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The Effect of Blockchain Technology on the Relationship between Shareholders Concentration and Risk Taking of Banking Sectors in Bangladesh

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Abstract

This study examines the effect of Blockchain Technology (BT) adoption on the relationship between Shareholder Concentration (SHC) and Risk-Taking (RT) in the banking sector of Bangladesh. By applying agency and Recourse Based View (RBV) theory connected in the relationship of BT on SHC and RT. Using time series data from listed Private Commercial Banks (PCB) and BT used banks in Bangladesh over the period of six years (2017 – 2023 year). SHC is measured through shareholding the percentage of shares concentration, while bank risk-taking is proxy by indicators such as Non-Performing Loan (NPL) ratio and Z-score. Structural Equation Modeling (SEM) building estimations are employed to measure mediating effects. The findings reveal that SHC is positively associated with bank risk-taking, supporting the intense that dominant shareholders may encourage riskier strategies to the stakeholder's interest. However, the results also imply that BT strengthens transparency and monitoring, thereby mitigating excessive risk incentives arising from concentrated shareholders. This study contributes to the literature by integrating BT into banking risk and shareholders structure

research and offers policy implications for regulators and bank managers seeking to enhance financial stability in emerging markets.

Key Words: Credit Risk, Ownership Structure, Blockchain Technology, Z-Score.

1. Introduction

Today, the banking industries have exuberantly embraced technological innovations to increase technical efficiency, integrity, transparency, and accountability in risk proceeds. To keep update risk information needed modern technology like Blockchain. Blockchain is a transformative technology that is a decentralized ledger system that enables secure, tamper-proof, twisted and transparent recording of transactions. While Blockchain has been widely discussed in relation to financial inclusion, digital currencies, and payment systems. Understanding these systems is a crucial part for developing countries like Bangladesh, where the banking sector plays a crucial role in supporting financial stability and economic growth.

SHC is parts of shares significantly participates internal and strategic decision-making within banks. Large shareholders concentration can lead to increased control and adjacent to managerial objectives in terms of risk taking. On the contrary, it may also enable monitoring shareholders to desired riskier strategies that offer their intense to undermine broader shareholder welfare. The complexity between bank risk taking and shareholders concentration leads to increased context-dependent and influenced by conceptual frameworks, good governance practices, and market conditions.

At present over the world, the banking sectors are facing severe types of losses. Behind these losses, bank borrowing, lending and loan sanctioning system are alarming to credit risk, default risk, and Non-Performing Loan (NPL). The NPL is one of them that has increased at an unusual rate. In the last quarter, it was 10.1%, and before that, it was 8.8% in the last two years (Kassim & Rahman, 2018). Prior studies mentioned lack of adequate collateral (Haque, 2019), the moral decay of businessmen (Ozili, 2019), lagging in repaying the loan, and the lengthy judgment systems by the court are considered as risk procedure (Cosgrove, 1990).

Risk-taking is used in the study as proxy of NPLs and Z score that arises from being unable or failing to meet debt obligations, leading to loss for the lender. NPLs depress bank liquidity (ROA, NPM, LCR, NIM) and investors' confidence. It is one kind of threat to meet solvency that is considered as central indicator of bank asset quality and financial stability. The high NPLs push to increase weaker bank profitability, disrupted credit supply, and lead to longer recessions, especially financial meltdown. This downturn and unresolved NPL are closely associated with more severe and protracted post-crisis recessions. In sense of Z-score that indicates as default risk. Default risk adversely affects bank profitability, liquidity, solvency, and systemic stability, while shaping risk-taking incentives, governance responses, regulatory intervention, and broader economic outcomes. Weak insolvency regimes, slow decision-making from shareholders, and poor regulatory quality predict worse risk taking problems and slower resolution (Faizul Haque, 2018).

Blockchain Technology has become a potential revolution among individuals, society, industries, and communities (Deloitte, 2021). Although, very few banks in Bangladesh launched to conduct the Blockchain Technology is considered an emerging tool to strengthen shareholders' voting rights, transparency, meeting minutes, and evidence of participation, particularly via improved registers and voting systems. At the same time, it raises non-trivial questions about confidential and privacy information. Islam et al. (2025) explained that Blockchain Technology is used to minimize costs with authenticity that impact on decision-making. According to Hasib et al. (2023), automated and registries process regarding NPL may decrease the intention of illegal loan sanctioning systems. As systematics and secure based process, Blockchain Technology plays a significant role on NPL procedure.

Islam (2022) mentioned in his study that the participation of shareholders in decision making plays a critical role in determining corporate governance effectiveness, financial performance, and risk proceeds. Similarly, Islam et al. (2025) found shareholders concentration and its confidential information that is needed to save and secure with evidence. As an authentic and evidence-based device, Blockchain Technology plays a unique and unparalleled role (Sharma, 2020). Therefore, both shareholders concentration and risk taking procedure in Blockchain plays a mediating role of an organization.

The aim of the study is to determine the effect of BT on the relationship between SHC and risk-taking of banking industries in Bangladesh. Prior studies found the potential benefits of BT processes and created immutable records (Schmidt & Wagner, 2019). Although existing literature on SHC and bank risk-performance, little is known about how emerging internal governance technologies, such as Blockchain, reshape this relationship. Empirical studies largely ignore the role of BT in enhancing transparency and monitoring, particularly in emerging economies with concentrated shareholders structures like Bangladesh. Consequently, there is a clear theoretical and empirical gap

in understanding whether BT mediates the relationship of SHC on bank's risk in the Bangladeshi banking sector. Although previous studies examine SHC and bank risk-taking, no empirical research has explicitly tested whether BT adoption alters this relationship in the context of Bangladesh's banking sector. Schmidt and Wagner (2019) claimed that the findings also provide credence to the bank shareholders "global advantage. Thus, only in nations with more stringent activity limits have market discipline reversed, while capital stringency increased bank instability. Although BT cannot manage its immense popularity in developing countries like Bangladesh, it has created demand to reduce risk in financial institutions particularly the banking sectors. Finally, as a result, our research questions are investigated to learn more about the structure of BT on SHC and NPL, how it affects risk-taking, expanding our knowledge in this area:

RQ1. Is there relationship between shareholders concentration and Risk Taking?

RQ2. Is shareholder concentration positively associated with blockchain technology adoption?

RQ3. Does Blockchain technology has positive impact on Risk Taking?

RQ4. Does the mediating effect of Blockchain technology between shareholders concentration and Risk Taking?

2. Literature Review

2.1 Shareholders concentration and Risk-Taking

Ownership is one kind of stakeholders who plays an important role on governance process. This type's ownership is considered as parts and parcel to take decision that is influenced on Risk-Taking of a financial institutions particularly, in banking sectors (Islam, 2022). In agency mechanism there are concerning issues that higher transaction based ownership of controlling shareholders impact on agency costs and firm's performance (Haque, 2019; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2002). In favour of this argument, Iannotta, Nocera, and Sironi (2007) suggested that there is an inverse relationship between asset and bankruptcy Risk-Taking among banks. The ownership concentration has also a positive association between the insolvency and assets quality. Srairi (2013) also found negative relationship between ownership concentration and bank Risk-Taking proceeds. Similarly, Haque and Brown (2017) stated ownership concentration having a relevantly effect on bank efficiency. However, Haw, Ho, Hu, and Wu (2010) claimed that increased agency concerns in the financial sector, which are related to lending and borrowing problems, can result from concentrated ownership. Consequently, they discovered that higher insolvency Risk-Taking and increased return volatility among listed commercial banks are the driving forces behind this Risk-Taking concentrated control. Likewise, Hammami and Boubaker (2015) discovered a favourable correlation between bank Risk-Taking and stockholders. Even yet, the backdrop might emerge from the previously indicated slot it aims to examine because there is disagreement over the connection between ownership concentration and Risk-Taking.

When compared to its riskier activities, a bank's capital reserve is a crucial indicator, and non-performing loans provide information about the bank's lending effectiveness Lestari, D. (2018).

NPLs are significantly influenced by a number of factors, including the GDP growth rate, effective interest rate, inflation rate, and foreign exchange rate, type of bank, bank risk-taking behavior, ownership concentration, leverage, and credit quality Umar et al. (2018). The ratio of NPLs has no bearing on the production of liquidity Umar et al. (2016). There is a significant negative association between the growth of bank loans and non-performing loans. This effect is validated for the subsections of advanced, growing and is not restricted to geography. The negative correlation amongst NPLs & loan expansion is unaffected by financial planning firms Gjeçi et al (2023). The following hypothesis:

H_1. There is positive relationship between shareholder concentration and the Risk-Taking.

2.2 Shareholder Concentration and Blockchain Technology

Corporate governance (CG) is a system by which an organization is operated and controlled. **Ownership Concentration** is an important parts of CG. It plays significant role to ensure accountability, transparency and its rights in multi-member's managerial system of an organizations. Elgammal, et el,. (2018) stated the success of the CG that depend on organization's structure such as ownership, board structure and its respective internal and external committee. The committee like CG leads to increase organizational costs and complexity. It also emphases to ensure an effective decision-making according to achieve the organisation's goal (Ahlering & Deakin, 2007; De Filippi, Mannan, & Reijers, 2020). An organizational' goal is the essential parts of good governance that has not only several benefits for the organization, but also contribute to reduce higher capital costs, better organizational growth, and make easier access to internal as well as external resources in interests of shareholders (Claessens & Yurtoglu, 2013). To maintain the confidential information in favour of shareholder need a modern technology system. Blockchain Technology is an unparalleled modern device that enhances transparency and integrity of transactions for an organization. De Filippi et al. (2020) also found that to increase the level of trust and confidence among ownership, Blockchain system act as safety web of net in governance structure. The Blockchain Technology system on ownership structure that is significant to increase trust and confidence (De Filippi et al., 2020).

Hillman et al.,(2000) said that Blockchain Technology that opens up options for digital rights, monitoring, verification, and concealed fraud prevention ownership crime (Locke et al., 2015). There is a compelling argument that Blockchain Technology brings new digital networks with well-organized governance that resemble unofficial barter (Risius & Spohrer, 2017).

Blockchain Technology is regarded as an open-access distributed ledger that automatically records and updates transactions between many stakeholders. Blockchain makes permanent based transactions (Iansiti & Lakhani, 2017). Yermack (2017) suggested that because of Blockchain Technology complies with corporate governance framework, it offers more benefits including accurate record keeping, transparent ownership, lower costs, and liquidity. Additionally, it asserts that understanding financial regulations and updating public policies to align with stakeholder's interest (Akgiray, 2019). Kaal (2021) found that a decentralized structure offers an opportunities to solve the security issues. Thus, by taking into account the connection between Blockchain capabilities and ownership structure makes a smart contract can be simply comprehended, in this perspective the hypothesis is formulated:

H_2. Shareholder Concentration has positive impact on Blockchain technology.

2.3 Blockchain Technology and Risk Taking

Blockchain Technology is a permanent, decentralized digital ledger system that freely and safely records transactions over a distributed network (Kaal, 2021). Blockchain extend risk controlling procedure and operational efficiency in the banking sector by reducing information asymmetry. The diversification of managerial discretion enabling real-time monitoring. Therefore, the use of Blockchain technology may affect banks' risk-taking strategies, particularly in banking sectors with high shareholder concentration and complex regulations. BT strengthens the relationship between ownership structure and bank risk-taking. BT adoption may reduce excessive risk-taking, especially in banking sectors with concentrated ownership. Blockchain technology significantly affects an organization's risk processes (Lenz, 2019). Transparent, order reception, and delivery processing to the end of destinations are all included in the order processing cycle, which is vital for client fulfilment. In this sense, the technology facilitates real-time access to shipment tracking data for all parties involved, streamlining and accelerating risk proceeds Yermack (2017).

The smart contract is a digital replacement for conventional contracts. It contains terms, regulations, and penalties that are applicable to each person involved in each transaction (Kshetri, 2022). Smart contracts ensure that the terms are adhered to and facilitate understanding of agreements. Integrating Blockchain Smart Contracts with the Internet of Things (IoT). This integration significantly increases the resilience of the confidence and guarantees the stability of modern corporate operations (Tyagi et el., 2022).

H_3. Blockchain technology has positive impact on Risk Taking.

2.4 Blockchain Technology on Shareholder Concentration and Risk-Taking

Ownership is the fundamental rights that gives an institution, individual and group authority. The functions of ownership such as Annual General Meeting (AGM), share voting right, share meeting - minutes and others confidential information are considered as parameter on decision making. These parameters are needed to smooth run with integrity, immunity and safety. Blockchain is a device that offers to protect the data. Thus blockchain tends to detect and protect illegal activities from ownership concentration and assurance good governance quality. Fink Bradley (2017) posited high security can, improve monitoring and control insider dominance that affect ownership concentration.

Blockchain Technology is one of the distinct operating processes by keeping confidential as well as among its stakeholders, including ownership, managers, and shareholders, leading to better corporate governance. Haque (2019) posited that technology has a direct impact on how well ownership, regulation, and bank Risk-Taking function is well organized. In sense of Risk-Taking taking, that is arisen from not maintain regularity and sufficiency mechanism. In financial index, delay and late payment that leads to increase default Risk-Taking. The default Risk-Taking creates unacceptable situation that reduce the company's growth. To overcome delay and insufficiency need a modern device to control and monitoring the loan sanctioning mechanism. Blockchain Technology is a contemporary device that can identify the real and valid client to provide loan (Lafarre & Van der Elst, 2018). Blockchain Technology ensures reduced trading costs and more transparent ownership records as documentation, enabling real-time monitoring of shares being transferred between individuals (Fierro et al., 2016).

H_4.The mediating effect of Blockchain Technology build-up relationship between shareholders concentration and Risk-Taking.

2.5 Theoretical Foundation

Drawing on agency theory that explains inefficiencies in investment decisions due to conflicts between managers and shareholders (Jensen & Meckling, 1976). Managers may overinvest or underinvest due to private benefits, empire-building, or risk aversion. Blockchain technology reduces information asymmetry by providing immutable,

transparent records. The study endorse Resource-Based View (RBV) theory that views technology as a strategic resource, but one that creates value only when combined with complementary organizational capabilities (Barney, 1991). Blockchain alone is not sufficient. Corporate governance acts as a complementary organizational capability that enables firms to exploit Blockchain effectively. The study conceptualizes the theory of Blockchain technology as an adoption mechanism through which BT influence banks' SHC and risk technology choices.

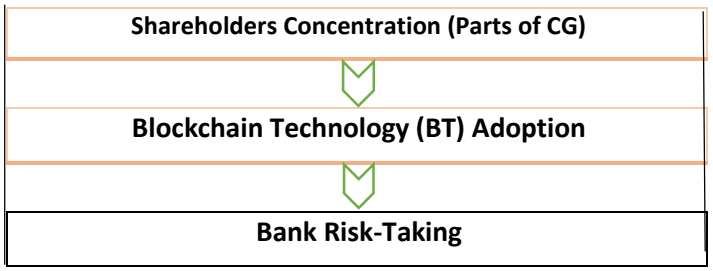

Fig. 1 Blockchain technology as an adoption mechanism

Sources: Shleifer & Vishny (1997). A survey of corporate governance.

2.6 Conceptual Framework

This study provides a conceptual framework that explains how the application of blockchain technology influences bank risk-taking through increased monitoring efficacy and transparency. BT is used as proxy of Blockchain Technology that plays a crucial mediating role on share concentration and risk.

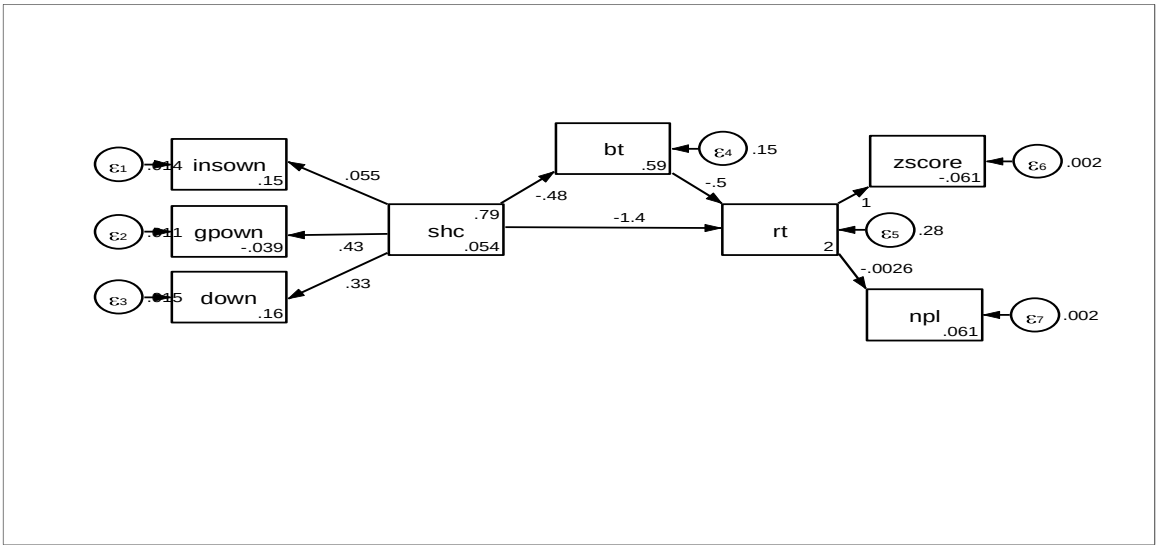

Fig. 2 Conceptual Framework as mediating effect

3. Research Design

By following Islam et el., (2025) the study was conducted secondary data with purposive sampling technique. As secondary source data is collected from 6 years (2017 to 2022) annual reports of 24 Private Commercial Bank (PCBs) and BT used Banks in Bangladesh. Blockchain technology data is designed by using dummy variables followed by Ezzi, et el., (2023) and Mueller and Hancock (2018). To examine the relationship as mediating effect is followed by (Byrne, 2013). Structural Equation Modeling (SEM) in model building and estimation under STATA is applied to measure the mediating effect on shareholders concentration and firm risk taking.

3.1 Measurement of variables as secondary data sources

The main objective of this study is to examine the role of a Blockchain technology between shareholder's concentration and risk taking. The measurement of secondary data is explained into the tables:

Table 1. Show variable definitions, measurements and sources

Risk measurement		
Credit Risk	NPL	The percentage of non-performing loans (NPL) to total loans is used to quantify by following Chowdhury et el., (2023), indicates that banks have defaulted on riskier loans (Safiullah & Shamsuddin, 2018).
Insolvency Risk	Z –Score	This score is used as a proxy for the bank's insolvency risk. According to Akbar et al. (2017), the Z-score is measured as = average (ROA) average$\frac{\text{CAR}}{\delta} \times$ ROA. The capital asset ratio is known as CAR, and the yearly ROA standard deviation, or δ (ROA), is determined for each bank-year observation using a rolling window of six years. A high Z-score indicates less risk-taking. In our regression, we employ the reciprocal of the Z-score, which means that a high Z-score corresponds to high risk and vice versa.
Shareholders Concentration attributes		
Institutional Shareholders	INOWN	Institutional Shareholders is measured as the number of Institutional are divided by the total number of directors who are hold share of PCBS by Faizul Haque, (2018)
General Public shareholders	GPOWN	General Public shareholders is measured as the number of individuals are divided by the total number of general public shareholders who are hold share of PCBS Faizul Haque, (2018)
Directors Shareholders	DOWN	Percentage of directors hold the shareholders Islam, (2022); Faizul Haque, (2018)
Blockchain Technology	BT	1if the implementation is first 2 years, the previous year, the current year, other else 0 (Ezzi, et el., 2023).

4. Result and Analysis

4.1 Reliability of Data by VIF

To test the reliability of data with the measurement scales, Variance Influence Factor (VIF) is the most acceptable in secondary data set. In this tool, all independent variables are measured, to ensure internal consistency with standard score is not over 10. The study uses the VIF is used as follows:

Table 2. Show the Internal consistence of Questionnaires

Variables	**VIF**	**Value**	The average score of VIF is 1.01 that indicates excellent fitting the data in the study.
INSOWN	1.01	0.9924	
DOWN	1.01	0.9926	
GPOWN	1.00	0.9963	
Mean VIF	1.01		

Where,

Variance Influence Factor (VIF)	Variance Inflation Factor (VIF) was employed to assess multicollinearity among explanatory variables, with all values remaining below the recommended threshold, indicating no serious collinearity concerns

This study also operated a reliability test to justify the trustworthy sequence of independent variables. According to Gerald (2018) suggested that the independent variable if its scale's VIF is 10 or bellow, indicating that the variable are not tolerable to model fit. Since all of the VIF reliability values are higher than 10 (Brown, 2002), that suggests each construct's items have a notably high level of collinearity. As a result, the independent variables' range for a reliable for VIF is 1 to 10 denoting no inconsistency in measurement data.

4.2 Factor analysis for Confirmatory of data uniqueness

The correlation between the item and the factor is called factor loading, and a factor loading of more than 0.30 often denotes a moderate data. Factor loadings are available in most statistical tools, including STATA. The principle conformity analysis (PCA) loading factor is displayed on the vertical axis, while the Eigen and mean

value are displayed on the horizontal axis. Bartlett's test of sphericity ($p < 0.001$) and a Kaiser-Meyer-Olkin (KMO) value greater than 0.70 indicated adequate sampling. According to Hair et al. (2007) examined that in order for a regression estimate to be considered good fit for a meaningful association, the observed variable's value must be above 0.3 and above 0.5 to be regarded as normal in nature. According to Bollen, Bollen (1989) claimed that a latent variable comprising characteristics define the concept underlying this model, which is normalization constraints are automatically provided to the Structural Equation Model (SEM) for the first-order factors. For the second-order factor normalization constraint was automatically provided by the structural equation model (SEM). The correlation between the item and the factor is more than 0.30 often denotes as acceptable. The following table shows the score that is acceptable to conduct the research.

Table 3. Show Factor loading (pattern matrix) and unique variance analysis

Variables	Factor-1	Factor-2	Factor-3	Uniqueness
INSOWN	0.6187	0.2711	0.0862	0.5363
GPOWN	0.6920	0.0639	0.1632	0.4905
DOWN	0.0190	0.6204	-0.687	0.7242
Z-Score	0.6441	0.0002	-0.0540	0.5822
NPL	0.0739	0.2501	0.2641	0.8623
BT	0.4262	0.2227	-0.0156	0.7685

4.3 Reliability of Goodness of Fit (gof) Statistics Test

The statistical test is the fundamental criteria for quantity research (Bourdieu, 1980). According to Gujarati (2009) outlined how fit the data that is needed to justify the collinear and represents an inadequate and irrelevant result. To ensure the data consistency, the goodness of fit (gof) statistics of SEM under STATA show a set of measurement tools such Likelihood ratio, population errors, information criteria, baseline comparison and size of residuals. The command of this test is "estat gof, stats (all)". Likelihood ratio are consisted with chi2, Prob > chi2, chi2_bs, p > chi2. The threshold of Prob > chi2 less than 0.05. The current study shows the p > chi2 is 0.000, it is nice fitting for the measurement. Population error consisted with RMSEA, CI of 90%. The threshold of RMSEA is 0.05 to 0.08 mediocre fit, 0.10 is poor fit and less than 0.05 is close fit. The current study shows the score of RMSEA < 0.05 that nice fit for the study.

Table 4. Show Goodness of Fit (gof) test

Fit statistic	Value	Description
Likelihood ratio:		
chi2_ms (0)	0.000	model vs. saturated
p > chi2	0.000	
chi2_bs(28)	10.426	baseline vs. saturated
p > chi2	0.015	
Population error:		
RMSEA	0.000	Root mean squared error of approximation
90% CI, lower bound	0.000	
upper bound	0.000	
pclose	1.000	Probability RMSEA <= 0.05
Information criteria:		
AIC	72.325	Akaike's information criterion
BIC	80.572	Bayesian information criterion
Baseline comparison:		
CFI	1.000	Comparative fit index
TLI	1.000	Tucker-Lewis index
Size of residuals:		
SRMR	0.000	Standardized root mean squared residual
CD	0.331	Coefficient of determination

4.4 Descriptive Statistics and Analysis

Table 10 provides the statistical data of the sample, together with the mean, minimum, maximum and standard deviations for variables. Descriptive statistics that are actually described from inferential statistics. The statistic simply shows the comparative analysis among the variables that is highly concentrated, as the largest portion of shareholders in capital market. Interestingly, the study descriptive the shareholder's concentration and its attributes such as INOWN, GPOWN and DOWN. Shareholders concentration that examined in previous studies by Haque (2019) and in the study posited that the shareholders concentration commonly consisted with shareholders concentration related with attributes such as institutional shareholders, general public shareholders and director

shareholders. The value of mean and standard deviation for SHC reattributes was 0.1969 (0.1225), 0.2975 (0.1476), 0.4258 (0.1486) and overall SHC 0.7909 (0.2382) respectively. The risk taking attributes consist with default, portfolio and NPL risk factors. The value of mean and standard deviation for RT attributes 0.6521 (0.6433), 0.0586 (0.0452), while overall RT0.7108 (0.6400). The mean value indicates central tendency while standard deviation indicates variability around the mean. The mean value is comparatively smaller than prior study also shows the mean value are 0.1434, 0.2815, 0.4216 and 0.0066 by Akbar et el., (2017). The large mean value is costly as well as complexity to take decision making. In contrary, Islam, Bhuiyan, and Kassim (2019) argued that larger mean value makes smart communication where experts level and key player ensure the suitable channel that impact on right decision taking. Previous study risk factors indicated as portfolio, default and credit risk is 1.24, 1.83 and 0.04 respectively (Haque, 2019). In the same way, a standard deviation (or σ) is a measurement tools of dispersed data is in relation to the mean. Comparatively less, or small, standard deviation indicates data are clustered tightly around the mean, and large or high standard deviation indicates data are more spread out. The present study shows the more stable general public shareholders due to larger value of others.

Table 5. Shows the descriptive statistics of Variables

Descriptive Statistics					
Variables	N	Mean	Max	Min	Std. dev.
INOWN	24	0.1969	0.4400	0.0493	0.1225
GPOWN	24	0.2975	0.5438	0.0000	0.1476
DOWN	24	0.4258	0.8699	0.1011	0.1486
SHC Consent.	24	0.7909	1.3103	0.3038	0.2382
Z-score	24	0.6521	2.0998	0.0841	0.6433
NPL	24	0.0586	0.2310	0.0130	0.0452
RT	24	0.7108	2.1560	0.0971	0.6400
BT	24	0.2083	1.0000	0.0000	0.4149

4.5 Correlation Matrix

The table 11 of correlation matrix that displays the correlation coefficients between pairs of variables in sample data set. The measurement number of correlation coefficient is between -1 and +1 that disclosed it's strongly two variables move together. Some of the variables in the correlation matrix have positive scores, indicating that as one increases, the other does too. Conversely, certain variables exhibit negative correlation, meaning that as one variable rises, the other falls. Table 10 shows the correlation matrix of shareholder concentration and risk taking of IBs in Bangladesh. Shareholder concentration as an independent variable that consists of INSOWN, GPOWN and DOWN. TAM is as mediating effect and risk taking is dependent variables. Hence, highly correlated variable is shareholders and its others variables, and in the same way the lowest value is carried by RT and its others variables. Risk Taking denotes two variables such NPL and Z-score. Hair et el, (2019) argued that the score 0.20 – 0.30 below average, 0.40 – 0.50 average, 0.50 – 0.60 good, 0.60 – 0.70 better and above 0.70 is excellent fit for good research. The most of the value in table 11 show under better criteria to conduct research in the study.

Table 6. Shows descriptive statistics of Correlation Matrix

	INOWN	**GPOWN**	**DOWN**	**GOVOWN**	**Shareholders**	**Z-score**	**NPL**	**RT**	**BT**
INOWN	1.000								
GPOWN	0.024	1.000							
DOWN	0.064	0.476	1.000						
Shareholders	0.540	0.707	0.628	0.273	1.000				
Z-score	0.022	0.724	0.720	0.921	0.112	1.000			
NPL	0.157	0.692	0.343	0.569	0.268	-0.451	1.000		
RT	0.215	0.625	-0.006	0.519	0.113	1.000	0.949	1.000	
BT	0.734	0.371	0.041	0.690	0.281	0.469	-0.219	0.469	1.000

4.6 Standardize, Direct, Indirect and Total effect of co- efficient path

This study examined the role of BT on SHC and RT by using Standardize, Direct, Indirect and total effect of co-efficient path. Table 7 shows the fitting target model that indicates as building and estimation on SEM under STATA where iteration 0, log likelihood is 29.1627, LR test and probability > ch2 =0.000. The SEM results indicates that standardize direct effect of BT on SHC moderately effect (β = -0.4796, p < 0.161), while others coefficient path such as RT→ BT and SHC (β = -0.5017 and -0.4467, p < 0.067 and 0.002). Table 8 shows the result of standardize direct effect of coefficient value among variables. The path standardize direct effect of BT on SHC (β = -0.4796, p < 0.161), while others coefficient path such as RT→ BT and SHC (β = -2.5017 and -1.4467,

p < 0.067 and 0.002). Table 9 shows the result of standardize indirect effect of coefficient value among variables. The path standardize indirect effect of BT on SHC is 0, that mean no path, while others coefficient path such as RT→ BT and SHC (no path and 0.2460, p < 0.266). Table 10 shows the result of standardize direct effect of coefficient value among variables. The path standardize direct effect of BT on SHC (β = -0.4796, p < 0.161), while others coefficient path such as RT→ BT and SHC (β = -0.5017 and -1.2060, p < 0.067 and 0.014). In addition, the indirect there is no path among the variables and the total effect of BT on SHC and RT remains one statistically significant but another is moderate significant suggesting partial mediation.

Table 7: Shows the result of standardize effect of mediating

Items	Coef.	Std.error	z	P >IzI
Structural				
BT ←				
SHC	- 0.4796	0.3418	-1.40	0.161
Cons	0.58767	0.2818	2.09	0.037
RT ←				
BT	-0.5017	0.2742	-1.82	0.067
SHC	-1.4467	0.4776	-3.02	0.002
_Cons	1.9596	0.4115	4.76	0.000

Table 8. Shows the result of standardize direct effect

Items	Coef.	Std.error	z	P >IzI
Structural				
BT←				
SHC	-0.4796	0.3418	-1.40	0.161
RT ←				
BT	-2.5017	0.2742	-1.82	0.067
SHC	-1.4467	0.4776	-3.03	0.002

Table 9. Shows the result of standardize indirect effect

Items	Coef.	Std.error		z	P >IzI
Structural		No path			
BT ←					
SHC	0				0
RT ←					
BT	0 (No path).				0
SHC	0.2406	0.3160	1.11	0.266	

Table 10. Shows the result of standardize total effect

Items	Coef.	Std.error	z	P >IzI
Structural				
BT ←				
SHC	-0.4796	0.3418	-1.40	0.161
RT ←				
BT	-0.5017	0.2742	-1.63	0.067
SHC	-1.2060	0.4901	-2.46	0.014

5. Discussion

Overall, the statistical tools shows fitted results to conduct the study. The theoretical approach also support to strangeness framework. As agency theory (Jensen & Meckling, 1976) and RBV theory (Barney, 1991) that support to measure the data. The literature significantly support the hypothesis 1 where SHC has positive impact on Blockchain technology. The literature positively support the hypothesis 1while SHC significantly support to reduce excess risk taking. A positive relationship between SHC and risk-taking suggests that firms with more

concentrated shareholders tend to engage in higher levels of risk-taking. This occurs because large or controlling shareholders have stronger incentives and greater power to influence managerial decisions and may encourage riskier strategies to maximize returns. The hypothesis statistically support between 90 to 95 percentage confidence level and indicates BT indirectly impact on SHC and risk that is consistent with previous study (Ezzi, et el., 2023). In addition, hypothesis 2, statistically insignificant relationship between BT and RT. Although, literature shows the significant relationship between BT and RT. As the theory of agency perspective, SHC reduces coordination and monitoring costs, enabling dominant owners to support Blockchain adoption to enhance transparency, efficiency, and long-term firm value's opportunities (Lui, & Ngai, 2019).

The hypothesis 3, as indirect path analysis such mediating effect of BT on SHC and RT statistically significant. SHC can improve efficiency, reduce settlement time in payments, and mitigate risk manipulation by Akbar et al. (2017). SHC and its impact on risk taking that is supported by Haque (2019). According to Mohidul et el, (2021) examined that SHC and its equivalent variables have positive relationship with risk taking and played significant role to reduce risk taking. In the study Blockchain technology that is considered high volume of security, safety and firstly transferring system. Gupta and Sadoghi (2018) argued about Blockchain technology and risk-reducing aspects within financial organizations, particularly the banking industry. Another study has looked at Blockchain in a particular business, like the finance industry and the fear logistics industry (Schuetz & Venkatesh, 2020), similarly, Blockchain as technology recover different challenges for the organization (Frizzo-Barker et al., 2020). SHC has a favorable effect on Blockchain development, which in turn motivates lead to take more effective to reduce risk taking. Thus, Blockchain build-up a networking hub as a mediation effect through which SHC influences risk-taking.

5.1 Theoretical Implications

This study extends Agency Theory by monitoring effectiveness of shareholders concentration that follow-up a constructive hierarchy (Jensen & Meckling, 1976). By using Blockchain Technology, the hierarchy systems that enabled transparency, immutability and reduce information asymmetry independently of shareholders concentration. Therefore, weakening the necessity for dominant shareholders to engage in excessive risk-taking to discipline managers. By positioning blockchain adoption as a mediating mechanism, this study bridges RBV and bank risk-taking theory with technology by following Kaal, (2021). The integration that is not merely an operational innovation but a strategic governance instrument that conditions how shareholder concentration reduce risk taking, thus extending the theoretical scope of technology adoption models into financial risk and its reducing procedure

5.2 Practical Implications

Practically, the findings offer exuberant implications for, policymakers, regulators and bank top authorities in banking sectors. Encouraging Blockchain adoption can serve as a complementary monitoring tool to mitigate excessive risk-taking in banks characterized by concentrated shareholders. There are various ways in which the concentration of shareholders, including directors, the general public, and institutions shareholders can benefit. Blockchain technology could improve transparency, immunity, and trust while also helping shareholders avoid risk-taking misconduct, thereby supporting the long-term stability and resilience of the banking sector.

6. Conclusion

This study examines the effect of Blockchain technology on the relationship between SHC and risk-taking among banking sectors in Bangladesh. The findings indicates that SHC and it is associated with higher risk-taking tendencies, reflecting the dominant influence of controlling shareholders on strategic decisions in banks sectors. However, this relationship changes meaningfully with the adoption of Blockchain technology. The results indicate that Blockchain technology plays a mediating role positively association between SHC and risk-taking. To ensure transparency, traceability, and real-time monitoring of transactions, Blockchain reduces information asymmetry and limits opportunistic behavior by dominant owners. Consequently, banks with higher levels of Blockchain adoption exhibit more disciplined risk taking, even in the presence of SHC structures. The Blockchain adoption functions not merely as a technological triumph but as an institutional monitoring mechanism that strengthens integral parts of SHC. This contributes to the emerging literature by embedding Blockchain within the banking risk framework rather than treating it as an isolated innovation.

6.1 Limitations and Future Research Directions

This study has several limitations that should be considered when interpreting the findings. Firstly, the use of purposive sampling may limit the generalizability of the results, as the sample may not represent the broader population of BT users in Bangladesh or other regions. The annual report not directly show the data of BT, which may introduce bias and overlook the perspectives of those with limited access to or experience with BT services. Additionally, the study employed a cross-sectional design, providing a snapshot of user attitudes at a single point in time. This design does not capture long-term behavior or shifts in attitudes, which could evolve as users gain

more experience with BT platforms. Moreover, the reliance on self-reported data through observation could result in software bias, where some Banks not properly update annual report. Lastly, the study focused on dummy variable, which may not play a significant role like regular variables. If the aforementioned issues are resolved, it will be intended to help further research to expand the study's theoretical depth, methodological strength and beyond Bangladesh to a cross-country framework, especially Southeast Asian countries.

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Reference

[1] Ahlering, B., & Deakin, S. (2007). Labor regulation, corporate governance, and legal origin: A case of institutional complementarity? Law & Society Review, 41(4), 865-908.

[2] Akbar, S., Kharabsheh, B., Poletti, J., & Ali, Z. (2017). Board structure and corporate risk taking in the UK financial sector. International Review of Financial Analysis.

[3] Akgiray, V. (2019). The potential for blockchain technology in corporate governance.

[4] Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of management, 17(1), 99-120.

[5] Bollen, K. A. (1989). Structural equations with latent variables (Vol. 210): John Wiley & Sons.

[6] Bourdieu, P. (1980). Le mort saisit le vif. Actes de la recherche en sciences sociales, 32(1), 3-14.

[7] Brown, J. D. (2002). The Cronbach alpha reliability estimate. JALT Testing & Evaluation SIG Newsletter, 6(1).

[8] Byrne, B. M. (2013). Structural equation modeling with EQS: Basic concepts, applications, and programming: Routledge.

[9] Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. Emerging markets review, 15, 1-33.

[10] Chowdhury, M. A. I., Uddin, M. S., Ullah, H., Ahmmed, M., & Shadek, M. J. (2023). What causes nonperforming loans? Evidence from the Islamic banking sector of Bangladesh. International Journal of Accounting & Finance Review, 14(1), 11-21.

[11] Cosgrove, M. P. (1990). Defaulters in general practice: reasons for default and patterns of attendance. British Journal of General Practice, 40(331), 50-52.

[12] De Filippi, P., Mannan, M., & Reijers, W. (2020). Blockchain as a confidence machine: The problem of trust & challenges of governance. Technology in Society, 62, 101284.

[13] Deloitte. (2021). Boards on Blockchain: Explore Evolving Risks. https://deIoitte. wsj.com/cfo /2021/ 01 /20/ boards-on-blockchain-explore-evolving-risks/.

[14] Elgammal, A., Liu, B., Kim, D., Elhoseiny, M., & Mazzone, M. (2018). The shape of art history in the eyes of the machine. Paper presented at the Proceedings of the AAAI Conference on Artificial Intelligence.

[15] Ezzi, F., Abida, M., & Jarboui, A. (2023). The mediating effect of corporate governance on the relationship between blockchain technology and investment efficiency. Journal of the Knowledge Economy, 14(2), 718-734.

[16] Faizul Haque, (2018) "Shareholders, regulation and bank risk-taking: evidence from the Middle East and North Africa (MENA) region", Corporate Governance: The International Journal of Business in Society

[17] Fierro, L., Gaddis, M., Kinney, M., Reed, J., Kirkwood, B., Greene, M., . . . Deloitte Consulting, L. (2016). Implementation pilot for two-dimensional (2D) vaccine barcode utilization: summary report.

[18] Frizzo-Barker, J., Chow-White, P. A., Adams, P. R., Mentanko, J., Ha, D., & Green, S. (2020). Blockchain as a disruptive technology for business: A systematic review. International journal of information management, 51, 102029.

[19] Gerald, B. (2018). A brief review of independent, dependent and one sample t-test. International Journal of Applied Mathematics and Theoretical Physics, 4(2), 50-54.

[20] Gjeçi, A., Marinč, M., & Rant, V. (2023). Non-performing loans and bank lending behaviour. Risk Management, 25(1), 7.

[21] Gujarati, D. (2009). N., and Dawn C., Porter,(2009). Basic econometrics, 5, 1-15.

[22] Gupta, S., & Sadoghi, M. (2018). EasyCommit: A Non-blocking Two-phase Commit Protocol. Paper presented at the EDBT.

[23] Hair, J. F., Money, A. H., Samouel, P., & Page, M. (2007). Research methods for business. Education+ Training, 49(4), 336-337.

[24] Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2019). Multivariate data analysis.

[25] Hammami, Y., & Boubaker, A. (2015). Shareholders structure and bank risk-taking: Empirical evidence from the Middle East and North Africa. International Business Research, 8(5), 271.

[26] Haque, F. (2019). Shareholders, regulation and bank risk-taking: evidence from the Middle East and North Africa (MENA) region. Corporate Governance: The International Journal of Business in Society, 19(1), 23-43.

[27] Hasib, K. T. A. M., Hasan, R., Ahmed, M., & Haque, A. B. (2023). Blockchain Based Smart Card for Smart City Enabling Technologies for Effective Planning and Management in Sustainable Smart Cities (pp. 173-202): Springer.

[28] Haw, I.-M., Ho, S. S., Hu, B., & Wu, D. (2010). Concentrated control, institutions, and banking sector: An international study. Journal of banking & finance, 34(3), 485-497.

[29] Hillman, A. J., Cannella, A. A., & Paetzold, R. L. (2000). The resource dependence role of corporate directors: Strategic adaptation of board composition in response to environmental change. Journal of Management studies, 37(2), 235-256.

[30] Iannotta, G., Nocera, G., & Sironi, A. (2007). Shareholders structure, risk and performance in the European banking industry. Journal of banking & finance, 31(7), 2127-2149.
[31] Iansiti, M., & Lakhani, K. R. (2017). Managing our hub economy. Harv. Bus. Rev, 10, 117.
[32] Islam, M. M. (2022). The Effects of Director Shareholders on Capital Adequacy and Risk-Takingg Among Private Commercial Banks in Bangladesh Within the Basel Capital Adequacy Framework. Management Studies,doi: 10.17265/2328-2185/2022.02.004, 10(2), 106-114
[33] Islam, M. M. (2022). The Effects of Director Shareholders on Capital Adequacy and Risk Taking Among Private Commercial Banks in Bangladesh Within the Basel Capital Adequacy Framework. Management, 10(2), 106-114.
[34] Islam, M. M., Bhuiyan, A. B., & Kassim, A. A. (2019). Board Characteristics and Risk-Taking Decisions among Islamic Financial Institutions in Bangladesh. Selangor Business Review, 15-25.
[35] Islam, M.M., Islam, M.M., Islam, M.A., Alharthi, M. and Hassan, M.S. (2025), "Shaping the future: board communication, credit risk and blockchain technology evolution in banking industries – evidence from Bangladesh", International Journal of Islamic and Middle Eastern Finance and Management, Vol. ahead-of-print No. ahead-of-print. https:// www. emerald. com/ insight/ content/doi/10.1108/imefm-04-2024-0206/full/html https:// doi.org/10.1108/IMEFM-04-2024-0206
[36] Jensen, M. C., & Meckling, W. H. (2019). Theory of the firm: Managerial behavior, agency costs and shareholders structure. In Corporate governance (pp. 77-132). Gower.
[37] Kaal, W. A. (2021). Blockchain solutions for agency problems in corporate governance Information for efficient decision making: Big data, blockchain and relevance (pp. 313-329): World Scientific.
[38] Kassim, S. H., & Rahman, M. (2018). Handling default risks in microfinance: the case of Bangladesh. Qualitative Research in Financial Markets, 10(4), 363-380.
[39] Kshetri, N. (2019). Cybercrime and cybersecurity in Africa. Journal of Global Information Technology Management, 22(2), 77-81.
[40] Kusano, I., Baldomir, A., Jurado, J. Á., & Hernández, S. (2018). The importance of correlation among flutter derivatives for the reliability based optimum design of suspension bridges. Engineering Structures, 173, 416-428.
[41] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. (2002). Investor protection and corporate valuation. The journal of finance, 57(3), 1147-1170.
[42] Lafarre, A., & Van der Elst, C. (2018). Blockchain technology for corporate governance and shareholder activism. European Corporate Governance Institute (ECGI)-Law Working Paper(390).
[43] Lenz, R. (2019). Managing distributed ledgers: Blockchain and beyond. Available at SSRN 3360655.
[44] Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. American Psychologist, 73(1), 26.
[45] Lestari, D. (2018). Corporate governance, capital reserve, non-performing loan, and bank risk taking. International Journal of Economics and Financial, (8), 2.
[46] Locke, A. E., Kahali, B., Berndt, S. I., Justice, A. E., Pers, T. H., Day, F. R., . . . Yang, J. (2015). Genetic studies of body mass index yield new insights for obesity biology. Nature, 518(7538), 197-206.
[47] Lui, A. K., & Ngai, E. W. (2019). The long term effect of blockchain adoption on firm value.
[48] Mohidul, Bhuiyan, A. B., Kassim, A. A. M., & Rasli, S. (2021). The Effect of Corporate Governance and Risk-Taking Among Islamic Financial Institutions in Bangladesh. Selangor Business Review http://sbr.journals.unisel.edu.my/ojs/index.php/sbr (ISSN 2716-5876.
[49] Mollah, S., Hassan, M. K., Al Farooque, O., & Mobarek, A. (2017). The governance, risk-taking, and performance of Islamic banks. Journal of financial services research, 51, 195-219.
[50] Mueller, R. O., & Hancock, G. R. (2018). Structural equation modeling The reviewer's guide to quantitative methods in the social sciences (pp. 445-456): Routledge.
[51] Ozili, P. K. (2019). Non-performing loans and financial development: new evidence. The Journal of Risk Finance, 20(1), 59-81.
[52] Risius, M., & Spohrer, K. (2017). A blockchain research framework: What we (don't) know, where we go from here, and how we will get there. Business & information systems engineering, 59, 385-409.
[53] Safiullah, M., & Shamsuddin, A. (2018). Risk in Islamic banking and corporate governance. Pacific-Basin Finance Journal, 47, 129-149.
[54] Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. Journal of Purchasing and Supply Management, 25(4), 100552.
[55] Schuetz, S., & Venkatesh, V. (2020). Blockchain, adoption, and financial inclusion in India: Research opportunities. International journal of information management, 52, 101936.
[56] Sharma, A. (2020). Analysing the applicability of blockchain accounting and its impact on financial reporting. Sumedha Journal of Management, 9(2), 1-13.
[57] Shleifer, A., & Vishny, R. W. (1997). A survey of corporate governance. The journal of finance, 52(2), 737-783.
[58] Srairi, S. (2013). Shareholders structure and risk-taking behaviour in conventional and Islamic banks: Evidence for MENA countries. Borsa Istanbul Review, 13(4), 115-127.
[59] Umar, M., & Sun, G. (2018). Determinants of non-performing loans in Chinese banks. Journal of Asia Business Studies, 12(3), 273-289.
[60] Williamson, O. E. (1996). The mechanisms of governance: Oxford university press.
[61] Yermack, D. (2017). Corporate governance and blockchains. Review of finance, 21(1), 7-31.
[62] Zhu, Y., Elhoseiny, M., Liu, B., Peng, X., & Elgammal, A. (2018). A generative adversarial approach for zero-shot learning from noisy texts. Paper presented at the Proceedings of the IEEE conference on computer vision and pattern recognition.

Appendix

```
. sem (shc -> bt, ) (shc -> rt, ) (bt -> rt, ), nocapslatent

Endogenous variables

Observed:  bt rt

Exogenous variables

Observed:  shc

Fitting target model:

Iteration 0:   log likelihood = -29.162736
Iteration 1:   log likelihood = -29.162736

Structural equation model                       Number of obs      =         24
Estimation method  = ml
Log likelihood     = -29.162736
```

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
bt <-						
shc	-.4795855	.34175	-1.40	0.161	-1.149403	.1902323
_cons	.5876577	.2818076	2.09	0.037	.035325	1.13999
rt <-						
bt	-.5017248	.2742436	-1.83	0.067	-1.039232	.0357828
shc	-1.446664	.4776121	-3.03	0.002	-2.382766	-.5105611
_cons	1.959579	.4114855	4.76	0.000	1.153082	2.766076
var(e.bt)	.1524235	.0440009			.0865628	.2683939
var(e.rt)	.2751289	.0794229			.1562484	.4844589

```
LR test of model vs. saturated: chi2(0)   =      0.00, Prob > chi2 =      .
.
. estat teffects, standardized
```

```
. estat teffects, standardized
```

Direct effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
bt <-					
shc	-.4795855	.34175	-1.40	0.161	-.2753767
rt <-					
bt	-.5017248	.2742436	-1.83	0.067	-.3251956
shc	-1.446664	.4776121	-3.03	0.002	-.5384036

Indirect effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
bt <-					
shc	0	(no path)			0
rt <-					
bt	0	(no path)			0
shc	.2406199	.2160982	1.11	0.266	.0895513

Total effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
bt <-					
shc	-.4795855	.34175	-1.40	0.161	-.2753767
rt <-					
bt	-.5017248	.2742436	-1.83	0.067	-.3251956
shc	-1.206044	.4901174	-2.46	0.014	-.4488523

```
. estat teffects, standardized
```

```
.
. estat gof, stats(all)
```

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(0)	0.000	model vs. saturated
p > chi2	.	
chi2_bs(3)	10.426	baseline vs. saturated
p > chi2	0.015	
Population error		
RMSEA	0.000	Root mean squared error of approximation
90% CI, lower bound	0.000	
upper bound	0.000	
pclose	1.000	Probability RMSEA <= 0.05
Information criteria		
AIC	72.325	Akaike's information criterion
BIC	80.572	Bayesian information criterion
Baseline comparison		
CFI	1.000	Comparative fit index
TLI	1.000	Tucker-Lewis index
Size of residuals		
SRMR	0.000	Standardized root mean squared residual
CD	0.331	Coefficient of determination

```
.
```