

## **CHAPTER V**

### **CONCLUSIONS AND SUGGESTIONS**

#### **5.1 Conclusion**

##### **5.1.1 The Impact of Digital Transformation on Firm Value**

The results indicate that Digital Transformation has a significant effect on Firm Value among food value chain companies listed on the Indonesia Stock Exchange during the 2019–2024 period. However, contrary to the initial hypothesis, the relationship is negative. This finding suggests that higher levels of digital transformation disclosure are associated with lower firm value during the observation period. One possible explanation is that digital transformation requires substantial strategic investments in technology infrastructure, system integration, employee training, and organizational adjustment. These investments may increase short-term costs and reduce investors' expectations regarding near-term financial performance before long-term benefits are realized. Therefore, H1 is statistically supported, although the direction of the relationship differs from the proposed hypothesis.

##### **5.1.2 The Impact of Digital Transformation on ESG Performance**

The findings show that Digital Transformation does not have a significant effect on ESG Performance. Although digital technologies are expected to facilitate sustainability management, transparency, and stakeholder communication, the results suggest that digital transformation initiatives undertaken by the sampled firms have not yet translated into measurable improvements in ESG Performance. Therefore, H2 is rejected.

##### **5.1.3 The Impact of ESG Performance on Firm Value**

The results reveal that ESG Performance does not significantly affect Firm Value. This finding indicates that ESG disclosure has not yet become a major factor influencing market valuation among food value chain companies in Indonesia. Although ESG practices may contribute to long-term sustainability and stakeholder relationships, investors may continue to place greater emphasis on conventional financial performance and profitability indicators when evaluating firm value. Therefore, H3 is rejected.

#### 5.1.4 Mediating Role of ESG Performance

The mediation analysis based on the Baron and Kenny approach indicates that ESG Performance does not mediate the relationship between Digital Transformation and Firm Value. The results show that Digital Transformation does not significantly affect ESG Performance, while ESG Performance also does not significantly affect Firm Value. Since the required mediation conditions are not fulfilled, ESG Performance cannot act as a mediating variable in the relationship between Digital Transformation and Firm Value. Therefore, H4 is rejected.

### 5.2 Theoretical Implications

#### 5.2.1 Resource-Based View

The findings partially support the Resource-Based View (RBV). RBV argues that valuable strategic resources enable firms to create sustainable competitive advantages, which ultimately contribute to superior firm value. In this study, Digital Transformation significantly affects Firm Value, indicating that digital capabilities represent important organizational resources. However, the negative direction of the relationship suggests that the benefits of digital transformation may not be realized immediately. Instead, firms may experience substantial implementation costs and adjustment challenges before these digital resources can be converted into sustainable competitive advantages that are recognized by capital markets and reflected in Firm Value. Therefore, the results support RBV in terms of the strategic importance of digital resources, while also highlighting the time and investment required to realize their value.

#### 5.2.2 Stakeholder Theory

The findings provide limited support for Stakeholder Theory. The theory suggests that firms that effectively address stakeholder expectations through sustainability practices should achieve greater stakeholder trust and higher firm value. However, the results indicate that ESG Performance does not significantly influence Firm Value. In addition, Digital Transformation does not significantly affect ESG Performance. These findings suggest that ESG

disclosures within the sampled firms have not yet become sufficiently influential to affect investor perceptions or market valuation. Consequently, the expected stakeholder-driven value creation mechanism proposed by Stakeholder Theory is not fully supported in the context of this study.

### 5.3 Managerial Implications

#### 5.3.1 Food & Beverages Industries

Managers in food and beverage manufacturing companies should recognize that digital transformation requires substantial investment and may not immediately generate positive market responses. Therefore, firms should focus not only on adopting digital technologies but also on ensuring that these investments create measurable business value and support long-term Firm Value. Effective communication of digital transformation objectives and outcomes to investors may also help reduce uncertainty regarding digital investment expenditures.

#### 5.3.2 Food Producers Industries

Food producers and fisheries companies should utilize digital technologies to strengthen supply chain transparency, resource monitoring, and sustainability performance to improve stakeholder confidence and support long-term corporate value. Although digital transformation was not found to significantly improve ESG Performance, integrating digital systems with sustainability initiatives may help firms strengthen ESG disclosure quality and improve stakeholder confidence over the long term.

#### 5.3.3 Retail Industries

Food retail companies should leverage digital technologies to use digital technologies to strengthen operational resilience and improve long-term competitiveness, while enhancing sustainability disclosure to support investor confidence. At the same time, retailers should strengthen sustainability reporting practices to increase transparency and demonstrate accountability to consumers and investors. Although ESG Performance was not found to

significantly affect Firm Value, consistent sustainability disclosure may become increasingly important as investor awareness of ESG issues continues to grow.

#### 5.4 Limitations

This study has several limitations. First, the sample is limited to food value chain companies listed on the Indonesia Stock Exchange, which may restrict the generalizability of the findings to other industries and countries. Second, the observation period covers only six years, from 2019 to 2024, which may not fully capture the long-term effects of digital transformation and ESG initiatives. Third, Digital Transformation is measured using a keyword frequency approach based on annual report disclosures, which may not fully reflect the actual level of digital transformation implementation within firms. Fourth, ESG Performance is measured using ESG disclosure indicators rather than third-party ESG ratings, which may result in differences in measurement quality. Finally, Firm Value is measured solely using Tobin's Q, while other market-based or accounting-based performance indicators may produce different results. Finally, this study focuses on the mediating role of ESG Performance and does not consider other potential mechanisms through which Digital Transformation may influence Firm Value, such as innovation capability, operational resilience, or financial performance.

#### 5.5 Recommendations for Future Research

Future research may extend this study in several ways. First, future studies may include firms from different industries or countries to improve the generalizability of the findings. Second, longer observation periods may be used to capture the long-term effects of digital transformation and ESG performance on firm value. Third, future studies may employ alternative ESG measurements, such as ESG ratings provided by external agencies, to obtain a more comprehensive assessment of sustainability performance. Fourth, researchers may consider using more specific digital transformation indicators, such as investments in artificial intelligence, cloud computing, big data analytics, or Internet of Things technologies. Fifth, future studies may compare alternative panel data estimation techniques, such as Fixed Effects or Random Effects models, with the pooled panel regression model employed in this study.

to examine whether firm-specific heterogeneity influences the observed relationships and to enhance the robustness of the empirical findings. Finally, future studies may explore additional mediating or moderating variables, such as innovation capability, operational efficiency, profitability, or corporate governance quality, to better understand the mechanisms through which digital transformation influences firm value.



## REFERENCES

- Arvidsson, S., & Dumay, J. (2022). Corporate ESG reporting quantity, quality and performance: Where to now for environmental policy and practice? *Business Strategy and the Environment*, 31(3), 1091–1110. <https://doi.org/10.1002/bse.2937>
- Baron, R. M., & Kenny, D. A. (1986). *The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations* (Vol. 51, Number 6). Psychological Association, Inc.
- Brenner, B., & Hartl, B. (2021). The perceived relationship between digitalization and ecological, economic, and social sustainability. *Journal of Cleaner Production*, 315, 128128. <https://doi.org/10.1016/j.jclepro.2021.128128>
- Broadstock, D. C., Chan, K., Cheng, L. T. W., & Wang, X. (2021). The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China. *Finance Research Letters*, 38, 101716. <https://doi.org/10.1016/J.FRL.2020.101716>
- Chen, J. (2025, August 23). *What Are Consumer Staples? Definition and Importance for GDP*. Investopedia.
- Garnett, A. G. (n.d.). *Consumer staples sector: Investing in stocks that provide the basics for living*. Britannica Money.
- Google Projects 13 percent Growth in Indonesia's Digital Economy. (2024, November 14). Invest Indonesia.
- Hoepner, A. G. F., Oikonomou, I., Sautner, Z., Starks, L. T., & Zhou, X. Y. (2024). ESG shareholder engagement and downside risk. *Review of Finance*, 28(2), 483–510. <https://doi.org/10.1093/rof/rfad034>
- Khan, M. A. (2022). ESG disclosure and Firm performance: A bibliometric and meta analysis. *Research in International Business and Finance*, 61, 101668. <https://doi.org/10.1016/j.ribaf.2022.101668>
- Kothari, C. R. . (2004). *Research methodology : methods & techniques*. New Age International (P) Ltd.
- Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis. *Journal of Finance*, 72(4), 1785–1824. <https://doi.org/10.1111/jofi.12505>
- O'Brien, K., Downie, A., & Scapicchio, M. (n.d.). *What is digital transformation?* IBM.
- Rahat, B., & Nguyen, P. (2024). The impact of ESG profile on Firm's valuation in emerging markets. *International Review of Financial Analysis*, 95, 103361. <https://doi.org/10.1016/J.IRFA.2024.103361>
- Ren, C., & Lin, X. (2024a). Digital transformation, competitive strategy choices and firm value: evidence from China. *Industrial Management and Data Systems*, 124(4), 1656–1676. <https://doi.org/10.1108/IMDS-03-2023-0172>

- Ren, C., & Lin, X. (2024b). Digital transformation, competitive strategy choices and firm value: evidence from China. *Industrial Management and Data Systems*, 124(4), 1656–1676. <https://doi.org/10.1108/IMDS-03-2023-0172>
- Teece, D. J. (2018). Dynamic capabilities as (workable) management systems theory. *Journal of Management and Organization*, 24(3), 359–368. <https://doi.org/10.1017/jmo.2017.75>
- Velte, P. (2017). Does ESG performance have an impact on financial performance? Evidence from Germany. *Journal of Global Responsibility*, 8(2), 169–178. <https://doi.org/10.1108/JGR-11-2016-0029>
- Wang, D., & Xia, X. (2024a). The impact of digital transformation on firms' value: examining the role of ESG performance and the effect of information interaction. *Business Process Management Journal*, 30(4), 1236–1265. <https://doi.org/10.1108/BPMJ-06-2023-0469>
- Wang, D., & Xia, X. (2024b). The impact of digital transformation on firms' value: examining the role of ESG performance and the effect of information interaction. *Business Process Management Journal*, 30(4), 1236–1265. <https://doi.org/10.1108/BPMJ-06-2023-0469>
- What is digital transformation? (n.d.).
- What is ESG? (n.d.). Bursa Efek Indonesia.
- Xie, X., Zhu, H., & Zhao, J. (2024). How effective is digital transformation? Heterogeneous insights from listed companies' ESG performance. *Humanities and Social Sciences Communications*, 11(1). <https://doi.org/10.1057/s41599-024-04039-5>
- Zhang, M., & Huang, Z. (2024). The Impact of Digital Transformation on ESG Performance: The Role of Supply Chain Resilience. *Sustainability (Switzerland)*, 16(17). <https://doi.org/10.3390/su16177621>
- Zheng, X., & Bu, Q. (2024). Enterprise ESG Performance, Digital Transformation, and Firm Performance: Evidence from China. *SAGE Open*, 14(4). <https://doi.org/10.1177/21582440241291680>
- Zhou, Z., Yuan, Z., & He, C. (2025). Can digital transformation promote firms' sustainable development? Evidence based on ESG performance. *International Review of Financial Analysis*, 105, 104434. <https://doi.org/10.1016/J.IRFA.2025.104434>

## APPENDICES

### *Appendix 1. 1 Digital Transformation Keyword Dictionary*

| Dimension              | Keyword                                                                                                                                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Digital Transformation | Digital transformation, Digitalization, Digital Platform, Digital System, Big Data, Data Analytics, Cloud Computing, Automation, Enterprise Resource Planning, E-Commerce, Online Platform, Supply Chain Digitalization. |

*Source: Compiled by the Researcher (2026)*

### *Appendix 1. 2 ESG Disclosure Scoring Instrument*

| No | GRI Indicator                                        | Assessment Criteria                                               | Score                               |
|----|------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------|
| 1  | GRI 302-1 Energy Consumption Within the Organization | Company discloses quantitative energy consumption data            | 1 = Disclosed;<br>0 = Not Disclosed |
| 2  | GRI 302-3 Energy Intensity                           | Company discloses energy intensity ratio                          | 1 = Disclosed;<br>0 = Not Disclosed |
| 3  | GRI 303-5 Water Consumption                          | Company discloses quantitative water consumption data             | 1 = Disclosed;<br>0 = Not Disclosed |
| 4  | GRI 305 GHG Emissions                                | Company discloses Scope 1, Scope 2, or Total GHG emissions        | 1 = Disclosed;<br>0 = Not Disclosed |
| 5  | GRI 306 Waste Generated                              | Company discloses waste generation or disposal information        | 1 = Disclosed;<br>0 = Not Disclosed |
| 6  | GRI 403-9 Work-Related Injuries                      | Company discloses occupational injury, accident, or fatality data | 1 = Disclosed;<br>0 = Not Disclosed |

|    |                                                   |                                                                                             |                                     |
|----|---------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------|
| 7  | GRI 404-1 Training & Education                    | Company discloses employee training and development information                             | 1 = Disclosed;<br>0 = Not Disclosed |
| 8  | GRI 414-1 Supplier Social Screening               | Company discloses supplier social assessment, audit, screening, or due diligence activities | 1 = Disclosed;<br>0 = Not Disclosed |
| 9  | GRI 416-1 Product Health & Safety Assessment      | Company discloses food safety systems, certifications, or product safety assessments        | 1 = Disclosed;<br>0 = Not Disclosed |
| 10 | GRI 417-1 Product Information & Labeling          | Company discloses product labeling, nutrition, ingredient, allergen, or halal information   | 1 = Disclosed;<br>0 = Not Disclosed |
| 11 | GRI 2-12 ESG Oversight by Highest Governance Body | Company discloses board-level oversight of ESG or sustainability issues                     | 1 = Disclosed;<br>0 = Not Disclosed |
| 12 | GRI 205-2 Anti-Corruption Training                | Company discloses anti-corruption or ethics training activities                             | 1 = Disclosed;<br>0 = Not Disclosed |
| 13 | GRI 205-3 Confirmed Incidents of Corruption       | Company discloses confirmed corruption incidents, including zero cases                      | 1 = Disclosed;<br>0 = Not Disclosed |

*Source: GRI Standard (2021) and Compiled by the Researcher (2026)*

### *Appendix 1. 3 Variable Measurement Summary*

| No | Variable   | Proxy      | Formula                                                                                  |
|----|------------|------------|------------------------------------------------------------------------------------------|
| 1  | Firm Value | Tobin's Q  | $\frac{(\text{Market Value of Equity} + \text{Total Liabilities})}{\text{Total Assets}}$ |
| 2  | Leverage   | Debt Ratio | $\frac{\text{Total Liabilities}}{\text{Total Assets}}$                                   |

|   |           |                                   |                  |
|---|-----------|-----------------------------------|------------------|
| 3 | Firm Size | Natural Logarithm of Total Assets | Ln(Total Assets) |
|---|-----------|-----------------------------------|------------------|

*Source: Compiled by the Researcher (2026)*

*Appendix 1. 4 Company List as Research Sample*

| No | Industry           | Company Name                                  | Stock Code |
|----|--------------------|-----------------------------------------------|------------|
| 1  | Food and Beverages | Astra Agro Lestari Tbk.                       | ADES       |
| 2  |                    | FKS Food Sejahtera Tbk.                       | AISA       |
| 3  |                    | Bumi Teknokultura Unggul Tbk                  | BTEK       |
| 4  |                    | Campina Ice Cream Industry Tbk                | CAMP       |
| 5  |                    | Wilmar Cahaya Indonesia Tbk.                  | CEKA       |
| 6  |                    | Sariguna Primatirta Tbk.                      | CLEO       |
| 7  |                    | Wahana Interfood Nusantara Tbk                | COCO       |
| 8  |                    | Wicaksana Overseas Internation                | WICO       |
| 9  |                    | Delta Djakarta Tbk                            | DLTA       |
| 10 |                    | Diamond Food Indonesia Tbk                    | DMND       |
| 11 |                    | Sentra Food Indonesia Tbk                     | FOOD       |
| 12 |                    | Garudafood Putra Putri Jaya Tbk               | GOOD       |
| 13 |                    | Buyung Poetra Sembada Tbk                     | HOKI       |
| 14 |                    | Indofood CBP Sukses Makmur Tbk                | ICBP       |
| 15 |                    | Mulia Boga Raya Tbk.                          | KEJU       |
| 16 |                    | Wahana Pronatural Tbk                         | WAPO       |
| 17 |                    | Mayora Indah Tbk.                             | MYOR       |
| 18 |                    | Nippon Indosari Corpindo Tbk                  | ROTI       |
| 19 |                    | Sekar Bumi Tbk.                               | SKBM       |
| 20 |                    | Sekar Laut Tbk.                               | SKLT       |
| 21 |                    | Siantar Top Tbk.                              | STTP       |
| 22 |                    | Tunas Baru Lampung Tbk                        | TBLA       |
| 23 |                    | Ultrajaya Milk Industry & Trading Company Tbk | ULTJ       |
| 24 |                    | Astra Agro Lestari Tbk.                       | AALI       |
| 25 |                    | Austindo Nusantara Jaya Tbk                   | ANJT       |

|    |                              |                                             |      |
|----|------------------------------|---------------------------------------------|------|
| 26 | Food Producers and Fisheries | Estika Tata Tiara Tbk.                      | BEEF |
| 27 |                              | BISI International Tbk.                     | BISI |
| 28 |                              | Eagle High Plantations Tbk.                 | BWPT |
| 29 |                              | Charoen Pokphand Indonesia Tbk              | CPIN |
| 30 |                              | Central Proteina Prima Tbk.                 | CPRO |
| 31 |                              | Cisadane Sawit Raya Tbk.                    | CSRA |
| 32 |                              | Dharma Satya Nusantara Tbk.                 | DSNG |
| 33 |                              | FKS Multi Agro Tbk.                         | FISH |
| 34 |                              | Era Mandiri Cemerlang Tbk.                  | IKAN |
| 35 |                              | Jaya Agri Wattie Tbk.                       | JAWA |
| 36 |                              | Japfa Comfeed Indonesia Tbk                 | JPFA |
| 37 |                              | Malindo Feedmill Tbk.                       | MAIN |
| 38 |                              | Mahkota Group Tbk.                          | MGRO |
| 39 |                              | Palma Serasih Tbk.                          | PSGO |
| 40 |                              | Prime Agri Resources Tbk.                   | SGRO |
| 41 |                              | Sreeya Sewu Indonesia Tbk.                  | SIPD |
| 42 |                              | Sinar Mas Agro Resources and Technology Tbk | SMAR |
| 43 |                              | Sawit Sumbermas Sarana Tbk.                 | SSMS |
| 44 |                              | Bakrie Sumatera Plantations Tbk             | UNSP |
| 45 | Retail                       | Sumber Alfaria Trijaya Tbk.                 | AMRT |
| 46 |                              | Enseval Putera Megatrading Tbk              | EPMT |
| 47 |                              | DFI Retail Nusantara Tbk.                   | HERO |
| 48 |                              | Midi Utama Indonesia Tbk.                   | MIDI |
| 49 |                              | Matahari Putra Prima Tbk.                   | MPPA |
| 50 |                              | Supra Boga Lestari Tbk.                     | RANC |
| 51 |                              | Tigaraksa Satria Tbk.                       | TGKA |

*Source: IDX and Compiled by the Researcher (2026)*

### Appendix 1. 5 Descriptive Analysis

| View         | Proc | Object | Print | Name     | Freeze | Sample   | Sheet | Stats     | Spec |          |           |
|--------------|------|--------|-------|----------|--------|----------|-------|-----------|------|----------|-----------|
|              |      |        |       | DT       |        | ESG      |       | TOBIN_S_Q |      | LEVERAGE | FIRM_SIZE |
| Mean         |      |        |       | 2.359477 |        | 0.442436 |       | 326.7334  |      | 5.728638 | 28.03669  |
| Median       |      |        |       | 1.000000 |        | 0.384600 |       | 1.354370  |      | 0.482782 | 28.88142  |
| Maximum      |      |        |       | 43.00000 |        | 1.000000 |       | 9790.770  |      | 1600.054 | 36.14325  |
| Minimum      |      |        |       | 0.000000 |        | 0.076900 |       | 0.154197  |      | 0.067154 | 14.38175  |
| Std. Dev.    |      |        |       | 4.860162 |        | 0.216018 |       | 1314.608  |      | 91.44070 | 3.519286  |
| Skewness     |      |        |       | 4.625101 |        | 0.506090 |       | 4.379487  |      | 17.40679 | -1.736803 |
| Kurtosis     |      |        |       | 31.24343 |        | 2.279158 |       | 22.95624  |      | 303.9986 | 7.006187  |
|              |      |        |       |          |        |          |       |           |      |          |           |
| Jarque-Bera  |      |        |       | 11261.53 |        | 19.68756 |       | 6055.883  |      | 1170605. | 358.4723  |
| Probability  |      |        |       | 0.000000 |        | 0.000053 |       | 0.000000  |      | 0.000000 | 0.000000  |
|              |      |        |       |          |        |          |       |           |      |          |           |
| Sum          |      |        |       | 722.0000 |        | 135.3853 |       | 99980.41  |      | 1752.963 | 8579.228  |
| Sum Sq. Dev. |      |        |       | 7204.458 |        | 14.23242 |       | 5.27E+08  |      | 2550227. | 3777.540  |
|              |      |        |       |          |        |          |       |           |      |          |           |
| Observations |      |        |       | 306      |        | 306      |       | 306       |      | 306      | 306       |
|              |      |        |       |          |        |          |       |           |      |          |           |

Source: EViews (2026)

### Appendix 1. 6 Correlation Analysis

|          | DT        | ESG       | TOBIN_S_Q | LEVERAGE  | FIRM_SIZE |  |  |  | Correlation |
|----------|-----------|-----------|-----------|-----------|-----------|--|--|--|-------------|
| DT       | 1.000000  | -0.063109 | 0.005385  | 0.019127  | 0.058682  |  |  |  |             |
| ESG      | -0.063109 | 1.000000  | -0.117265 | -0.035449 | 0.109074  |  |  |  |             |
| TOBIN... | 0.005385  | -0.117265 | 1.000000  | -0.014235 | -0.493329 |  |  |  |             |
| LEVER... | 0.019127  | -0.035449 | -0.014235 | 1.000000  | -0.220574 |  |  |  |             |
| FIRM_... | 0.058682  | 0.109074  | -0.493329 | -0.220574 | 1.000000  |  |  |  |             |

Source: EViews (2026)

### Appendix 1. 7 Model 1 – Common Effect Method

Dependent Variable: ESG  
Method: Panel Least Squares  
Date: 06/13/26 Time: 11:14  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306

| Variable              | Coefficient | Std. Error         | t-Statistic | Prob.    |
|-----------------------|-------------|--------------------|-------------|----------|
| C                     | 0.258783    | 0.101597           | 2.547145    | 0.0114   |
| DT                    | -0.003086   | 0.002542           | -1.214264   | 0.2256   |
| LEVERAGE              | -2.28E-05   | 0.000138           | -0.164567   | 0.8694   |
| FIRM_SIZE             | 0.006815    | 0.003598           | 1.893970    | 0.0592   |
| Root MSE              | 0.213842    | R-squared          |             | 0.016834 |
| Mean dependent var    | 0.442436    | Adjusted R-squared |             | 0.007067 |
| S.D. dependent var    | 0.216018    | S.E. of regression |             | 0.215253 |
| Akaike info criterion | -0.221019   | Sum squared resid  |             | 13.99284 |
| Schwarz criterion     | -0.172344   | Log likelihood     |             | 37.81586 |
| Hannan-Quinn criter.  | -0.201552   | F-statistic        |             | 1.723600 |
| Durbin-Watson stat    | 0.654107    | Prob(F-statistic)  |             | 0.162140 |

Source: EViews (2026)

### Appendix 1. 8 Model 1 - Lagrange Multiplier Test

Lagrange Multiplier Tests for Random Effects  
Null hypotheses: No effects  
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

|                      | Test Hypothesis      |                      |                      |
|----------------------|----------------------|----------------------|----------------------|
|                      | Cross-section        | Time                 | Both                 |
| Breusch-Pagan        | 110.1506<br>(0.0000) | 43.11549<br>(0.0000) | 153.2661<br>(0.0000) |
| Honda                | 10.49527<br>(0.0000) | 6.566239<br>(0.0000) | 12.06431<br>(0.0000) |
| King-Wu              | 10.49527<br>(0.0000) | 6.566239<br>(0.0000) | 9.425105<br>(0.0000) |
| Standardized Honda   | 10.92639<br>(0.0000) | 7.454124<br>(0.0000) | 7.880136<br>(0.0000) |
| Standardized King-Wu | 10.92639<br>(0.0000) | 7.454124<br>(0.0000) | 7.073762<br>(0.0000) |
| Gourieroux, et al.   | --                   | --                   | 153.2661<br>(0.0000) |

Source: EViews (2026)

### Appendix 1. 9 Model 1 - Fixed Effect Method

Dependent Variable: ESG  
Method: Panel Least Squares  
Date: 06/13/26 Time: 11:20  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 0.927076    | 0.439373   | 2.109996    | 0.0358 |
| DT        | 0.004404    | 0.003585   | 1.228634    | 0.2204 |
| LEVERAGE  | 2.03E-05    | 0.000115   | 0.176889    | 0.8597 |
| FIRM_SIZE | -0.017661   | 0.015651   | -1.128430   | 0.2602 |

  

| Effects Specification                 |           |                    |          |
|---------------------------------------|-----------|--------------------|----------|
| Cross-section fixed (dummy variables) |           |                    |          |
| Root MSE                              | 0.151566  | R-squared          | 0.506092 |
| Mean dependent var                    | 0.442436  | Adjusted R-squared | 0.402214 |
| S.D. dependent var                    | 0.216018  | S.E. of regression | 0.167018 |
| Akaike info criterion                 | -0.582650 | Sum squared resid  | 7.029511 |
| Schwarz criterion                     | 0.074454  | Log likelihood     | 143.1454 |
| Hannan-Quinn criter.                  | -0.319851 | F-statistic        | 4.872002 |
| Durbin-Watson stat                    | 1.316730  | Prob(F-statistic)  | 0.000000 |

Source: EViews (2026)

### Appendix 1. 10 Model 1 – Chow Test

Redundant Fixed Effects Tests  
Equation: Untitled  
Test cross-section fixed effects

| Effects Test             | Statistic  | d.f.     | Prob.  |
|--------------------------|------------|----------|--------|
| Cross-section F          | 4.992547   | (50,252) | 0.0000 |
| Cross-section Chi-square | 210.659085 | 50       | 0.0000 |

Source: EViews (2026)

*Appendix 1. 11 Model 1 – Random Effect Method*

Dependent Variable: ESG  
Method: Panel EGLS (Cross-section random effects)  
Date: 06/13/26 Time: 11:53  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306  
Swamy and Arora estimator of component variances

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 0.329845    | 0.164208   | 2.008703    | 0.0455 |
| DT        | 0.001247    | 0.002969   | 0.419987    | 0.6748 |
| LEVERAGE  | 8.57E-06    | 0.000113   | 0.075908    | 0.9395 |
| FIRM_SIZE | 0.003909    | 0.005806   | 0.673233    | 0.5013 |

*Source: EViews (2026)*

*Appendix 1. 12 Model 1 - Hausman Test*

Correlated Random Effects - Hausman Test  
Equation: Untitled  
Test cross-section random effects

| Test Summary         | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|----------------------|-------------------|--------------|--------|
| Cross-section random | 5.633047          | 3            | 0.1309 |

Cross-section random effects test comparisons:

| Variable  | Fixed     | Random   | Var(Diff.) | Prob.  |
|-----------|-----------|----------|------------|--------|
| DT        | 0.004404  | 0.001247 | 0.000004   | 0.1159 |
| LEVERAGE  | 0.000020  | 0.000009 | 0.000000   | 0.5560 |
| FIRM_SIZE | -0.017661 | 0.003909 | 0.000211   | 0.1378 |

*Source: EViews (2026)*

### Appendix 1. 13 Model 2 - Common Effect Method (CEM)

Dependent Variable: TOBIN\_S\_Q  
Method: Panel Least Squares  
Date: 06/13/26 Time: 12:04  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306

| Variable              | Coefficient | Std. Error         | t-Statistic | Prob.  |
|-----------------------|-------------|--------------------|-------------|--------|
| C                     | 5804.977    | 536.1223           | 10.82771    | 0.0000 |
| DT                    | 10.45624    | 13.41265           | 0.779580    | 0.4362 |
| LEVERAGE              | -1.878249   | 0.729638           | -2.574222   | 0.0105 |
| FIRM_SIZE             | -195.8917   | 18.98724           | -10.31702   | 0.0000 |
| Root MSE              | 1128.427    | R-squared          | 0.260776    |        |
| Mean dependent var    | 326.7334    | Adjusted R-squared | 0.253433    |        |
| S.D. dependent var    | 1314.608    | S.E. of regression | 1135.875    |        |
| Akaike info criterion | 16.92118    | Sum squared resid  | 3.90E+08    |        |
| Schwarz criterion     | 16.96985    | Log likelihood     | -2584.941   |        |
| Hannan-Quinn criter.  | 16.94065    | F-statistic        | 35.51223    |        |
| Durbin-Watson stat    | 0.677390    | Prob(F-statistic)  | 0.000000    |        |

Source: EViews (2026)

### Appendix 1. 14 Model 2 - Lagrange Multiplier Test

Lagrange Multiplier Tests for Random Effects  
Null hypotheses: No effects  
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

|                      | Test Hypothesis      |                       |                      |
|----------------------|----------------------|-----------------------|----------------------|
|                      | Cross-section        | Time                  | Both                 |
| Breusch-Pagan        | 350.6167<br>(0.0000) | 2.072127<br>(0.1500)  | 352.6889<br>(0.0000) |
| Honda                | 18.72476<br>(0.0000) | -1.439488<br>(0.9250) | 12.22253<br>(0.0000) |
| King-Wu              | 18.72476<br>(0.0000) | -1.439488<br>(0.9250) | 4.273230<br>(0.0000) |
| Standardized Honda   | 19.30801<br>(0.0000) | -1.262324<br>(0.8966) | 8.051443<br>(0.0000) |
| Standardized King-Wu | 19.30801<br>(0.0000) | -1.262324<br>(0.8966) | 1.403093<br>(0.0803) |
| Gourieroux, et al.   | --                   | --                    | 350.6167<br>(0.0000) |

Source: EViews (2026)

*Appendix 1. 15 Model 2 - Fixed Effect Method (FEM)*

Dependent Variable: TOBIN\_S\_Q  
Method: Panel Least Squares  
Date: 06/13/26 Time: 12:27  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 643.8469    | 1511.494   | 0.425967    | 0.6705 |
| DT        | -55.96983   | 12.33212   | -4.538540   | 0.0000 |
| LEVERAGE  | 0.126004    | 0.394547   | 0.319365    | 0.7497 |
| FIRM_SIZE | -6.626168   | 53.84020   | -0.123071   | 0.9021 |

*Source: EViews (2026)*

*Appendix 1. 16 Model 2 - Chow Test*

Redundant Fixed Effects Tests  
Equation: Untitled  
Test cross-section fixed effects

| Effects Test             | Statistic  | d.f.     | Prob.  |
|--------------------------|------------|----------|--------|
| Cross-section F          | 18.566321  | (50,252) | 0.0000 |
| Cross-section Chi-square | 472.497181 | 50       | 0.0000 |

*Source: EViews (2026)*

*Appendix 1. 17 Model 2 - Random Effect Method (REM)*

Dependent Variable: TOBIN\_S\_Q  
Method: Panel EGLS (Cross-section random effects)  
Date: 06/13/26 Time: 12:31  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306  
Swamy and Arora estimator of component variances

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 4076.419    | 848.4108   | 4.804770    | 0.0000 |
| DT        | -44.31891   | 11.43076   | -3.877163   | 0.0001 |
| LEVERAGE  | -0.006812   | 0.392143   | -0.017370   | 0.9862 |
| FIRM_SIZE | -130.0110   | 29.91717   | -4.345697   | 0.0000 |

*Source: EViews (2026)*

*Appendix 1. 18 Model 2 - Hausman Test*

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

| Test Summary         | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|----------------------|-------------------|--------------|--------|
| Cross-section random | 31.983951         | 3            | 0.0000 |

Cross-section random effects test comparisons:

| Variable  | Fixed      | Random      | Var(Diff.)  | Prob.  |
|-----------|------------|-------------|-------------|--------|
| DT        | -55.969826 | -44.318913  | 21.419001   | 0.0118 |
| LEVERAGE  | 0.126004   | -0.006812   | 0.001891    | 0.0023 |
| FIRM_SIZE | -6.626168  | -130.010953 | 2003.730738 | 0.0058 |

*Source: EViews (2026)*

*Appendix 1. 19 Model 3 - Common Effect Method (CEM)*

Dependent Variable: TOBIN\_S\_Q

Method: Panel Least Squares

Date: 06/13/26 Time: 12:46

Sample: 2019 2024

Periods included: 6

Cross-sections included: 51

Total panel (balanced) observations: 306

| Variable              | Coefficient | Std. Error         | t-Statistic | Prob.     |
|-----------------------|-------------|--------------------|-------------|-----------|
| C                     | 5904.701    | 541.3007           | 10.90836    | 0.0000    |
| DT                    | 9.266880    | 13.43171           | 0.689926    | 0.4908    |
| ESG                   | -385.3584   | 303.3450           | -1.270364   | 0.2049    |
| LEVERAGE              | -1.887018   | 0.728930           | -2.588750   | 0.0101    |
| FIRM_SIZE             | -193.2655   | 19.08029           | -10.12907   | 0.0000    |
| Root MSE              | 1125.414    | R-squared          |             | 0.264719  |
| Mean dependent var    | 326.7334    | Adjusted R-squared |             | 0.254947  |
| S.D. dependent var    | 1314.608    | S.E. of regression |             | 1134.722  |
| Akaike info criterion | 16.92237    | Sum squared resid  |             | 3.88E+08  |
| Schwarz criterion     | 16.98321    | Log likelihood     |             | -2584.122 |
| Hannan-Quinn criter.  | 16.94670    | F-statistic        |             | 27.09177  |
| Durbin-Watson stat    | 0.686404    | Prob(F-statistic)  |             | 0.000000  |

*Source: EViews (2026)*

### Appendix 1. 20 Model 3 - Lagrange Multiplier Test

Lagrange Multiplier Tests for Random Effects

Null hypotheses: No effects

Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

|                      | Test Hypothesis      |                       |                      |
|----------------------|----------------------|-----------------------|----------------------|
|                      | Cross-section        | Time                  | Both                 |
| Breusch-Pagan        | 344.1173<br>(0.0000) | 1.733031<br>(0.1880)  | 345.8503<br>(0.0000) |
| Honda                | 18.55040<br>(0.0000) | -1.316446<br>(0.9060) | 12.18624<br>(0.0000) |
| King-Wu              | 18.55040<br>(0.0000) | -1.316446<br>(0.9060) | 4.337973<br>(0.0000) |
| Standardized Honda   | 19.24709<br>(0.0000) | -1.120129<br>(0.8687) | 8.116832<br>(0.0000) |
| Standardized King-Wu | 19.24709<br>(0.0000) | -1.120129<br>(0.8687) | 1.529649<br>(0.0631) |
| Gourieroux, et al.   | --                   | --                    | 344.1173<br>(0.0000) |

Source: EViews (2026)

### Appendix 1. 21 Model 3 - Fixed Effect Method (FEM)

Dependent Variable: TOBIN\_S\_Q

Method: Panel Least Squares

Date: 06/13/26 Time: 12:47

Sample: 2019 2024

Periods included: 6

Cross-sections included: 51

Total panel (balanced) observations: 306

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 383.7813    | 1522.733   | 0.252034    | 0.8012 |
| DT        | -57.20536   | 12.35234   | -4.631134   | 0.0000 |
| ESG       | 280.5225    | 216.4148   | 1.296226    | 0.1961 |
| LEVERAGE  | 0.120313    | 0.394040   | 0.305333    | 0.7604 |
| FIRM_SIZE | -1.671935   | 53.90336   | -0.031017   | 0.9753 |

#### Effects Specification

Cross-section fixed (dummy variables)

|                       |          |                    |           |
|-----------------------|----------|--------------------|-----------|
| Root MSE              | 519.6677 | R-squared          | 0.843224  |
| Mean dependent var    | 326.7334 | Adjusted R-squared | 0.809495  |
| S.D. dependent var    | 1314.608 | S.E. of regression | 573.7855  |
| Akaike info criterion | 15.70373 | Sum squared resid  | 82636672  |
| Schwarz criterion     | 16.37301 | Log likelihood     | -2347.671 |
| Hannan-Quinn criter.  | 15.97140 | F-statistic        | 25.00012  |
| Durbin-Watson stat    | 2.764500 | Prob(F-statistic)  | 0.000000  |

Source: EViews (2026)

*Appendix 1. 22 Model 3 - Chow Test*

Redundant Fixed Effects Tests  
Equation: Untitled  
Test cross-section fixed effects

| Effects Test             | Statistic  | d.f.     | Prob.  |
|--------------------------|------------|----------|--------|
| Cross-section F          | 18.523808  | (50,251) | 0.0000 |
| Cross-section Chi-square | 472.902480 | 50       | 0.0000 |

*Source: EViews (2026)*

*Appendix 1. 23 Model 3 - Random Effect Method (REM)*

Dependent Variable: TOBIN\_S\_Q  
Method: Panel EGLS (Cross-section random effects)  
Date: 06/13/26 Time: 12:50  
Sample: 2019 2024  
Periods included: 6  
Cross-sections included: 51  
Total panel (balanced) observations: 306  
Swamy and Arora estimator of component variances

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 4030.450    | 849.7999   | 4.742822    | 0.0000 |
| DT        | -44.60729   | 11.42693   | -3.903697   | 0.0001 |
| ESG       | 123.9753    | 208.2939   | 0.595194    | 0.5522 |
| LEVERAGE  | -0.009841   | 0.391606   | -0.025130   | 0.9800 |
| FIRM_SIZE | -130.3029   | 29.78634   | -4.374585   | 0.0000 |

*Source: EViews (2026)*

*Appendix 1. 24 Model 3 - Hausman Test*

Correlated Random Effects - Hausman Test  
Equation: Untitled  
Test cross-section random effects

| Test Summary         | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|----------------------|-------------------|--------------|--------|
| Cross-section random | 35.168007         | 4            | 0.0000 |

*Source: EViews (2026)*