumer ethnocentrism of consumers.

3.2.2. Independent and Moderating Variable
For independent variables, this study adopts three dimensions which are corporate image, product image and user image to measure the brand image of laptops. Specifically, these dimensions include hard factors such as size of business, performance of product and level of education, and soft factors such as the design of products and the personality of consumers (Biel, 1992). In addition, for the features of laptop market, this study adds "the research and development capability of the company" which

complemented by Jiao (2007) to evaluate the corporate image of laptop companies. Furthermore, consumer ethnocentrism is both the independent variable and the moderating variable, and this study capture consumer ethnocentrism from the aspect of impactive economic effect of buying foreign products and the necessity of buying domestic products.

3.2.3. Dependent Variables

For dependent variables, this study uses three questions which are "the likelihood of buying the products of this brand", "the willingness to buy products compared with other brands" and "the possibility of buying products of this brand in the near future" to capture the purchase intention of college students.

4. DATA ANALYSIS
4.1. Descriptive Statistics

In the sample, male accounts for 36.4% with the number of 137, and female accounts for 63.6% with the number of 239, so there are more women than men in the sample. As for academic degree, the main part of sample is bachelor, which accounts for nearly 80%. This percentage of junior college students is around 8%, and this number is 4% less than the total percentage of masters and doctors. In addition, the age of the sample is mainly from 19 to 23, and the number of respondents aged between 19 and 26 are 326. As to monthly disposable incomes, 45 percent of respondents have the monthly disposable incomes reaching up to RMB 1000-2000. The percentages of respondents who has RMB 2000-3000 and over RMB 3000 monthly disposable income are balanced, with 22% and 23% respectively. As to the brand of laptops, there are 182 respondents use foreign laptops and 194 respondents use domestic laptops, with 48% and 52% respectively, as can be seen from the Figure 3 below.
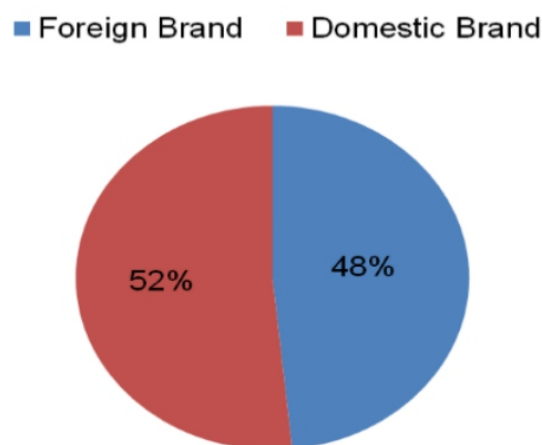
Figure 3. The brand usage of laptops in the sample.

The mean scores of corporate image, product image and user image are 4.03, 3.68 and 3.41 respectively, which means that the brand image of domestic and foreign laptops are slightly excellent in respondents' mind. Furthermore, the mean score of consumer ethnocentrism is 1.8, so the level of consumer ethnocentrism is low among the college students in China. This result is consistent with Ding (2017), which shows that developing countries, especially China, have low consumer ethnocentrism. What is more, the mean score of consumer ethnocentrism among males (1.96) is a little higher than that of consumer ethnocentrism among females (1.75), as can be seen from the Figure 4.
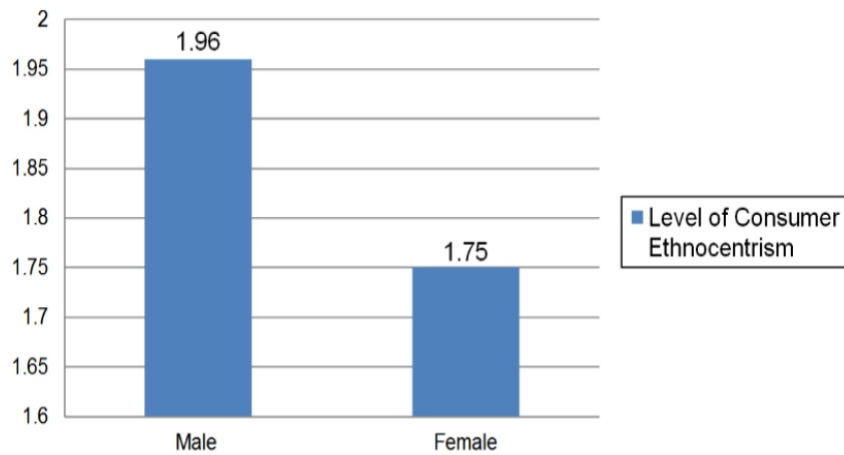
Figure 4. Level of consumer ethnocentrism.

4.2. Reliability and Validity Test

The reliability analysis and factor analysis using SPSS (24.0) are performed to test the reliability and validity of measurements. As for reliability analysis, this study uses the number of Cronbach's α value to judge the reliability of the questionnaire and collected data. If the Cronbach's α value is above 0.70, the reliability of the scale is high (Zhou, 2014). According to the data shown in Table 1, the Cronbach's α value for the whole questionnaire is 0.841. As a result, the reliability of the whole scale meets the requirements for academic research. In detail, the Cronbach's α value for four coefficients which are the coefficients of corporate image, user image, purchase intention and consumer ethnocentrism are all above 0.70; moreover, one coefficient is above 0.50, so the questionnaire is reliable.

Table 1. Reliability analysis results.

Factor	Cronbach's α Value	
Corporate Image	0.788	
Product Image	0.511	
User Image	0.762	0.841
Purchase Intention	0.934	
Consumer Ethnocentrism	0.895	

For validity test results, because all dimensions and items of this study are based on the many previous literatures and theories, content validity meets the requirement of questionnaire. Furthermore, this study uses factor analysis to examine construct validity. Lin and Lu (2010) stated that if the factor loadings of the measuring questions are higher than 0.4, it means the questionnaire has a better construct validity. In addition, Wang (2018)pointed out that if the KMO values of the measuring questions are above 0.6 and sig. ≤ 0.05, the questionnaire is suitable for factor analysis. Since the KMO value for the whole questionnaire is 0.836 and sig. = 0.000, and the KMO value for brand image, purchase intention and consumer ethnocentrism are all over 0.7 and sig. = 0.000, the data is suitable for factor analysis. In the factor analysis (see Table 2), most factor loadings are above 0.7 and some of them are above 0.8, so the questionnaire is effective.

Table 2. Factor analysis results.

Factor	Item	Factor Loading				
Corporate Image	CI 1	0.845				
	CI 2	0.788				
	CI 3	0.613				
Product Image	PI 1		0.882			
	PI 2		0.664			
	PI 3		0.660			
User Image	UI 1			0.807		
	UI 2			0.768		
	UI 3			0.691		
Purchase Intention	WB 1				0.888	
	WB 2				0.884	
	WB 3				0.870	
Consumer Ethnocentrism	CE 1					0.916
	CE 2					0.911
	CE 3					0.900

4.3. Correlation Analysis

This study applies Pearson correlation coefficient method to analyze the correlation between variables. Table 3, Table 4, Table 5 present the correlation coefficients of the whole sample, domestic brands and foreign brands respectively. According the analyzing statistics shown in the tables, correlation coefficients are all less than 0.6 and most of them are less than 0.5, so the correlation between variables is not high. The highest correlation coefficient is the correlation between the interaction of corporate image and consumer ethnocentrism and the interaction of user image and consumer ethnocentrism with 0.587. Thereby, the data meets the requirements for further regression analysis.

4.4. Hypothesis Testing

Table 6 describes the regression analysis for the domestic and foreign laptop brands. As to the results in the Table 6, all Durbin-Watson (DW) values are above 2, which within the range of 1.5 and 2.5 (Lin & Lu, 2010), so the results obey the normal distribution. In addition, the variance inflation factor (VIF) values for all items are less than 10, so there is no autocorrelation between residual items. According to model 1 (M1), the results presents that thebrand image could explain 40.3% of the variance towards purchase intention; moreover, with the regression coefficient value for corporate image ($\beta = 0.283$, p = 0.000 < 0.001), product image ($\beta = 0.195$, p = 0.000 <0.001) and user image ($\beta = 0.334$, p = 0.000 < 0.001), these three dimensions of brand image reach the statistical significance. Therefore, corporate image, product image and user image can positively influence the purchase intention of college students. As to model 2 (M2), after controlling the demographic factors, consumer ethnocentrism does not influence the purchase intention of college students for buying either domestic laptops or foreign laptops ($\beta=0.084$, p = 0.107 > 0.1). The results of Model 3 (M3) show that the interaction item between user image and consumer ethnocentrism ($\beta = -0.107$, p = 0.03 <0.05) could have a negative impact on the college students' willingness to buy different brands of laptops. As a result, H1 and H7 are supported; however, H4 is not supported.

Table 3. Correlation coefficients of domestic and foreign brand samples.

Variable	G	E	A	MDI	CI	PI	UI	CE	CI×CE	PI×CE	UI×CE
G	1										
E	-0.146**	1									
A	-0.109*	0.178**	1								
MDI	0.049	-0.030	0.381**	1							
CI	0.094	0.000	-0.061	0.200**	1						
PI	0.007	-0.014	-0.007	-0.012	0.450**	1					
UI	0.105*	-0.031	-0.069	0.098	0.472**	0.279**	1				
CE	-0.111*	-0.086	0.091	-0.016	0.016	0.091	0.094	1			
CI×CE	0.034	-0.066	-0.012	-0.077	0.085	0.036	0.029	0.174**	1		
PI×CE	-0.013	-0.041	-0.006	-0.113*	0.037	-0.059	0.034	0.112*	0.481**	1	
UI×CE	0.042	-0.054	0.051	-0.035	0.028	0.032	-0.038	0.202**	0.554**	0.387**	1
N	376	376	376	376	376	376	376	376	376	376	376

Notes: G, Gender; E, Education; A, Age; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample.
*$p<0.05$; **$p<0.01$

Table 4. Correlation coefficients of domestic brand sample.

Variable	G	E	A	MDI	CI	PI	UI	CE	CI×CE	PI×CE	UI×CE
G	1										
E	-0.177*	1									
A	-0.093	0.164*	1								
MDI	0.078	-0.077	0.353**	1							
CI	0.077	-0.073	-0.124	0.113	1						
PI	-0.016	-0.035	-0.056	0.070	0.573**	1					
UI	0.080	-0.135	-0.103	0.018	0.457**	0.450**	1				
CE	-0.049	-0.002	0.064	-0.030	0.141*	0.142*	0.190**	1			
CI×CE	0.136	-0.007	-0.045	-0.105	0.242**	0.054	0.145*	0.237**	1		
PI×CE	0.048	0.085	-0.06	-0.212**	0.058	-0.029	0.013	0.106	0.545**	1	
UI×CE	0.128	-0.026	-0.040	-0.055	0.138	0.011	0.100	0.216**	0.587**	0.537**	1
N	194	194	194	194	194	194	194	194	194	194	194

Notes: G, Gender; E, Education; A, Age; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample.
*$p<0.05$; **$p<0.01$

Table 5. Correlation coefficients of foreign brand sample.

Variable	G	E	A	MDI	CI	PI	UI	CE	CI×CE	PI×CE	UI×CE
G	1										
E	-0.121	1									
A	-0.147*	0.187*	1								
MDI	-0.022	0.004	0.394**	1							
CI	0.065	0.068	-0.040	0.222**	1						
PI	0.058	0.018	0.067	-0.07	0.377**	1					
UI	0.092	0.053	-0.079	0.102	0.433**	0.159*	1				
CE	-0.164*	-0.177*	0.146*	0.044	-0.084	0.003	0.051	1			
CI×CE	-0.069	-0.084	0.049	-0.003	-0.048	-0.014	-0.029	0.082	1		
PI×CE	-0.087	-0.227**	0.108	0.036	-0.014	-0.174*	0.053	0.064	0.429**	1	
UI×CE	-0.029	-0.025	0.165*	0.009	-0.029	0.051	-0.116	0.214**	0.466**	0.246**	1
N	182	182	182	182	182	182	182	182	182	182	182

Notes: G, Gender; E, Education; A, Age; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample.
*$p<0.05$; **$p<0.01$

Table 6. Regression analysis of domestic and foreign brands.

	β	t	p	VIF	R²	F	DW
Control Variables							
Gender	0.094	1.810	0.071	1.037			
Education	0.070	1.334	0.183	1.060	0.015	2.432*	2.194
Age	-0.106	-1.865	0.063	1.237			
MDI	0.103	1.841	0.066	1.193			
M1 (H1)							
Gender	0.044	1.082	0.280	1.048			
Education	0.058	1.400	0.162	1.064			
Age	-0.023	-0.515	0.607	1.276			
MDI	-0.014	-0.301	0.763	1.291	0.403	37.148***	2.024
CI	0.283***	5.613	0.000	1.602			
PI	0.195***	4.299	0.000	1.293			
UI	0.334***	7.319	0.000	1.306			
M2 (H4)							
Gender	0.104*	1.983	0.048	1.050			
Education	0.081	1.527	0.128	1.077			
Age	-0.117*	-2.041	0.042	1.253	0.019	2.477*	2.172
MDI	0.108	1.935	0.054	1.197			
CE	0.084	1.617	0.107	1.037			
M3 (H7)							
Gender	0.057	1.383	0.167	1.070			
Education	0.054	1.321	0.187	1.085			
Age	-0.019	-0.423	0.672	1.301			
MDI	-0.016	-0.358	0.721	1.326			
CI	0.292***	5.799	0.000	1.627			
PI	0.201***	4.431	0.000	1.320	0.414	25.046***	2.060
UI	0.319***	6.981	0.000	1.334			
CE	0.038	0.904	0.367	1.108			
CI×CE	-0.062	-1.223	0.222	1.667			
PI×CE	0.069	1.487	0.138	1.375			
UI×CE	-0.107*	-2.181	0.030	1.531			
N	376						

Notes: R², Adjusted R²; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample; *p<0.05; **p<0.01, ***p<0.001.

Table 7 shows the regression results for the domestic brands. The DW value for all the items are within the range of 1.5 and 2.5, so the results obey the normal distribution. Moreover, all the VIF values are less than 10, so there is no autocorrelation between residual items. The results in model 4 (M4) indicate that the brand image could interpret 37.9% of the variance towards purchase intention. In addition, the regression coefficient value for corporate image (β = 0.285, p = 0.000 < 0.001), product image (β = 0.229, p = 0.002 < 0.01) and user image (β = 0.269, p = 0.000 < 0.001), these results mean that brand image can positively affect the purchase intention of college students. According to model 5 (M5), consumer ethnocentrism can have a positive impact on the purchase intention of college students for buying domestic laptops (β=0.199, p = 0.006 < 0.01). As to Model 6 (M6), the interaction items between consumer ethnocentrism and three dimensions brand image show no significance, since p-values are all above 0.01. Therefore, H2, H2a, H2b, H2c and H5 are supported, while H8 is not supported.

Table 8 presents the regression results based on the sample of foreign brands. The DW value for all the items are above 2 and less than 2.5, so the results obey the normal distribution. Furthermore, all VIF values are less than 10, so there is no autocorrelation between residual items. The results in model 7 (M7) demonstrate that the brand image, including corporate image, product image and user image, could interpret 40.9% of the variance towards purchase intention.

In addition, the regression coefficient value for corporate image (β = 0.232, p = 0.001 < 0.01), product image (β= 0.240, p = 0.000 < 0.001) and user image (β = 0.365, p = 0.000 < 0.001), so brand image does have a positive impact on the purchase intention of college students. According to model 8 (M8), there is no significance of consumer ethnocentrism on the college students' purchase intention of foreign laptops (β = -0.018, p = 0.815 > 0.05). As to the data in the Model 9 (M9), consumer ethnocentrism can negatively moderate the influence of the corporate image on the purchase intention of college students, with the result of β = -0.151 and p = 0.03 < 0.05. Consequently, H3, H3a, H3b, H3c, H6 and H9 are supported.

Table 7. Regression analysis of domestic brands.

	β	t	p	VIF	R²	F	DW
Control Variables							
Gender	0.064	0.867	0.387	1.047			
Education	0.048	0.646	0.519	1.074	-0.012	0.449	1.931
Age	-0.042	-0.533	0.594	1.204			
MDI	0.037	-0.474	0.636	1.179			
M4 (H2, H2a, H2b,H2c)							
Gender	0.047	0.805	0.422	1.057			
Education	0.088	1.492	0.137	1.088			
Age	0.055	0.867	0.387	1.237			
MDI	-0.120	-1.924	0.056	1.211	0.379	17.798***	1.809
CI	0.285***	3.897	0.000	1.660			
PI	0.229**	3.187	0.002	1.610			
UI	0.269***	4.037	0.000	1.382			
M5 (H5)							
Gender	0.073	0.996	0.321	1.049			
Education	0.054	0.731	0.466	1.075			
Age	-0.059	-0.759	0.449	1.211	0.023	1.926	1.948
MDI	-0.025	-0.33	0.742	1.182			
CE	0.199**	2.788	0.006	1.009			
M6 (H8)							
Gender	0.061	1.027	0.306	1.087			
Education	0.085	1.432	0.154	1.098			
Age	0.045	0.714	0.476	1.253			
MDI	-0.110	-1.723	0.087	1.279			
CI	0.289***	3.834	0.000	1.765			
PI	0.219**	3.014	0.003	1.637	0.380	11.759***	1.866
UI	0.263***	3.906	0.000	1.411			
CE	0.086	1.429	0.155	1.130			
CI×CE	0.018	0.235	0.815	1.872			
PI×CE	0.046	0.630	0.529	1.686			
UI×CE	-0.127	-1.700	0.091	1.749			
N	194						

Notes: R², Adjusted R²; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample; *p<0.05; **p<0.01, ***p<0.001.

5. DISCUSSION AND IMPLICATIONS

5.1. Discussion

This study theoretically and empirically contributes several important findings to the research regarding the influence of brand image and consumer ethnocentrism on the consuming behaviors of Chinese college students in the laptop industry. Firstly, for the influence of brand image on purchase intention, weather the college students purchase a domestic or foreign brand of laptop, the better the brand image of the laptop, the stronger the students' purchase intention. In other words, if the corporate image, product image and user image of the laptop can satisfy the college students, these students will be willing to buy the laptop. This finding is consistent with some previous research results. For example, Pang and Yang (2014) empirically demonstrated that the corporate image of the laptops can have a remarkable influence on the consuming behavior of consumers, whether the laptop is a domestic or foreign brand. In addition, Zhou (2014) proved that brand image which consists of corporate image, product image and user image can have a positive impact on the consumers' purchase intention of domestic and foreign cosmetics. Therefore, this study infers that brand image is one of the main factors driving college students' consuming behaviors when they are purchasing laptops. Companies which have reputable corporate image such as strong research and development capability and scale of business, attractive product image such as cheaper price and various patterns, and reasonable user image (eg. education level, personality) are easy to improve the college students' willingness to buy their products.

Table 8. Regression analysis of foreign brands.

	β	t	p	VIF	R²	F	DW
Control Variables							
Gender	0.102	1.380	0.169	1.033			
Education	0.071	0.944	0.346	1.052	0.037	2.752*	2.100
Age	−0.186*	−2.274	0.024	1.255			
MDI	0.199*	2.494	0.014	1.192			
M7 (H3, H3a, H3b, H3c)							
Gender	0.040	0.681	0.497	1.044			
Education	0.013	0.213	0.832	1.068			
Age	−0.124	−1.874	0.063	1.339			
MDI	0.101	1.523	0.130	1.357	0.409	18.906***	2.015
CI	0.232**	3.272	0.001	1.538			
PI	0.240***	3.759	0.000	1.246			
UI	0.365***	5.728	0.000	1.247			
M8 (H6)							
Gender	0.099	1.317	0.190	1.063			
Education	0.066	0.863	0.389	1.110			
Age	−0.183*	−2.201	0.029	1.288	0.032	2.201	2.099
MDI	0.198*	2.481	0.014	1.193			
CE	−0.018	−0.235	0.815	1.102			
M9 (H9)							
Gender	0.030	0.515	0.607	1.096			
Education	0.007	0.113	0.910	1.232			
Age	−0.115	−1.695	0.092	1.445			
MDI	0.101	1.531	0.128	1.370			
CI	0.220**	3.106	0.002	1.570			
PI	0.257***	3.960	0.000	1.326	0.423	13.073***	2.042
UI	0.358***	5.530	0.000	1.317			
CE	−0.029	−0.465	0.642	1.182			
CI×CE	−0.151*	−2.189	0.030	1.494			
PI×CE	0.067	0.998	0.320	1.427			
UI×CE	−0.043	−0.641	0.522	1.406			
N	182						

Notes: R², Adjusted R²; MDI, Monthly Disposable Income; CI, corporate image; PI, product image; UI, user image; CE, consumer ethnocentrism; N, Number of Sample; *p<0.05; **p<0.01, ***p<0.001.

Secondly, in addition to brand image, consumer ethnocentrism can also positively influence the purchase intention of laptops; however, this effect can be only effective when college students buy domestic products. This finding is consistent with Yen (2018), who stated that Consumer ethnocentrism is positively associated with the willingness of consumers in developing countries to buy domestic products. Generally, consumer ethnocentrism has no effect when college students purchasing laptops, let alone the college students who buy foreign brand laptops. This finding is partially in line with Ding (2017), who empirically noted that consumer ethnocentrism is not the chief concern amongst Chinese consumers' product preference between domestic and foreign products. Furthermore, this study also finds that the level of consumer ethnocentrism of Chinese college students is low. This finding is square with several previous studies (eg. (Ding, 2017; Wang & Chen, 2004)), which proved that Chinese consumers have low level of consumer ethnocentrism, and even high ethnocentric consumers may buy foreign laptops if the quality of these laptops are higher than that of domestic laptops. Therefore, this study confirms that consumer ethnocentrism is an important factor that drives college students to buy domestic laptops; it can reduce

the attractiveness of foreign laptops in some college students' minds. On the other hand, for students who have comparatively low or no consumer ethnocentrism, foreign laptop companies are likely to offset the little impact of consumer ethnocentrism by improving their brand image (eg. superior performance, sterling reputation), although it may be not a long-term effective method to stimulate Chinese college students to buy foreign laptops due to the continuous technological progress and more attractive local pricing strategies of Chinese laptop companies. Thirdly, the influence of consumer ethnocentrism on the relationship between the brand image and the purchase intention of laptops varies with domestic and foreign laptop brands. Specifically, in general, whether the college students purchase domestic or foreign laptop brands, consumer ethnocentrism can negatively moderate the impact of user image on the college students' willingness to buy laptops. In other words, comparing with low or no ethnocentric college students, high ethnocentric college students can restrain the influence of user image on their purchase intention. For example, although the user image of Apple or Lenovo shows the users of this company desire the quality of life and particularly meets some college students' expectations, high consumer ethnocentrism can reduce the influence of user image, thereby mitigate the positive effect of brand image on the purchase intention of college students. This is an innovative finding that quite few researchers have found before. What is more, notably, as to the college students who purchase domestic laptop brands, there is no moderating effect of consumer ethnocentrism on the relationship between brand image and purchase intention. This may be because consumer ethnocentrism is not of the great importance in Chinese college students' minds when shopping (Han, 2017). In other words, compared with low or no ethnocentric college students, the willingness of buying domestic products will not be raised even the college students have high ethnocentrism.

Nevertheless, as to the influence on the choice decisions of foreign laptop brands, consumer ethnocentrism can play a significant role in moderating the relationship between the corporate image and purchase intention of college students. It is novel to find that compared with low or no ethnocentric college students, high ethnocentric college students may be transfer to choose domestic laptop brands such as Huawei or Mi, even though some foreign laptop brands (eg. Apple, Samsung) have large marketing scale, long history, and comparative research and development capabilities. This finding partially proves the statement of Xu et al. (2017), who suggested that consumer ethnocentrism could significantly change consumer preferences and the consumer preference of high ethnocentric group for domestic and foreign brands can be greatly diminished. Moreover, consumers could reject foreign

products on moral and patriotic grounds but not due to lower product quality evaluations in a developing country like China (Ding, 2017). This finding can be an evidence for further research about the moderating effect of consumer ethnocentrism on the relationship between the brand images of foreign products and the consumers' purchase intention in developing countries. Thus, foreign laptop marketers should not do some sensitive events, such as national discrimination and national insulting remarks, for Chinese college students' market, if they want to remain the willingness of college students to buy their products.

5.2. Implications

From the theoretical perspective, this study has the following four implications.

(1) This study empirically proved the assumptions that brand image can significantly associated with the willingness of Chinese college students to buy laptops. More importantly, there is no difference between the influence of domestic laptop brand image on the purchase intention of college students and that of foreign laptop brand image on the purchase intention of college students.

(2) This study further ensures that all three dimensions of brand image, which are corporate image, product image and user image, can positively influence the purchase intention of consumers for either the domestic laptop brands or foreign laptop brands. Second, this study proves that the level of consumer ethnocentrism is low among the Chinese college students, which is more detailed than previous researches which took the young people as a

(3) This study affirms the hypothesis that consumption ethnocentrism has no significant influence on the willingness of college students to buy laptops. However, the results also points out that consumer ethnocentrism is positively related to the purchase intention of college students for domestic laptop brands, while it will become an irrelevant factor when these students are purchasing foreign laptop brands.

(4) Based on the results of this study, consumer ethnocentrism has a moderating effect on the context between brand image and consuming decisions of college students. This finding can partially provide the evidence for the views of Ding (2017), who claimed that consumer ethnocentrism has only moderate influences on young consumers in China. Additionally, it is novel to yield the finding that consumer ethnocentrism can negatively moderate the influence of user image on the purchase intention of college students for different brands of laptops and the impactof corporate image on the purchase intention of college students for the foreign brand laptops.

In addition to the theoretical implications, this study also has four essential practical implications. First, this study reveals that the laptop companies need to improve their brand images of the products so that consumers, especially college students group, can maintain the long-term purchase intention for their products. In addition, it is an effective method to boost their products' brand images through corporate image (eg. research and development capability, world of mouth), product image (eg. price, function) and user image (eg. personality, educational level). Second, this study emphasizes that companies need to catch the business opportunity of consumer ethnocentrism and create some China-style marketing strategies, so that high ethnocentric college students can be easily attracted to buy domestic laptops and become loyal consumers. Third, this study presents the importance of consumer ethnocentrism on the consuming decisions of foreign laptops. It is extremely essential for the foreign investors or marketers, especially those from the laptop industry, to avoid some problems such as insult remarks and discrimination that can cause the national conflict between the home country and China, and thereby ignite the anger of consumers in China. Otherwise, no matter how favorable the corporate image the laptop has, Chinese college students would not buy this laptop due to the negative moderating effect of

consumer ethnocentrism. At last, foreign laptop companies also need to improve their brand image of products, so that the influence of consumer ethnocentrism can be mitigated.

6. CONCLUSIONS

The purpose of this study is to research the influence of brand image, consumer ethnocentrism on the college students' willingness to buy laptops and the moderating effect of consumer ethnocentrism on the influence of laptop brand image on the purchase intention of college students. Through examination and comparison, this study confirms that brand image has a positive impact on the college students' purchase intention for laptops, regardless of the laptop is a domestic or foreign brand. In addition, consumer ethnocentrism generally does not influence the purchase intention of college students for different brands of laptops; nevertheless, it can be positively associated with college students' purchase intention of domestic laptop brands. Furthermore, this study also proves that consumer ethnocentrism can have a negative moderating effect on the influence of the laptops' user image on college students' purchase intention, regardless of domestic or foreign laptop brands. Moreover, consumer ethnocentrism is not the chief concern for college students when they purchase domestic laptops; however, it can play a significant moderator role when college students choose foreign laptops; in detail, compared with low or no ethnocentrism, the influence of corporate image on the college students' willingness to buy foreign laptops can be reduced with high consumer ethnocentrism.

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THE INFLUENCE OF POPULATION AGGLOMERATION ON THE UPGRADING OF THE INDUSTRIAL STRUCTURE — EVIDENCE FROM CHINA

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ABSTRACT

As an important component of economic, social, and industrial development, changes in the labor force affect a country's economic development in terms of fiscal expenditure, consumption structure, and production capacity, which also promote or inhibit the upgrading of the overall industrial structure and internal structure. Based on the inter provincial panel data of 30 provinces, autonomous regions, and municipalities (excluding the Tibet Autonomous Region) in mainland China from 2010 to 2019, this paper conducts an empirical analysis of the impact of population agglomeration on the upgrading of theindustrial structure and the contribution rate of tertiary industry output value in different regions. We conclude: (1) Generally speaking, population agglomeration has the effect of promoting the upgrading of the industrial structure. (2) The impact of population agglomeration on the industrial structure is different in different regions, hindering the upgrading of the industrial structure in eastern provinces, having no significant impact on the western region, and encouraging the upgrading of the industrial structure of central provinces. (3) Concerning the tertiary industry, population agglomeration significantly promotes the contribution rate of the tertiary industry output value in different regions. Therefore, the following suggestions are put forward: (1) Promote the reform of the household registration system. (2) Increase investment in human capital.

Keywords: Population agglomerationOptimizationUpgrading Industrial structureSpatial Durbin modelSpillover effect.

1. INTRODUCTION

As an important component of economic, social, and industrial development, changes in the labor force affect a country's economic development in terms of fiscal expenditure, consumption structure, and production capacity, which in turn promote or inhibit improvements to the country's overall industrial structure and internal structure. Whether seen in terms of geography or population, China is undoubtedly a big country. The population structure and industrial structure of the east, middle, and west of China each have their own characteristics. Taking the Hu line as a boundary, China's population density exhibits a trend of sparse northwest and dense southeast and is centered on megacities with tens of millions of people, such as Beijing, Shanghai, Guangzhou, and Shenzhen. Since the establishment of the market economy system, population flow has become freer and freer, increasing the significance of the population density differences between different regions and relying on the vast labor market to achieve outstanding advances in economic development. The development of labor-intensive industries has injected a strong impetus into the country's overall economic development. The study of the relationship

between population agglomeration and upgrades to the industrial structure plays an important role in China's long-term development.In current academic circles, the research on the subject of population agglomeration is not closely integrated with that on industrial structure upgrading. Many papers study population agglomeration from the perspective of population growth mechanisms or the pressure on economic development; the research on industrial structure upgrading often takes the direction, speed, and regional differences of industrial structure upgrading as its starting point, and rarely considers how the level of population agglomeration affects the industrial structure. Therefore, this paper introduces the factor of population agglomeration into the study of industrial structure upgrade speed and regional heterogeneity and discusses the advantages and disadvantages of population agglomeration for economic development. Thus, it aims to enrich the results of the population agglomeration research field and provide this field with more reference materials.

To better understand the role of population factors in the upgrading of industrial structures and the differences between different regions, as well as to make more effective use of the benefits of population factors and to avoid the disadvantages of population agglomeration on the economy, the paper is based on ten years of provinces' population data, ensuring that the empirical results are more comprehensive and authentic. The analysis of the empirical results provides suggestions for the policy orientation of industrial structure upgrading, especially the policies involving population factors.

2. LITERATURE REVIEW
2.1. Current Status of Population Agglomeration Research
Chinese scholars mostly study population agglomeration by investigating the causes of population agglomeration and its impact on the environment. The factors affecting population agglomeration include environmental ecology, innovation drive, economic development, etc. Yuan, Caoyong, Ni, Qiuhai, and Zhou (2020) used a stepwise multiple regression model to conduct an empirical analysis and found that a good ecological environment, including a suitable temperature, altitude, and amount of precipitation, is an important factor in attracting population, and that haze pollution correlates negatively with population agglomeration. Moreover, Zhu and Zhao (2021) believed that bystarting from population and consumption, regional joint prevention and control policies could offer a powerful measure to prevent smog. In addition, demographic factors play an intermediary role in real estate prices and economic development. Economic agglomeration stimulates innovation input, which in turn drives up real estate prices, while high housing prices inhibit population agglomeration. To a certain extent, transportation convenience determines the efficiency of population flow. As China's transportation routes become more and more smooth, areas with more trains are often areas with higher population density. In other words, a well-developed transportation system has a strong effect on the accumulation of human capital. Generally, cities with high levels of economic development rely on a variety of industries, abundant jobs, and an active and avant-garde living atmosphere to attract young people.

In academic circles, varying views are held on the impact of population agglomeration. In terms of the ecological environment, He (2019) used the least squares method to conduct an empirical analysis of provincial data and proposed that through an increase in average education level, the increase in pollution caused by population agglomeration can be alleviated, whereas industrial pollution is not directly caused by population agglomeration. Liu and Leng (2020)empirically analyzed the threshold model and found that the impact of population agglomeration on haze pollution shows a diminishing margin after crossing the threshold. In terms of economic development, population agglomeration brings about an agglomeration of human capital and an increase in energy consumption, thereby

promoting economic development. Zhou, Wang, and Zhang (2021) conducted an analysis based on the spatial Durbin model and concluded that population agglomeration brings information consumption dividends, thereby promoting information consumption. Sun (2021) showed that population gatherings boost the development of the circulation industry. However, Wang, Nian, and Wang (2017) argued that a population density that is too high will inhibit per capita output, and there is an optimal balance between city size and economic development. Li, Yan, and Xiaosang (2020) also held this view but believed that most cities in China had not yet reached the stage of restraint.Other scholars' research on population agglomeration has also focused on the above two aspects. Chen and Wei (2014) pointed out that employment opportunities, per capita income, public goods, and immigration path dependence were important factors affecting population agglomeration. Han, Wang, Tao, and Gao (2014) analyzed the attractiveness of cities to the population through complex niches and showed that there is a threshold effect in complex niches. Wang et al. (2018), among others, used remote sensing to draw a population density map of Chinathat improved the spatialization model of population. Shen, Chen, Yang, and Zhang (2019) conducted a variety of empirical analyses and showed that city scale has a positive impact on urban productivity, but excessive population gatherings have a negative effect on productivity development and have spillover effects.

2.2. Current Status of Research on Industrial Structure

Chinese scholars mainly conduct research and analysis on the factors that affect the upgrading of the industrial structure. Chen (2021) argued, based on panel data analysis, that government financial investment, human capital, urbanization, and the urban-rural income gap significantly affect industrial upgrading and have space for spillover effects. The establishment of the free trade zone has effectively promoted technological innovation and thus promoted the upgrading of the regional industrial structure. As financial agglomeration and regional housing prices change, the industrial structure shows a corresponding trend. Transportation infrastructure also plays an obvious positive role in facilitating the upgrading of the industrial structure of a region, as well as that of neighboring regions. The impact of environmental regulations on the upgrading of the industrial structure takes the shape of an inverted U -shaped curve. At present, China is still in a stage where strengthening environmental regulations can stimulate the optimization of the industrial structure. Fu (2021) confirmed through a PSTR model that the expansion of the scale of international trade has a diminishing effect on the upgrading of the industrial structure.

The upgrading of the industrial structure includes both the overall upgrading of the industrial structure and the internal upgrading of the industrial structure, which not only touches on the rationalization of the industrial structure but also includes the progress of its integration. The significance of upgrading the industrial structure is not that the tertiary industry is more important, but that it requires the balanced development of all industries, that is, maintaining the stability of the primary industry, strengthening the secondary industry, and allowing the tertiary industry to prosper. In the dynamic stochastic overall model, the manufacturing industry will produce strong externalities, and its structural changes will curb energy adjustment and promote the adjustment of greenhouse gas emissions. The adjustment of the industrial structure reflects the dynamic relationships between the industries. The development speed of the industrial structure and changes in the proportion of industries are important factors affecting economic growth. The lack of hardware and software facilities is another important obstacle to the upgrading of the industrial structure. Lihong (2011) believed that the theory of the circular economy provided useful ideas for optimizing and upgrading the industrial structure. Xuejun, Bingqian, Jiaxu, and Xiangyue (2018) argued that China should strengthen human capital and foreign investment,

optimize the business environment, expand intellectual property trade, build a global innovation chain, and promote industrial upgrading to enhance its status in the international division of labor. Yu and He (2012) concluded that the blueprint for upgrading the industrial structure was a light industry structure and a low-carbon energy environment.After reviewing a large number of studies on population agglomeration and industrial structure upgrading, a few conclusions can be drawn. First, few academic studies have analyzed the effect of population agglomeration on industrial structure upgrading, so there is a significant gap in this area. Second, most studies take the national or provincial level as their overall research object, and few studies have investigated the regional level. Third, at present, there are still differing opinions on the impact of population agglomeration on the upgrading of the industrial structure, and more empirical research is needed to adequately characterize it.

3. THE MECHANISM BY WHICH POPULATION AGGLOMERATION AFFECTS THE UPGRADING OF THE INDUSTRIAL STRUCTURE

This paper holds that the Lewis dual economic model can explain the problem of migrant workers entering cities in China. Since a large number of migrant workers entering a city forms a population agglomeration there, it follows that the Lewis dual economic model can, to a certain extent, provide theoretical support for the influence of population agglomeration on the industrial structure.American economist Walter Izard integrated the principles of time, hierarchy, and traditional three-dimensional space transformation in the study of economics, and put forward the concept of spatial economics. In Von and Johann (1842) studied the issue of agricultural location in his book "The Relationship between Isolated Countries and Agriculture and National Economy" and proposed that the most important factor that affects the variety and management of farms was distance. If the sum of freight and marginal cost caused by increased input was higher than the price, then the input would not be increased; only when freight and marginal cost were less than the price, couldan increase in input bring benefits and the scale of production expand. After the Industrial Revolution, the theory of industrial location emerged. Christaller (1933) proposed that given the constraints of resource supply and product sales, the network node analysis method was the best solution to solve the optimal positioning problem of the manufacturer to minimize transportation costs, and George Picker used mathematical methods to prove it. Subsequently, Kristelle put forward the theory of the central area in his 1933 book "The Central Area of Southern Germany". Central area theory explained the existence of cities and towns and the factors that affected their development. These three spatial economic theories all discuss static partial equilibrium. In Lösch (1938) introduced general equilibrium in spatial research in "Location Economics", making distance itself the center. Space economics has since been further developed.

Since the 1970s, the combination of econometrics and spatial economics has given rise to spatial econometrics. In 1979, Palink proposed five criteria for the development of spatial measurement models, which laid a good foundation for the development of spatial measurement. Prior to this point, econometrics had mainly studied the relevance of variables in time, while ignoring their mutual influence in space. In the real world, variables cannot meet the requirements of complete independence and randomness, and there are often temporal and spatial correlations between variables. It is precisely because of the spatial correlation of variables that econometrics cannot satisfy the classical assumption of independence and identical distribution. In the spatial measurement model, the spatial weight matrix is introduced to reflect the interactive relationships of variables in space. The spatial weight matrix takes many forms, such as the adjacency matrix and inverse distance matrix. At present, spatial measurement models mainly include spatial autoregressive models, hybrid regression-spatial autocorrelation models, spatial error models, spatial Doberman models, and so on. The spatial Durbin model considers not only

the lag effect of the variable but also includes the error effect of the variable. This paper uses the Spatial Durbin Model to conduct an empirical analysis of the impact of population agglomeration on the upgrading of the industrial structure. The field of spatial econometrics provides a solid theoretical basis for the research of this paper.

4. EMPIRICAL ANALYSIS OF THE IMPACT OF POPULATION AGGLOMERATION ON THE UPGRADING OF THE INDUSTRIAL STRUCTURE

4.1. Construction of the Indicator System

This paper refines indicators such as urban output efficiency. The selected indicators in this paper are all available from official data from 2010 to 2019. The indicators selected in this paper reflect the level of population agglomeration and the current status of industrial structure upgrading. Yet, while the index system reflects as much as possible the various aspects of population agglomeration and industrial structure upgrading, at the same time, it must have a strong systemic connection. The indicators must conform to the characteristics of the region and be able to reflect the differences between the upgrading of industrial structures in different provinces.

Concerning the selection of explained variables, the degree of advanced industrial structure is used as a measure of the level of industrial structure. The specific calculation is as follows:

$$INS = \sum_{i=1}^{3} Y_i \times i = Y_1 \times 1 + Y_2 \times 2 + Y_3 \times 3 \quad (1 < INS < 3) \tag{1}$$

Equation 1 presents the calculation of the degree of advanced industrial structure, where Y_i represents the contribution rate of the output value of the tertiary industry to the province's GDP. The closer the index value is to 3, the higher the industrial structure of the city. By assigning different weights to the three industries, this indicator emphasizes the importance of the tertiary industry.

Concerning the selection of explanatory variables, the degree of population agglomeration is calculated as the quotient of the population density of a province and the national population density, as follows:

$$PA_{it} = \frac{(P_{it} / P_{nt}) \times 100\%}{(S_{it} / S_{nt}) \times 100\%} = \frac{P_{it} / P_{nt}}{S_{it} / S_{nt}} \tag{2}$$

Equation 2 presents the degree of population concentration, where PA_{it} represents the t year of the i province's population agglomeration, P_{it} represents the number of t year of the i province's population (ten thousand), P_{nt} represents the t year of the total national population (ten thousand), S_{it} refers to the t year of the i province's land area (square kilometers), and S_{nt} refers to the national administrative land area (square kilometers).

The control variable per capita GDP is used for the city's output efficiency. Per capita GDP can measure a city's per capita output level. The higher the per capita output level, the higher the city's output efficiency. The degree of government support is measured by the proportion of a province's fiscal expenditure to its GDP. The higher the proportion, the higher the degree of government support. The average number of years of education is used as an indicator of the level of human capital. The greater the number of years, the higher the average academic level of the province and the greater its human

academic talent. Table 1 presents the variables and measurement methods.

Table 1. Variables and measurement methods.

Variable	Symbol	Basic Meaning	Measurement Method
Explained variable	INS	Industrial structural upgrade	Advanced degree of industrial structure.
Core explanatory variables	PA	Population agglomeration	The quotient of the proportion of a certain city's population to the country's population and the proportion of the city's administrative area to the country's land area.
Control variable	PGDP	Urban output efficiency	GDP per capita.
	HR	Human capital level	Average years of education.
	GOV	Government support	Government spending as a proportion of GDP.

This paper uses the data of 30 provinces in mainland China (excluding the Tibet Autonomous Region) from 2010 to 2019 to measure and analyze the impact of population agglomeration on the upgrading of the industrial structure. The data is taken from the website of the National Bureau of Statistics and the websites of the provincial statistical bureaus from 2010 to 2019. As relevant data cannot be found for many indicators of the Tibet Autonomous Region, the province is excluded. To eliminate the influence of heteroscedasticity, the data of industrial structure level, population agglomeration level, government support level, and urban output efficiency are processed in logarithm. Table 2 shows the descriptive statistics of the variables.

Table 2. Descriptive statistics of variables.

Variable	Obs.	Mean	Std. Dev.	Min	Max
HR	300	9.101	0.934	6.764	12.782
LNINS	300	0.871	0.053	0.761	1.041
LNPA	300	0.613	1.362	-2.853	3.292
LNGOV	300	-1.424	0.393	-2.184	-0.282
LNPGDP	300	1.493	0.471	0.262	2.802

4.2. Model Setting

4.2.1. Spatial Weight Matrix

The meaning of the spatial weight matrix is that the closer the geographical distance, the deeper the mutual influence will be. This paper adopts a 0-1 adjacency weight matrix, based on whether two provinces are adjacent to each other geographically; 1 means that two provinces are adjacent, and 0 means that they are not adjacent.

4.2.2. Moran Index

This paper uses a Moran index to test the degree of spatial autocorrelation between population agglomeration and industrial structure level. It is calculated as follows

$$Moran'I = \frac{\sum_{i=1}^{30}\sum_{j=1}^{30} w_{ij}\left(x_i - \bar{x}\right)\left(x_j - \bar{x}\right)}{s^2 \sum_{i=1}^{30}\sum_{j=1}^{30} w_{ij}} \tag{3}$$

Where x_i represents the concentration of population of i province and w_{ij} is the spatial weight matrix. The

range of the Moran index is from -1 to 1. The larger the value, the greater the spatial correlation of the index. A positive index indicates a positive spatial correlation between regions; 0 indicates that the variable is randomly distributed; a negative index indicates a negative spatial correlation between this indicator in each province. Table 3 presents the results of the Global Moran index in 2019.

Table 3. Global Moran index in 2019.

Variables	I	E(I)	Sd(I)	z	P-value
LNINS	0.26	−0.03	0.11	2.66	0.004***
LNPA	0.58	−0.03	0.12	5.10	0.000***
HR	0.35	−0.03	0.11	3.45	0.000***
LNGOV	0.46	−0.03	0.12	4.01	0.000***
LNPGDP	0.35	−0.03	0.12	3.16	0.001***

Note: *** indicates significance levels at 1%.

For the 2010 -2019 panel data, the Global Moran index indicates that industrial structure upgrading, the degree of population agglomeration, the extent of government support, urban productivity, human capital level are all significant at the 99% confidence level (see Table 3). The Z- score value is greater than 1.65, reflecting a clear positive spatial autocorrelation, so the data is suitable for use in a spatial autocorrelation model.
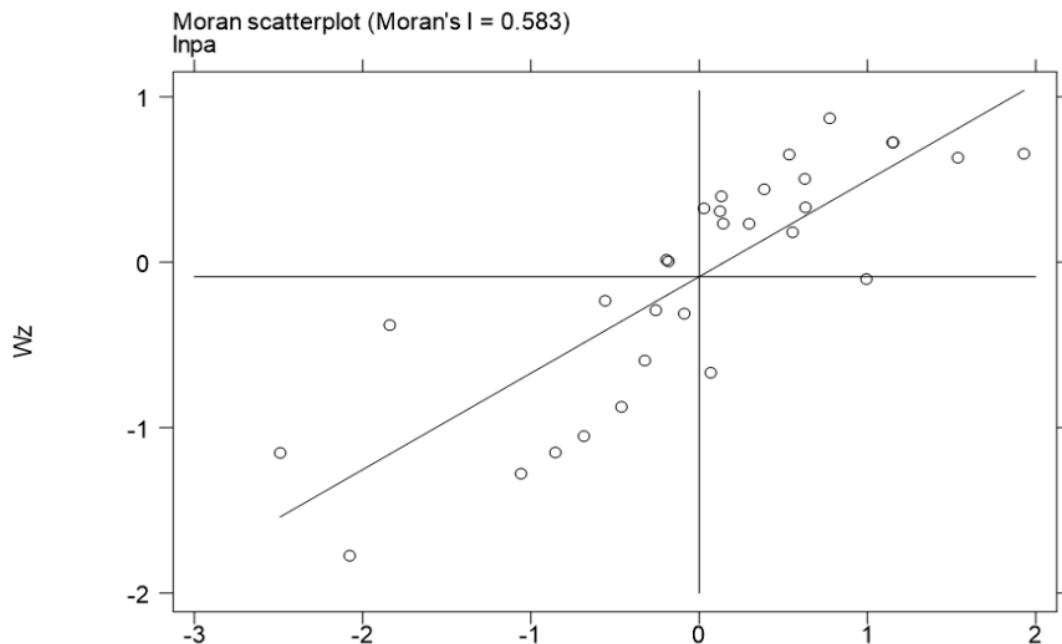

Figure 1. Moran scatterplot of population agglomeration.

Figure 1 illustrates the Moran scatterplot of the population agglomeration. The Moran scatter plot demonstrates that the population agglomeration indicators of 28 of the provinces are in high-high or low-low agglomeration areas, and only 2 provinces are in high-low or low-high agglomeration areas, with strong spatial freedom. Moreover, the provinces in high-high concentration areas are grouped more densely.

4.3. Model Selection and Testing

Table 4 shows the results of model selection and testing. The Lagrangian multiplier test results show that there are spatial errors and spatial lag effects at the 99% confidence level. Therefore, it is determined that the data used in this paper has the above two effects, making it suitable for the spatial Durbin model. The likelihood ratio test and Wald test are performed in Stata, and the P-value of the two tests is 0, which means that the spatial Durbin model cannot be split into a spatial lag model and a spatial error model. The Hausmann test on random effects and fixed effects is also performed in Stata. The null hypothesis of random effects is rejected at the 99% confidence level, therefore this paper chooses to apply the spatial Durbin fixed-effects model.

Table 4. Model selection and testing.

Testing method	Estimated value	P-value
Hausman test-statistic	215.531	0.0000***
Wald_spatial_lag	42.142	0.0000***
Likelihood-ratio test (Assumption: sar_a nested in sdm_a)	60.603	0.0000***
Likelihood-ratio test (Assumption: sem_a nested in sdm_a)	66.902	0.0000***
Lagrange multiplier (Spatial error)	210.032	0.0000***
Lagrange multiplier (Spatial lag)	139.612	0.0000***

Note: *** indicates significance levels at 1%.

4.4. Empirical Analysis

Since the level of industrial structure is the explanatory variable in this paper, one of the economic indicators involved is GDP. Changes in systems and policies, such as changes in certain tax rates, have a significant impact on GDP. At the same time, institutional factors also appear to be accompanied by changes over time, so this paper considers time fixed effects. In addition, the individual fixed effects and double fixed effects are estimated, and the results prove that the time-fixed model has the largest value and the best degree of fitness. Therefore, the spatial Durbin model is set as follows:

$$\ln INS_{it} = \delta \sum_{j=1}^{N} W_{ij} \ln INS_{it} + \beta_1 \times \ln PA_{it} + \sigma \sum_{j=1}^{N} W_{ij} \ln PA_{it} + \beta_2 \times \ln GOV$$
$$+ \beta_3 \times \ln PGDP_{it} + \beta_4 \times HR_{it} + \mu_i + \varepsilon_i \qquad (4)$$

In which $\delta, \sigma, \beta_1, \beta_2, \beta_3, \beta_4$ are the estimated coefficients, μ_i represents the time fixed effect, ε_i expresses a random interference term. Table 5 presents the results of the spatial Durbin model.

Table 5. Time fixed effects, individual fixed effects, and fixed effects.

Variables	(Time) lnINS	(IND) lnINS	(Both) lnINS
Main			
lnpa	0.0114***(7.35)	-0.00452(-0.12)	-0.0164(-0.51)
hr	0.00972***(3.85)	-0.00478(-1.54)	-0.00177(-0.52)
lngov	0.0650***(11.77)	0.0466***(5.58)	0.0136(1.55)
lnpgdp	0.0949***(14.71)	0.0328***(5.33)	-0.04***(-4.21)
Spatial			
rho	-0.261***(-3.95)	0.513***(8.84)	-0.130(-1.51)
Variance			
sigma2_e	0.000564***(12.17)	0.000095***(11.94)	0.000065***(12.22)
N	300	300	300

Note: t statistics in parentheses;*** $p < 0.001$.

The empirical results in Table 5 show, first, that the degree of population agglomeration, human capital level, urban output efficiency, and government support are all significant at the 95% confidence level, indicating that the above variables can significantly affect the optimization and upgrading of the industrial structure. Second, in terms of coefficients, the coefficients of population concentration, urban output efficiency, and human capital level are all positive, indicating that population concentration, urban output efficiency, and human capital level can promote the optimization and upgrading of the industrial structure. Among these, the coefficient of urban output efficiency is the largest, thus its explanatory capacity for the upgrading of the industrial structure is the highest.

Table 6. Fixed time decomposition.

Variables	(Direct effect)	(Indirect effect)	(Total effect)
lnpa	0.012***(0.00)	-0.003***(0.00)	0.009***(0.00)
hr	0.010***(0.00)	-0.002***(0.00)	0.008***(0.00)
lngov	0.067***(0.00)	-0.015***(0.00)	0.052***(0.00)
lnpgdp	0.097***(0.00)	-0.021***(0.00)	0.076***(0.00)
Observations	300	300	300
R-squared	0.754	0.754	0.754
Number of Provinces	30	30	30

Note: t statistics in parentheses; *** $p < 0.001$.

The direct effect reflects the average impact of population agglomeration on the upgrading of the industrial structure in the region, the indirect effect reflects the average impact of population agglomeration on the upgrading of the industrial structure in other regions, and the total effect explains the average impact of population agglomeration on the upgrading of the industrial structure in all regions. Thus, the time fixed effect can be broken down. Table 6 presents the results of the fixed time decomposition.

The estimation results in Table 6 indicate, first, that the R2 value is relatively large, which proves that the model is a good fit and can be used for analysis. Second, after adding the three variables of human capital, government support, and urban output efficiency as control variables, the impact of population agglomeration in a region on the upgrading of the regional industrial structure is positive. Every increase

in population agglomeration promotes the structural level of the industry by 0.012 units. The impact of population agglomeration in neighboring areas on the upgrading of the industrial structure of a region is negative. Every percentage point increase in the level of population agglomeration in neighboring areas will reduce the level of industrial structure in the region by 0.003. On the whole, however, population agglomeration provides a boost for the upgrading of the industrial structure. Every increase in population agglomeration increases the optimization level of the total industrial structure by 0.009.Third, the impact of the three control variables of human capital level, government support, and urban output efficiency on the upgrading of the industrial structure is consistent with the conclusions of many previous scholars. The impact of these three variables on the level of industrial structure is strongly significant. The coefficients in the direct effects are all positive, the coefficients in the indirect effects are all negative, and the coefficients in the total effects are all positive. The level of human capital promotes the upgrading of the industrial structure in a region while inhibiting the upgrading of the industrial structure in neighboring areas, which has obvious negative spillover effects. Each increase in the level of human capital by one unit will increase the level of the local industrial structure by 0.01 units and reduce the level of neighboring areas by 0.002 units. However, from the perspective of the total effect, the level of human capital has a positive impact on the industrial structure.

Table 7. Double fixed effects in Eastern, Central, and Western regions.

Variables	(East) lnINS	(Central) lnINS	(West) lnINS
Main			
lnpa	−0.105**(−2.99)	0.397***(5.24)	0.00547(0.04)
lnhr	0.0184(0.43)	0.0247(0.75)	−0.0206(−0.47)
gov	−0.0277(−0.60)	0.144*(2.32)	0.120*(2.45)
lnpgdp	−0.0679***(−5.73)	−0.00806(−0.71)	−0.0460**(−2.58)
Spatial			
rho	−0.0727(−0.38)	−2.186***(−5.64)	−0.231(−0.20)
Variance			
sigma2_e	0.0000320***(7.42)	0.0000155***(4.67)	0.0000524***(3.35)
N	110	80	110

Note: t statistics in parentheses; * p <0.05, ** p <0.01, *** p <0.001.

The 30 provinces studied here can be classified into the three regions of east, central, and west. The empirical analysis of spatial Durbin double fixed effects is carried out, and its results are presented in Table 7.First, after adding the three variables of human capital, government support, and urban output efficiency as control variables, the population agglomeration in the west of the country cannot effectively explain the upgrading of the industrial structure in the region, although the population agglomeration in the central part is shown to promote the upgrading of its industrial structure. However, the level of population agglomeration in the east of the country has a restraining effect on the upgrading of the industrial structure. Each increase in the level of population agglomeration in the central region increases its industrial structure upgrade level by 0.397 units. Each increase in the level of population agglomeration in the eastern region reduces its industrial structure upgrade level by 0.105 units. The over-concentration of population in the eastern region puts too much pressure on the cities, thereby reducing production efficiency, which is not conducive to the upgrading of the industrial structure. However, the degree of population agglomeration in the western region is too low to have an effective impact on the industrial structure, so its impact on the level of the industrial structure is not significant. In

contrast, the central region is currently in a stage where population agglomeration promotes the upgrading of the industrial structure.Second, the control variable is not significant in the double fixed effects model. The level of human capital cannot effectively explain the level of industrial structure in the eastern, central, and western regions. One possible reason is that academic qualification level is not enough to summarize the overall level of human capital. In terms of their effect on the upgrading of the industrial structure, vocational skills are a more contributor to human capital. Table 8 shows the results of the effect of population agglomeration on the contribution rate of the tertiary industry output value.

Table 8. The effect of population agglomeration on the contribution rate of the tertiary industry output value.

Variables	(East) lndscy	(Central) lndscy	(Western) lndscy
Main			
lnpa	0.482***(3.72)	0.397***(5.24)	0.737**(2.64)
lnhr	-0.0713(-0.46)	0.0247(0.75)	-0.165(-0.90)
gov	-0.351*(-2.03)	0.144*(2.32)	0.822***(5.26)
lnpgdp	0.59***(13.13)	-0.00806(-0.71)	0.94***(13.66)
Spatial			
rho	-0.547*(-2.51)	-2.17***(-5.64)	-0.452(.)
Variance			
sigma2_e	0.000438***(7.64)	0.0000155***(4.67)	0.000959***(7.31)
N	110	80	110

Note: t statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. lndscy means the contribution rate of the tertiary industry output value(logarithm).

4.5. The Impact of Population Agglomeration on the Contribution Rate of Regional Tertiary Industry Output Value

The service industry, entertainment industry, and financial industry account for a large proportion of the tertiary industry, and a prominent feature of these industries is the high proportion of labor factors. Therefore, it is conjectured that population agglomeration can significantly affect the contribution rate of the output value of the tertiary industry. Table 9 indicates the results of the robustness test.First, after adding the control variables of human capital, government support, and urban output efficiency, the impact of population agglomeration on the tertiary industry in different regions is significantly increased. For every unit increase in the level of population agglomeration, the contribution rate of the tertiary industry output value in the eastern region increases by 0.482 units, that of the central region increases by 0.397 units, and that of the western region increases by 0.737 units.

Table 9. Robustness test.

Variables	lnINS	P-value	lnINS	P-value		
	Main		Wx			
Lnpa	0.0128 *** (6.37)	0.000	0.0307 *** (6.88)	0.000		
Lngov	0.0780 *** (14.79)	0.000	0.0936 *** (5.70)	0.000		
lnpgdp	0.0907 *** (13.45)	0.000	0.0231(1.39)	0.164		
Hr	0.00801 ** (2.76)	0.006	-0.000175(-0.04)	0.969		
Spatial						
Rho	-0.488 *** (-5.75)	0.000				
Variance						
sigma2_e	0.0005 *** (11.87)	0.000				
	LR_Direct		LR Indirect		LR_Total	
Lnpa	0.0102 *** (4.31)	0.000	0.0190 *** (5.79)	0.000	0.0292 *** (11.53)	0.000
Lngov	0.0718 *** (13.64)	0.000	0.0439 *** (4.15)	0.000	0.116 *** (11.87)	0.000
lnpgdp	0.0936 *** (12.60)	0.000	-0.0166(-1.49)	0.136	0.0770 *** (9.43)	0.000

Hr	0.0082 * (2.57)	0.010	-0.00298 (-0.76)	0.446	0.00521 * (2.12)	0.034
N	300		300		300	

Note: t statistics in parentheses; * p <0.05, ** p <0.01, *** p <0.001.

Second, among the control variables, the degree of government support is significant, and the impact of urban output efficiency on the development of the tertiary industry in the eastern and western regions is significantly increased, while the impact in the central region is not significant. The contribution rate of the human capital level to the output of the tertiary industry in the eastern, central, and western regions is not significant. One possible reason is that the structure of education does not match the needs of the industry, causing distortions, and education is, therefore, unable to promote the industry. Another possible reason is that technical ability has a more significant impact on output value, and the average number of years of education has only an indirect effect on the contribution rate of output value.

4.6. Robustness Test
Analyzing the data for random effects, it is found that the sign of the coefficient of each variable is the same as the sign of the fixed effect, indicating that the model is robust.

5. CONCLUSIONS AND POLICY SUGGESTIONS
5.1. Conclusion
First, according to the analysis of inter-provincial data, population agglomeration has the effect of promoting the transformation of the industrial structure. From a regional perspective, population agglomeration inhibits the upgrading of the industrial structure in the eastern region, promotes the upgrading of the industrial structure in the central region, and has no effect on the upgrading of the industrial structure in the western region. In terms of the analysis of the tertiary industry, population agglomeration has significantly promoted the industrial structure of the eastern, central, and western regions. The agglomeration of the population means that the labor market in the region is more abundant, which has a positive effect on the allocation of labor among industries, especially when the labor force of young and middle-aged people accounts for a large proportion of the migrating population, and this population is also more welcomed by the market. It enriches the supply of the labor market, but also attracts more advanced industries to converge in the same area, thereby achieving economies of scale and stimulating economic growth. When a large number of people pour into the same area, on the one hand, it provides a large labor supply for the tertiary industry in the factor market. On the other hand, it increases the demand for tertiary industry products in the product market. Therefore, population agglomeration can stimulate the optimization and upgrading of the industrial structure and promote economic prosperity and development. Nonetheless, excessive population in the same area may lead to traffic congestion, cost increases, and other reductions in urban efficiency, as well as an increase in urban diseases. At present, however, most provinces in China can still bear the pressure brought by population agglomeration and further advance the industrial structure.

Second, from an inter-provincial perspective, human capital plays a role in promoting the upgrading of the industrial structure. Population agglomeration promotes the accumulation of human capital, and the spillover effect of knowledge appears, improving the productivity of labor and thus increasing the marginal return of labor. The agglomeration of human capital also promotes the conversion rate of knowledge and technology, which is transformed into endogenous power, thereby promoting technological innovation, changing the labor-to-technology ratio of the industry, and biasing the industry toward technological progress.

5.2. Policy Suggestions

Based on the empirical analysis and conclusions of this paper, we can make the following policy suggestions:

First, promote the reform of the household registration system. China's household registration system is linked to many aspects, such as medical care and insurance, and is one of the important factors restricting population mobility. Cities should fully consider their own stage of development, formulate corresponding and reasonable household registration systems, and encourage productivity while providing a secure path for the floating population.

Secondly, strengthen human capital investment and promote human capital accumulation. School education has long been widely valued by the public as a potential human capital investment method, but vocational skills training should not be underestimated. Vocational skills training can quickly cultivate the working ability required for the corresponding position, bringing direct benefits to enterprises and individuals. Therefore, it is necessary to enrich human capital investment, improve vocational training standards, and cultivate more talents who can meet the needsof the industry.

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PREDICTING THE BANKRUPTCY OF CEMENT COMPANIES IN BANGLADESH: A STUDY ON DHAKA STOCK EXCHANGE

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ABSTRACT

The financial status of a company can be measured and predicted using a variety of tools, techniques, and models like ratio analysis, vertical and horizontal analysis, etc.The objective of this study is to identify the bankruptcy position of Bangladeshi-listed cement companies. The Altman Z-Score model has been used here to assess the intensity of insolvency of Bangladeshi cement businesses with listings on Dhaka Stock Exchange (DSE) considering financial information from 2018 to 2021 using Altman ZScore model. The data has been analyzed using Statistical Package for Social Sciences (version 28.0.1.1) and also Microsoft excel. DSE currently lists seven (07) cement companies. According to the research, Heidelberg Cement Limited and Lafarge Holcim Bangladesh Limited are in the secure region having the maximum Z value of 33.47 and the minimum Z value is 3.17. Confidence Cement Limited, Meghna Cement Limited and Crown Cement Limited in 2021 are in the grey region having the maximum Z value of 2.71 and the minimum Z value of 1.82. Aramit Cement Limited, Crown Cement Limited, and Premier Cement Mills Limited are in the bankrupt region having the Z value of less than 1.80. These three companies must outperform in sales with the improvement in operational costs to overcome bankruptcy. We found a positive correlation between all of the five independent variables and the dependent variable (Z Score).

Keywords: Altman Z- scoreBankruptcy predictionCement companies Dhaka stock exchangeFinancial ratiosDSEBangladesh.

1. INTRODUCTION

The top 10 companies in the country currently control around 81% of the entire cement market, and there are currently 37 operational cement mills in the country. Among them, seven companies are listed on the Dhaka Stock Exchange (DSE). Another analysis by Industrial Development Leasing Company (IDLC) claims that during the past 20 years, as Bangladesh's economy has grown, the yearly per capita cement consumption has climbed from 45 to 200 kg. Real estate firms consume 30% of overall consumption, while people consume 25% of it. The public sector accounts for 45% of total consumption (Cement Industry of Bangladesh: Challenges and Future Opportunities, 2021). Increase in per capita cement consumption will also led the industry become boom subject to some abnormal situation faced like

Covid-19 pandemic. Profit decreases of most of the business due to Covid-19 pandemic all over the world (Hossain, Nesa, Dowla, & Akter, 2021). Like other industry profit maximization is the main objective of cement industry also. Generally, this objective may not be fulfilled due to lack of sound financial condition as well as operational inefficiencies. There are various factors affecting financial performance of any organization. Financial instability has become one of the major topics discussed in corporate world particularly in corporate finance. And it is certainly not a sudden event. Companies become bankrupt due to poor corporate governance and their inefficiency in controlling the fixed cost as well as downfall in the revenue. Inappropriate strategy and poor financial policy may push companies to become bankrupt. The stock markets of Bangladesh have listed many industries among which cement industry is a major one. Due to the ongoing development projects and the increase of per capita income of the people tends to develop their life style that helps industry to operate in full capacity. Early warning signs eventually result in bankruptcy and liquidation (Wijaya & Anantadjaya, 2014). Researchers in accounting, finance, banking, and credit risk management use the multivariate approach to failure prediction on a global scale. Odibi, Basit, and Hassan (2015) indicates in their study that businesses in financial crisis or on the verge of bankruptcy are more similar businesses that are unable to pay their creditors. They also demonstrated that the likelihood of a company going bankrupt increases if its fixed costs are extremely high, its revenues are sensitive to the state of the economy, or its assets cannot be liquidated.

Cement industry is one of the most important industries contributing to our national economy. This industry is directly related to the country's development. Many people are directly or indirectly involved in this industry. Many investors are investing in cement industry as the raising sector in Bangladesh. But they are anxious about losing the investment and want to know the actual risks in this industry. Investors always desire high return and the certainty of getting back their actual investments by taking low risks (Hossain, 2020). Many studies are found in the literatures about predicting bankruptcy and financial failure of different industries but a very few studies found focusing the cement industry using Altman Z-Score model in Bangladesh. The policy makers and the investors will get excellent inputs in decision making from this study.

2. LITERATURE REVIEW

There are various research works carried out on financial performance and bankruptcy prediction from different aspect. These studies used reveal different variables as the factors of financial performance analysis. The same has been found in the study of Al-Kassar and Soileau (2014) that Financial management and top management of the companies benefit from the examination of financial performance by paying more attention to key ratios. Considering the results of research conducted by Zhang and Li (2006) it was also found that company owners usually have a significant effect on company performance. Another study by Wattoo (2022) on ownership structure revealed that financial structure (equity financing and debt financing) has significantly positive effect on financial structure in overall Pakistani Financial Industry. The other determining factors of financial performance are firm's size and liquidity ratio that significantly affecting the financial performance in this sector. The empirical study byErin, Bamigboye, and Arumona (2020) It is clear that having a competent Chief Risk Officer (CRO), a board risk committee that functions in a proper manner, and the presence of independent directors will all significantly boost a company's performance in the current financial situation. As well as empirical research by García (2022)demonstrates a favorable correlation between financial performance and business sustainability.

There is also a strong positive relationship between corporate social responsibility practices and the financial performance of financial institutions (Muchiri & Erdei-gally, 2019). Correlation and multiple regression analysis from the study ofKablay and Gumbo (2021) It has been demonstrated that interest income on loans has a major impact on banks' Return on Assets and Return on Equity whereas effective management of fund to control cost and increase the profit in future (Saranya & Sridevi, 2019). Another rigorous study on banking companies of both Pakistan and India shows that financial performance is positively impacted by the intellectual capital (Mondal & Ghosh, 2012).Pagaddut (2021) researched on Philippine micro, small and medium enterprises to determine the influence on financial performance and those financial ratios—specifically, the debt ratio, asset turnover, and gross profit margin—have a major impact on that performance. Other similar studies done by Rettobjaan (2020) showed that bankruptcy is significantly impacted negatively by liquidity, profitability, and age. The debt arrangement significantly reduces the likelihood of bankruptcy. While size, activity ratio, and solvency have little impact on bankruptcy. It was discovered that declining working capital and jeopardizing the liquidity position were frequent factors influencing the stability of the majority of the sample companies. After testing hypotheses, it became obvious that there was no appreciable difference in the companies' working capital to total assets ratios during the study period (Gopalakrishnan, Gupta, Raja, Reddy, & Subbarao, 2019). The Z-score and all five independent factors under non-failed companies have a significant link, according to Pearson's correlation test, but only three of the five independent variables under failed companies have a significant relationship with the dependent variable (Odibi et al., 2015).

A study shows that companies experiencing financial distress have negative numbers in working capital, earnings before interest and tax, or on retained earnings (Matturungan, Purwanto, & Irwanto, 2017). The research conducted by Afjal and Das (2020) on financial performance and bankruptcy prediction indicate that the study plays a crucial role in the policy decisions made by its numerous internal or external users. The study result ofKadarningsih, Oktavia, Falah, and Sari (2021) demonstrates that the financial hardship of manufacturing companies is significantly influenced by profitability and leverage. However, the financial crisis of manufacturing enterprises is unaffected by liquidity or operating capacity. The comparative analysis of z-score results demonstrates that, on average, Saudi Arabia's Islamic banking sector outperformed the rest of the sample, as evidenced by the first and second places that Saudi banks held on the list of z-score bankruptcy rankings. The outcomes also demonstrate that the association between the top five Islamic banking countries and bankruptcy is determined to be substantial based on performance metrics including liquidity, profitability, and insolvency (Jan & Marimuthu, 2015). Ogachi, Ndege, Gaturu, and Zoltan (2020) discovered in their analysis that the most important factors to use for predicting bankruptcy in the companies listed in the National Stock Exchange of India Limited were inventory turnover, asset turnover, debt equity ratio, debtor's turnover, total asset, debt ratio, and working capital ratio. There are various ways to prevent bankruptcy, including increasing sales income with a more effective sales staff, reducing operational waste, and increasing productivity to lower operating costs. The leadership team must present clear objectives and a tactical plan for how to exit the bankruptcy zone as the final and most crucial step (Fitriani, Hasan, & Indrapriyatna, 2019).

he previous performance shown in a company's financial statements may not be useful in projecting the future, which means that the accounting-ratio-based models need to be periodically refreshed(Mensah, 1984). Hillegeist, Keating, Cram, and Lundstedt (2004) claim that because accounting data is constructed to depict a company's financial state in accordance with the "going-concern" principle, its predictive power for bankruptcy is likely to be restricted.

While the model was initially developed from samples of publicly traded manufacturing companies, Edward I. Altman introduced the Altman Z-score for discriminate analysis to predict bankruptcy or financial strength or financial distress; it is also widely used in private manufacturing, non manufacturing, and service companies (Altman, Iwanicz-Drozdowska, Laitinen, & Suvas, 2017). Voda, Dobrotă, Țîrcă, Dumitrașcu, and Dobrotă (2021) demonstrates in their research that, in contrast to other studies that only looked at one potential scenario, the Z score model helped to the development of a bankruptcy forecasting model as well as to insolvency. The result of the study conducted by Al-Manaseer and Al-Oshaibat (2018) revealed a high level of predictability for the Z-score model, and the results suggest that Z-Score model might be a useful signal for many consumers of financial statements, including financial managers, auditors, lenders, and investors, to make the right decisions in the event of financial failure.

3. METHODOLGY OF THE STUDY

3.1. Sample Selection

For this study, seven (07) samples have been considered which are currently enlisted on the Dhaka Stock Exchange (DSE) and represent 100% of total population. The data used in this study was gathered over a four-year period from secondary sources (the company's annual reports) (2018 to 2021).

3.2. Data Analysis

The Altman Z score model is thought to be the most appropriate and accurate of the bankruptcy prediction models. Supitriyani, Siahaan, Astuti, Putri, and Susanti (2021) found 85.75% accuracy of Altman model used on the companies listed on the Indonesia Stock Exchange which was better than the Springate model with 73% accuracy in the same study. Another study Kukreja, Gupta, Sarea, and Kumaraswamy (2020) indicates that the Altman Z-score model is more predictable than the Beneish M-score model in fraud detection. Beside Altman Z Score model, Pearson's correlation analysis has been performed for identifying the significance of relationship between the variables. However, to meet the model's needs, a few ratios were constructed using a ratio analysis, and MicrosoftExcel was used to examine the data that was acquired. The model is a multivariate discriminate analysis (MDA),which computes the values required for precise forecasting using the financial information.

The model is described below:

$$Z \text{ Score} = 1.2A + 1.4B + 3.3C + 0.6D + 1E$$

Where,

A= Working Capital/Total Assets (WC/TA)

B=Retained Earnings/ Total Assets (RE/TA)

C=Earnings Before Interest and Taxes/Total Assets (EBIT/TA)

D=Market Value of Equity/Total Liabilities (MVe/TL)

E=Total Sales/Total Assets (TS/TA)

The Altman Z Score model classifies the companies according to the financial position into three categories. Table 1 exhibits the bankruptcy measurement criteria according to the Altman Z score model.

Table 1. Bankruptcy measurement criteria.

Safe Zone	Grey Zone	Distress Zone
Z>2.99	1.81<Z<2.99	Z<1.81

4. ANALYSIS AND DISCUSSION

There are 5 variables that make up the Altman Z score, and these 5 variables are taken from the Aramit Cement Limited, Confidence Cement Limited, Crown Cement Limited, Heidelberg Cement Bangladesh Limited, LafargeHolcim Bangladesh Limited, Meghna Cement Mills Limited, and Premier Cement Mills Limited financial statements from 2018 to 2021. The values of the Z score indicators can be seen in Table 2 to 8.

Table 2. Value of ARAMIT Z score indicators.

ARAMIT				
Variables	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.12)	(0.17)	(0.16)	(0.04)
Retained Earnings/Total Assets	(0.11)	(0.14)	(0.12)	(0.08)
Earnings Before Interest and Taxes/Total Assets	0.21	0.12	0.14	0.13
Market Value of Equity/Total Liabilities	0.14	0.05	0.06	0.10
Total Sales/Total Assets	0.29	0.30	0.39	0.42

The working capital to total assets ratio reveals the company's liquidity status. According to the aforementioned data, all of the sampled companies—with the exception of LafargeHolcim Bangladesh Limited—have a negative or declining ratio. During the research period, the working capital to total assets of the company fluctuates from 0.04 to 0.17; the value of A shows a growing trend from 2018 to 20 and a declining tendency in 2021. It demonstrates that, with the exception of 2021, the company's short-term solvency has increased. It displays a satisfactory outcome (0.15<A<0.30) for 2019 and 2020. It has been observed throughout the study period, low mobilization of retained earnings with the ratio of retained profits to total assets varied between 0.08 and 0.14. A satisfactory positive demonstration of the result ranges from 0.12 to 0.21 derived from earnings before interest and taxes to total assets ratio shows that the company's earnings are commensurate with its total assets. The study leads to the conclusion that Aramit Cement Limited relies less on equity and more on debt. The result of other ratios such as total liabilities to market value of equity ranges from 0.05 to 0.14, total sales to total assets ratio 0.29 to 0.42 during the study period. This result helps to understand that the company's sales are modest when compared to the total assets it has. The company's solvency condition is not good overall.

Table 3. Value of CONFIDENCE Z score indicators.

Confidence				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.10)	(0.09)	(0.10)	(0.08)
Retained Earnings/Total Assets	0.43	0.37	0.34	0.34
Earnings Before Interest and Taxes/Total Assets	0.49	0.30	0.27	0.21
Market Value of Equity/Total Liabilities	1.10	0.85	1.28	1.24
Total Sales/Total Assets	0.40	0.40	0.53	0.48

The working capital to total assets ratio for the company ranges negatively from -0.08 to -0.10, indicating that current liabilities exceed current assets and that the ratio is almost 10% of total assets on average. It shows how inadequately the business's ability to stay solvent in the short run. Throughout the study period, the ratio of retained earnings to total assets fluctuated between 0.34 and 0.43, showing a moderate mobilization of retained profits. The positive and satisfactory ratio of EBIT to total assets, which ranges from 0.21 to 0.49, demonstrates that the company's earnings are in a satisfactory to excellent condition when compared to total assets. The analysis leads to the conclusion that Confidence Cement Limited relies more on equity than debt, with an exception in 2020.

The ratio of total liabilities to market value of equity ranges from 0.85 to 1.28. The ratio of total sales to total assets varied from 0.40 to 0.53 during the study period which shows that the revenue of the company lower than the total assets it has invested. The company's solvency position is generally considered to be average.

Table 4. Value of CROWN Z score indicators.

CROWN				
Variable	2021	2020	2019	2018
Working Capital/Total Assets	0.03	0.01	0.06	0.09
Retained Earnings/Total Assets	0.21	0.14	0.15	0.15
Earnings Before Interest and Taxes/Total Assets	0.31	0.17	0.24	0.20
Market Value of Equity/Total Liabilities	0.69	0.32	0.42	0.38
Total Sales/Total Assets	0.96	0.73	0.76	0.64

Inefficiencies observed in the firm's working capital mobilization, as seen by the working capital to total assets ratio, which ranges from 0.01 to 0.09. The ratio of retained earnings to total assets shows that the retained earnings mobilization is also low having the ratio fluctuation from 0.14 to 0.21. The positive and satisfactory range of 0.17 to 0.31 in the ratio of EBIT to total assets demonstrates the company's profitability. According to the analysis, Crown Cement Limited is less dependent on equity than it is on debt, with a range of 0.32 to 0.69 for the market value of equity to total liabilities. There are different sales to total assets ratios.

Table 5. Value of HEIDELBERG Z score indicators.

HEIDELBERG				
Variable	2021	2020	2019	2018
Working Capital/Total Assets	(0.13)	(0.13)	(0.11)	0.12
Retained Earnings/Total Assets	0.46	0.41	0.37	0.57
Earnings Before Interest and Taxes/Total Assets	0.26	0.15	0.07	0.41
Market Value of Equity/Total Liabilities	16.88	9.73	9.11	31.01
Total Sales/Total Assets	1.55	1.15	1.18	1.36

Working capital as a percentage of total assets ranges from -0.13 to 0.12, which shows that the corporation, with the exception of 2020, does not invest much in current assets. The ratio of retained earnings to total assets, which ranged from 0.37 to 0.57 over the study period, shows that the mobilization of retained profits is in an excellent to moderate position. The company's earnings are average in position, as seen by the positive and highly variable ratio of EBIT to total assets, which ranged from 0.07 to 0.41. Conforming to the analysis, Heidelberg Cement Bangladesh Limited is more dependent on equity than debt, with an MV of equity to total liabilities ratio that ranges from 9.11 to 31.01. Indicating that the company's sales are larger than the total assets it has invested, the sales to total assets ratio ranged from 1.15 to 1.5 during the study period.

Table 6. Value of LAFARGEHOLCIM Z score indicators.

LAFARGEHOLCIM				
Variable	2021	2020	2019	2018
Working Capital/Total Assets	0.08	(0.02)	(0.04)	0.07
Retained Earnings/Total Assets	0.28	0.18	0.13	0.15
Earnings Before Interest and Taxes/Total Assets	0.55	0.35	0.28	0.22
Market Value of Equity/Total Liabilities	5.19	4.22	2.30	4.04
Total Sales/Total Assets	0.78	0.70	0.50	0.57

Working capital to total assets of LafargeHolcim Bangladesh Limited ranges from -0.04 to 0.08, indicating an increase in current liabilities from 2018 to 2019 and 2020. The ratios went from being negative to beginning to be positive as a result. The ratio of retained profits to total assets, which ranged from 0.13 to 0.28 over the study period, shows a rising trend and demonstrates effective retained earnings mobilization. The fact that the ratio of EBIT to total assets is positive, growing steadily year over year, ranging from 0.22 to 0.55, indicates that the company's earnings are rising.Given that the ratio of MV of equity to total liabilities ranges from 2.30 to 5.19, the firm's MV of equity to total liabilities shows that LafargeHolcim Bangladesh Limited is progressively more dependent on equity than debt. During the research period, the ratio of sales to total assets fluctuated between 0.50 and 0.78, showing that the company's revenues were lower than the total assets it had invested.

Table 7. Value of MEGHNA Z score indicators.

MEGHNA				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.10)	(0.09)	(0.15)	0.08
Retained Earnings/Total Assets	0.05	0.05	0.06	0.06
Earnings Before Interest and Taxes/Total Assets	0.11	0.16	0.18	0.17
Market Value of Equity/Total Liabilities	1.08	1.19	1.49	1.59
Total Sales/Total Assets	0.74	0.75	0.95	0.80

Table 8. Value of PREMIER Z score indicators.

PREMIER				
Variable	**2021**	**2020**	**2019**	**2018**
Working Capital/Total Assets	(0.30)	(0.28)	(0.10)	(0.17)
Retained Earnings/Total Assets	0.18	0.19	0.21	0.24
Earnings Before Interest and Taxes/Total Assets	0.17	0.15	0.21	0.23
Market Value of Equity/Total Liabilities	0.28	0.24	0.35	0.61
Total Sales/Total Assets	0.48	0.49	0.64	0.75

Table 9. Value of coefficients and Z score.

Z Score of ARAMIT

Year	1.2A	1.4B	3.3C	0.6D	1E	Z Score
2021	(0.12)	(0.11)	0.21	0.14	0.29	0.41
2020	(0.17)	(0.14)	0.12	0.05	0.30	0.17
2019	(0.16)	(0.12)	0.14	0.06	0.39	0.30
2018	(0.04)	(0.08)	0.13	0.10	0.42	0.53

Z Score of CONFIDENCE

Year	1.2A	1.4B	3.3C	0.6D	1E	Z Score
2021	(0.10)	0.43	0.49	1.10	0.40	2.33
2020	(0.09)	0.37	0.30	0.85	0.40	1.82
2019	(0.10)	0.34	0.27	1.28	0.53	2.32
2018	(0.08)	0.34	0.21	1.24	0.48	2.19

Z Score of CROWN

Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	0.03	0.21	0.31	0.69	0.96	2.21
2020	0.01	0.14	0.17	0.32	0.73	1.36
2019	0.06	0.15	0.24	0.42	0.76	1.63
2018	0.09	0.15	0.20	0.38	0.64	1.45

Z Score of HEIDELBERG

Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	(0.13)	0.46	0.26	16.88	1.55	19.02
2020	(0.13)	0.41	0.15	9.73	1.15	11.31
2019	(0.11)	0.37	0.07	9.11	1.18	10.62
2018	0.12	0.57	0.41	31.01	1.36	33.47

Z Score of LAFARGEHOLCIM

Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	0.08	0.28	0.55	5.19	0.78	6.89
2020	(0.02)	0.18	0.35	4.22	0.70	5.43
2019	(0.04)	0.13	0.28	2.30	0.50	3.17
2018	0.07	0.15	0.22	4.04	0.57	5.05

Z Score of MEGHNA

Year	1.2A	1.4B	3.3C	.6D	1E	Z Score
2021	(0.10)	0.05	0.11	1.08	0.74	1.88
2020	(0.09)	0.05	0.16	1.19	0.75	2.06
2019	(0.15)	0.06	0.18	1.49	0.95	2.53
2018	0.08	0.06	0.17	1.59	0.80	2.71

Z Score of PREMIER

Year	1.2A	1.4B	3.3C	0.6D	1E	Z Score
2021	(0.30)	0.18	0.17	0.28	0.48	0.80
2020	(0.28)	0.19	0.15	0.24	0.49	0.80
2019	(0.10)	0.21	0.21	0.35	0.64	1.31
2018	(0.17)	0.24	0.23	0.61	0.75	1.66

It has been noted from the study that Meghna Cement Mills Limited's current liabilities are increasing, which will result in a negative working capital to total asset ratio that will range from -0.15 to 0.08. But the exception noted in 2018. The mobilization of retained earnings is not satisfactory and a negative trend observed having the ratio range from 0.05 to 0.06 over the study period. With the exception of 2019, when it varied from 0.11 to 0.18, the ratio of earnings before interest and taxes to total assets is positive, declining steadily year over year, indicating that the company's earnings are declining. Given that the ratio of MV of equity to total liabilities ranges from 1.08 to 1.59, the firm's MV of equity to total liabilities shows that LafargeHolcim Bangladesh Limited is less dependent on equity than debt year over year. The sales to total assets ratio fluctuated between 0.95 and 0.74 during the study period, showing that the company's sales aren't much lower than the total assets it has spent.Between 2018 and 2021, Premier Cement Limited will have more current liabilities than current assets, which will result in a negative working capital to total asset ratio that ranges from -0.10 to -0.30. The ratio of retained earnings to total assets, which ranged from 0.18 to 0.24 during the study period, shows a declining trend and poor retention earnings mobilization. With the exception of 2021, when it increased significantly and ranged from 0.15to 0.23, the ratio of EBIT to total assets is positive and declining steadily year over year, indicating that the company's earnings are declining. Considering that the ratio of MV of equity to total liabilities ranges from 0.24 to 0.61, the MV of equity to total liabilities of the firm shows that LafargeHolcim Bangladesh Limited is less dependent on equity than debt year over year. Throughout the research period, the sales-to-total-assets ratio fluctuated between 0.48 and 0.75, showing that the company's sales were lower than the total assets it had invested.

Table 10. Z Value and firm's classification.

Company	Year	Z Value	Zone
Aramit	2021	0.41	Distress Zone
	2020	0.17	Distress Zone
	2019	0.30	Distress Zone
	2018	0.53	Distress Zone
Confidence	2021	2.33	Grey Zone
	2020	1.82	Grey Zone
	2019	2.32	Grey Zone
	2018	2.19	Grey Zone
Crown	2021	2.21	Grey Zone
	2020	1.36	Distress Zone
	2019	1.63	Distress Zone
	2018	1.45	Distress Zone
Heidelberg	2021	19.02	Safe Zone
	2020	11.31	Safe Zone
	2019	10.62	Safe Zone
	2018	33.47	Safe Zone
Lafargeholcim	2021	6.89	Safe Zone
	2020	5.43	Safe Zone
	2019	3.17	Safe Zone
	2018	5.05	Safe Zone
Meghna	2021	1.88	Grey Zone
	2020	2.06	Grey Zone
	2019	2.53	Grey Zone
	2018	2.71	Grey Zone
Premier	2021	0.80	Distress Zone
	2020	0.80	Distress Zone
	2019	1.31	Distress Zone
	2018	1.66	Distress Zone

Based on the Table 9 & 10, In the period from 2018 to 2021, Aramit Cement Limited's financial performance is in the distress or bankrupt. This is evident from the Z value, which is Z1.8, which is less than 1.8. The company has to improve its financial performance to avoid bankruptcy by increasing its earning through increase in sales and also incest more on current assets. In the period from 2018 to 2021, Confidence Cement Limited's financialperformance is also dubious. The Z value of the company is in between 1.80 to 3.00 or 1.8<Z<3.00. The company may move to safe area by utilizing more of its assets to generate more sales as well as earning and also outperform in asset mobilization. In the years 2018, 2019, and 2020, Crown Cement Limited's financial performance has been poor. This is evident from Z's value, which is less than 1.80. The company management revises its financial policy to improve its financial performance to get rid of distress situation of 2018-2020. As a result, the financial performance improved in 2021 with a Z value of 2.21 and reached to grey position. It is expected that the way the company increase its Z value it will reach to safe zone in near future.

The financial performance of Heidelberg Cement Bangladesh Limited from 2018 to 2021 is in a comfortable range. The value of Z above 3.00 proves this. But there are still matter of concern regarding the financial performance of 2019 and 2020 where it can be observed that the Z value is decreasing compare to 2018 and 2021. The company should continue to maintain the same financial performance to avoid the chances of bankruptcy. LafargeHolcim Bangladesh Limited's financial performance from 2013 to 2017 has been balanced. This is indicated by the value of Z over 3.00. The increasing trend is observed year over year. The company must excel its financial performance to avoid the bankruptcy which was supposed to happen in 2019. Meghna Cement Limited's financial performance during the period of 2018 to 2021 is likewise dubious. The Z value of the company is in between 1.80 to 3.00 or 1.8<Z<3.00. There is a decreasing trend observed in the value of Z year over year. The company must improve its financial performance to avoid bankruptcy to be happened in near future by mobilizing its assets and increasing the investment in current assets as well as increase its earning through increase of sales. Premier Cement Mills Limited's financial performance from 2018 to 2021 falls into the category of hardship or insolvency. This is evident from the Z value, which is Z1.8, which is less than 1.8. The company must outperform in its operational activities to increase its asset mobilization, sales and earnings to improve its financial performance to avoid bankruptcy. It has to focus on increase of investment in current assets compare to its current liabilities.
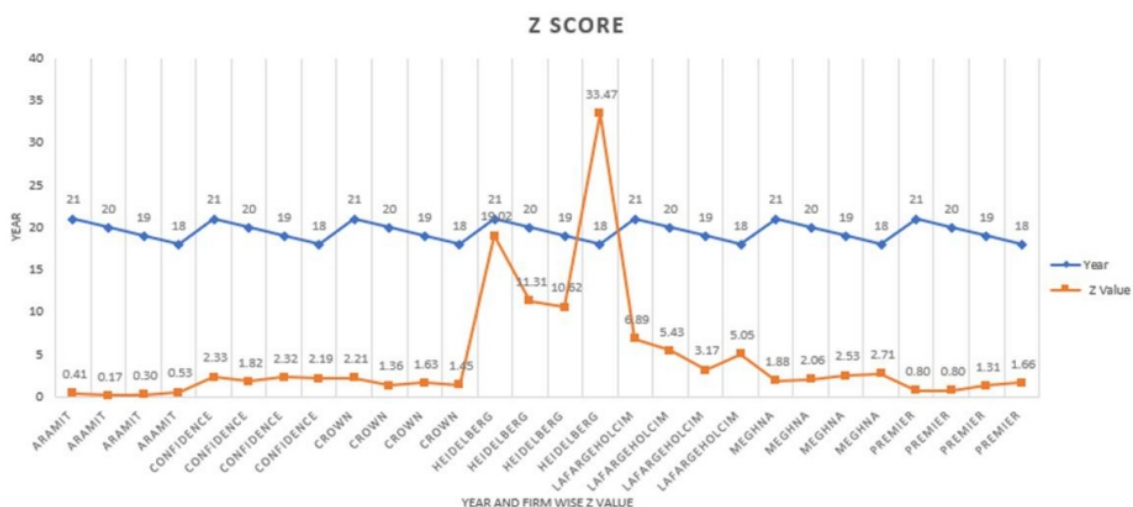

Figure 1. Graphical presentation of year-wise z score value (using MS excel).

Comparing HEIDELBERG to other cement businesses listed on the Dhaka Stock Exchange, Figure 1 indicates that it is the healthiest company overall. The graph shows that HEIDELBERG has the highest Z score, 33.47, as can be seen. The significant swings in the company's finances indicate that HEIDELBERG is only marginally stable when managing corporate finances. Because it is in a secure area, LAFARGEHOLCIM is a business that is also considered to be healthy. This is because the company's Z scores are all rising and are all above 3.0. From the table above, it can be inferred that the LAFARGEHOLCIM's financial situation declined in 2019, but that management responded rapidly the following year. LAFARGEHOLCIM's financial performance increased dramatically once more. CONFIDENCE and MEGHNA have a Z value that ranges from 1.82 to 2.71, placing them in the grey area. To get to the safe zone, these two businesses must strengthen their financial management and outperform in raising the value of Z. With the exception of CROWN's position in 2021, which has a Z value of 2.21, ARAMIT, CROWN, and PREMIER are classified as unhealthy or distressed if their curves fall below the Z value of 1.80. These businesses must right away enhance the current strategy in order for them to succeed right away and stop growing financially in the years to come. This is so because the company's Z score is below 1.8 for virtually the whole time. If the Z number is less than 1.8, the company is insolvent (depressed zone). The corporation needs to make major changes to its financial plan to avoid falling into bankruptcy the next year, which would be bad for business.

4.1. Correlation Analysis

Table 11 illustrates the correlation analysis performed using the Statistical Package for Social Sciences to show the strength of linear relationship among the variables of the distressed companies.

Table 11. Correlation matrix of the distressed companies.

	WC_TA	RE_TA	EBIT_TA	MVe_TL	TS_TA	Z Score
WC_TA	1					
RE_TA	−0.003	1				
EBIT_TA	0.307	0.659*	1			
MVe_TL	0.233	0.856**	0.827**	1		
TS_TA	0.464	0.814**	0.674*	0.886**	1	
Z Score	0.478	0.841**	0.793**	0.941**	0.972**	1

Note: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 13 shows and interprets the degree of correlation among the variables for both distressed (Table 11) and non-distressed (Table 12) companies. The result has been generated from the Statistical Package for Social Sciences software.

Table 13. Interpretation of correlation result.

Factors	R (distressed companies)	Relationship	r (non-distressed companies)	Relationship
A (WC_TA)	0.478	Low positive	0.288	Negligible positive
B (RE_TA)	0.841	High positive	0.669	Moderate positive
C (EBIT_TA)	0.793	High positive	0.207	Negligible positive
D (MVe_TL)	0.941	Very high positive	1	Very high positive
E (TS_TA)	0.972	Very high positive	0.763	High positive

4.1.1. Relationship between WC/TA and Z-Score

Contrary to what it shows for non-distressed companies with a correlation value of r=.288, working capital to total assets indicates a very negligible association with the z score for distressed companies with a correlation score f r=.478. In conclusion, there is a direct correlation between working capital to total assets and business failure. Similar studies by Odibi et al. (2015) also shows a positive correlations between the variables.

4.1.2. Relationship between RE/TA and Z-Score

With a correlation score of r=.841 for distressed companies and r=.669 for non-troubled companies, retained earnings to total assets has a strongly positive link with the z score for distressed companies. In conclusion, there is a direct link between retained earnings to total assets and business failure.

4.1.3. Relationship between EBIT/TA and Z-Score

With correlation scores of r=.793 and r=.207, respectively, earnings before interest and tax/total assets indicates a strong positive association with the z score for the distressed companies and a negligibly positive association with the z score for the non-distressed companies. The failure of the company has been found to have a positive association.

4.1.4. Relationship between MVe/TL and Z-Score

For both distressed and non-distressed enterprises, the market value of equity to total liabilities has a very strongly positive association with the z score, with correlation values of r=.941 and r=1.00, respectively. The higher levels of the independent variables (WC/TA, RE/TA, EBIT/TA, MVe/TL, and TS/TA) are said to raise the dependent variable, according to the positive correlation between the variables (z score).

4.1.5. Relationship between TS/TA and the Z-Score

With correlation values of r=.972 and r=.763, the total sales to total assets explain a very highly positive relationship with the z score for the troubled companies and a very positive relationship for the non-distressed enterprises. It denotes a favorable correlation between the z score and sales/total assets.

The Pearson correlation test reveals a significant relationship between three independent variables (RE TA, EBIT TA, MVe TL, and TS TA) and the dependent variable (Z-score) at the 0.01 level for non-distressed companies (P value: 0.003, 0.001, and 0.001), while four independent variables (RE TA, MVe TL, and TS TA) have a significant relationship with the dependent variable for distressed companies (P value: 0.00e 1, 0.004, <0.001, and <0.001).

5. CONCLUSION

Financial management plays a positive role in the maximization of a company's profit and wealth. This study will not only contribute to the exposure of liquidity, profitability, and solvency but also increase the knowledge of investors, creditors, policy makers and other stakeholders regarding their involvement with the industry. The companies that are in a distressed position and grey area may move to a safe zone by implementing a proper financial recovery plan along with the improvement of their financial performance. However, the users of this research output are suggested to consider the prevailing economic and market condition of the respective country and any unprecedented cause as well.

The Altman Z score model used in this investigation for the evaluation of variables and their importance may alter depending on modifications made to the underlying data set. But the potential investors are recommended to use this model as an assessment tool for the prediction of company performance. Apart from the variables considered, other factors cannot be quantified but may have an impact on the company financial performance.

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