Management (Montevideo). 2025; 3:323
doi: 10.62486/agma2025323
ISSN: 3046-4048

ORIGINAL

Omnichannel Taxation, Perceived Tax Audit Probability and Digital Tax Compliance: A Game Theoretic Analysis

Fiscalidad Omnicanal, Probabilidad Percibida De Auditoría Fiscal Y Cumplimiento Tributario Digital: Un Análisis Basado En La Teoría De Juegos

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Cite as: Puji Erasashanti A, Yazid H, Januarsi Y, Muchlish M. Omnichannel Taxation, Perceived Tax Audit Probability and Digital Tax Compliance: A Game Theoretic Analysis. Management (Montevideo). 2025; 3:323. https://doi.org/10.62486/agma2025323

Submitted: 15-11-2024 **Revised:** 22-04-2025 **Accepted:** 25-09-2025 **Published:** 26-09-2025

Editor: Ing. Misael Ron

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ABSTRACT

Introduction: as AI-enhanced omnichannel taxation becomes increasingly prevalent in digital government landscapes, understanding its influence on taxpayer compliance behaviour is essential, particularly in emerging economies where digital tax initiatives are still evolving.
Objective: this study investigates the strategic interactions between omnichannel taxation, perceived tax audit probability, digital tax transformation, and tax compliance behaviour within a game theory framework, distinguishing between voluntary and enforced compliance.
Method: a quantitative research design was employed, analysing survey data from 485 individual taxpayers residing in Indonesia's Greater Jakarta Area. The proposed research model was tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine both direct and mediating relationships amongst key variables, thereby ensuring a rigorous assessment of the hypothesised framework.
Results: findings reveal that omnichannel taxation significantly drives digital transformation and enhances voluntary compliance, highlighting its role in building trust and convenience. In contrast, perceived audit probability exerts a strong effect on enforced compliance, consistent with deterrence theory. Furthermore, digital transformation mediates the relationship between omnichannel taxation and voluntary compliance, demonstrating the importance of technological adoption in shaping behavioural outcomes. Together, these findings indicate that voluntary and enforced compliance represent complementary rather than competing mechanisms in the digital tax environment.
Conclusion: theoretically, this study advances the application of game theory in taxation by showing an evolution from zero-sum to positive-sum dynamics in compliance behaviour. Practically, tax authorities should prioritise improving error-prevention features, enabling seamless cross-platform integration, and adopting pre-filled tax returns to stimulate voluntary compliance and strengthen taxpayer trust.

Keyword: Omnichannel Taxation; Digital Transformation; Audit Probability; Game Theory; Tax Compliance.

RESUMEN

Introducción: a medida que la fiscalidad omnicanal mejorada por la inteligencia artificial se vuelve cada vez más frecuente en el panorama de la administración digital, es esencial comprender su influencia en el comportamiento de cumplimiento de los contribuyentes, especialmente en las economías emergentes, donde las iniciativas fiscales digitales aún están en evolución.

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Objetivo: este estudio investiga las interacciones estratégicas entre la fiscalidad omnicanal, la probabilidad percibida de auditoría fiscal, la transformación fiscal digital y el comportamiento de cumplimiento fiscal dentro de un marco de teoría de juegos, distinguiendo entre el cumplimiento voluntario y el cumplimiento forzoso.
Método: se empleó un diseño de investigación cuantitativo, analizando los datos de una encuesta realizada a 485 contribuyentes individuales residentes en el área metropolitana de Yakarta, en Indonesia. El modelo de investigación propuesto se probó utilizando el modelo de ecuaciones estructurales de mínimos cuadrados parciales (PLS-SEM) para examinar las relaciones directas y mediadoras entre las variables clave, garantizando así una evaluación rigurosa del marco hipotético.
Resultados: los resultados revelan que la tributación omnicanal impulsa significativamente la transformación digital y mejora el cumplimiento voluntario, lo que pone de relieve su papel en la creación de confianza y comodidad. Por el contrario, la probabilidad percibida de una auditoría ejerce un fuerte efecto sobre el cumplimiento obligatorio, en consonancia con la teoría de la disuasión. Además, la transformación digital media la relación entre la tributación omnicanal y el cumplimiento voluntario, lo que demuestra la importancia de la adopción de la tecnología en la configuración de los resultados conductuales. En conjunto, estos resultados indican que el cumplimiento voluntario y el cumplimiento obligatorio representan mecanismos complementarios y no competitivos en el entorno fiscal digital.
Conclusión: desde el punto de vista teórico, este estudio promueve la aplicación de la teoría de juegos en la fiscalidad al mostrar una evolución de la dinámica de suma cero a la de suma positiva en el comportamiento de cumplimiento. En la práctica, las autoridades fiscales deberían dar prioridad a la mejora de las funciones de prevención de errores, permitir una integración perfecta entre plataformas y adoptar declaraciones de impuestos prellenadas para estimular el cumplimiento voluntario y reforzar la confianza de los contribuyentes.

Palabras clave: Fiscalidad Omnicanal; Transformación Digital; Probabilidad de Auditoria; Teoría de Juegos; Cumplimiento Fiscal.

INTRODUCTION

The digital era has fundamentally changed the landscape of global tax administration.[1,2] A number of countries have successfully implemented tax digitization, which has been proven to increase administrative efficiency and tax revenue ratios.[3,4] Digital transformation also helps overcome time and space barriers, while increasing the efficiency of tax transactions.[5] On the other hand, perceptions of the power of tax authorities have been shown to contribute significantly to compliance in developing countries.[6]

Indonesia faces serious challenges in the process of tax modernization. Although the government has rolled out a digitalization initiative through the CoreTax program, its implementation has been delayed. Indonesia's tax ratio is only 8,3 % of GDP, far below the ASEAN average of 13,8 % and the international standard of 15–20 %.[7] In addition, the level of compliance among individual taxpayers, especially in the use of digital platforms, remains low.[3] This condition shows a gap between the ambition of digitalization and its realization in the field.

Previous studies show that tax compliance research is still dominated by two main frameworks, namely deterrence theory [8,9] and the slippery slope framework.[10,11] Both highlight the role of trust and power, but have fundamental limitations in explaining the strategic nature of interactions between tax authorities and taxpayers in the digital age.[12] For example, the slippery slope framework fails to capture the strategic dimension when taxpayers take into account the probability of audits or the enforcement strategies of tax authorities.

In addition, there is ambiguity in understanding how digitization affects perceptions of audit probability. Several studies assert that technology adoption reduces oversight costs and increases audit capacity.[13,14] However, the strategic mechanisms by which digital technology changes taxpayers' risk calculations have rarely been explored.[5]

Omnichannel taxation encompasses the integration and consistency of tax service delivery across multiple channels (web portals, mobile applications, physical tax offices, and telephone services), whereas digital tax transformation pertains to the utilization of digital technologies to facilitate tax calculation, reporting, and notification processes.[15] The concept of omnichannel taxation is also still very limited in the literature. Most studies only discuss single channels, such as e-filing or mobile applications, without examining cross-platform integration.[16,17] In fact, the omnichannel approach has the potential to expand access, improve user experience, and strengthen the legitimacy of tax institutions.[18]

Digital tax transformation is generally studied in a partial manner. Previous studies have focused more on specific technologies (e.g., e-billing, e-invoicing), while multidimensional aspects such as process optimization, behavioral changes, and long-term policy implications have not been thoroughly examined.[19] Thus, there is a gap in the literature that needs to be filled with a comprehensive perspective.

In the digital context, the interaction between taxpayers and tax authorities resembles a strategic game. Taxpayers decide their level of compliance by considering the possibility of audits, fines, and the benefits of using digital channels, while tax authorities design surveillance and technology strategies by considering taxpayer behavior.[20,21] Game theory allows for a formal analysis of this interdependence, for example through the concepts of dominant strategies, Nash equilibria, or payoff matrices.[22]

This approach is stronger than conventional frameworks because it can explain the dynamics of long-term strategies and adaptive responses of both parties in the digital taxation ecosystem.[23,24,25] The urgency of this research is driven by several key factors. First, Indonesia's low tax ratio limits its fiscal capacity to provide essential public services. Second, the delay in CoreTax and the slow rate of digital adoption increase the risk of falling behind other ASEAN countries. Third, the acceleration of global digital transformation after the COVID-19 pandemic makes immediate adaptation a necessity.[5] Fourth, the limited literature on omnichannel taxation and digital-based audit perceptions creates policy uncertainty.

Therefore, this study aims to analyze the strategic interaction between omnichannel taxation, perceived tax audit probability, and the digital tax compliance behavior of individual taxpayers using a game theory framework. The focus is to explore how digital transformation mediates the relationship between these factors and tax compliance, both voluntary and enforced.

Based on a literature review and theoretical arguments, this study formulates a number of hypotheses. These hypotheses are constructed to capture direct, mediating, and strategic interaction effects within a game theory framework, thus remaining empirically relevant and consistent with the methodological approach.

H1a: omnichannel taxation has a positive effect on voluntary tax compliance.

H1b: omnichannel taxation has a positive effect on coercive tax compliance.

H1c: omnichannel taxation has a positive effect on digital tax transformation.

H2a: the perceived probability of a tax audit has a positive effect on voluntary tax compliance.

H2b: the perceived probability of a tax audit has a positive effect on coercive tax compliance.

H2c: perceived probability of tax audit positively affects digital tax transformation.

H3a: digital tax transformation positively affects voluntary tax compliance.

H3b: digital tax transformation positively affects compulsory tax compliance.

H4a: digital tax transformation mediates the relationship between omnichannel taxation and voluntary tax compliance.

H4b: digital tax transformation mediates the relationship between omnichannel taxation and enforced tax compliance.

H4c: digital tax transformation mediates the relationship between perceived audit probability and voluntary tax compliance.

H4d: digital tax transformation mediates the relationship between perceived audit probability and enforced tax compliance.

METHOD

This research is a quantitative study with an observational analytical survey approach that aims to analyze the influence of omnichannel taxation, digital tax transformation, and perceived tax audit probability on voluntary tax compliance and enforced tax compliance within the framework of game theory of tax compliance. This study is non-experimental with a cross-sectional design, in which data is collected in a specific period without direct intervention. The location of the study is the Greater Jakarta Metropolitan Area, which was chosen because it has a high internet penetration rate, the largest concentration of taxpayers in Indonesia, and its status as a pilot area in the implementation of a digital taxation system. Data collection was carried out from April to July 2024.

The research population included all individual taxpayers in Indonesia, with a sample size of 485 respondents obtained through purposive sampling. Inclusion criteria were established to ensure the relevance of respondents to the research context, including: registered taxpayers with an active Taxpayer Identification Number (NPWP), active users of digital taxation platforms such as e-filing or e-billing in the last two years, at least 18 years of age, and having reported their Annual Tax Return (SPT) online. Respondents who provided incomplete or inconsistent answers were excluded from the analysis. The purposive sampling technique was chosen because it was relevant to the research objectives, although it was acknowledged that it could limit the generalization of the findings.

Details of the research instrument are presented in table 1. The research instrument was a structured questionnaire with a 7-point ordinal scale (1 = strongly disagree to 7 = strongly agree). All constructs were adapted from previous literature and had undergone preliminary testing to ensure the clarity of the questions. The reliability of the instruments was tested using Cronbach's Alpha, rho_A, and composite reliability, while convergent validity was examined through the average variance extracted (AVE) value. The data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with a bootstrapping technique of 5,000

samples to test direct relationships and mediating effects. Potential method-specific biases were controlled using Harman's single factor test, while multicollinearity was evaluated using the variance inflation factor (VIF).

Table 1. Research instruments

No	Variable	Operational Definition	Measurement	Scale
1	Voluntary Tax Compliance (VTC)	Tax compliance carried out voluntarily without coercion is based on taxpayers' awareness of their tax obligations. Appiah et al.[26]; Pangesti et al.[27]	VTC1: Paying taxes voluntarily without coercion. VTC2: Reporting income accurately to the tax authorities. VTC3: Keeping all business documents for accurate determination of tax payable.	Ordinal (1-7)
2	Enforced Tax Compliance (ETC)	Tax compliance arising from external pressures, such as audits, sanctions, or fear of punishment. da Silva et al.[8]	ETC1: Paying taxes because they feel compelled to do so. ETC2: Paying taxes because the DGT frequently conducts audits. ETC3: Paying taxes even though they don't really want to. ETC4: Paying taxes because the tax office frequently conducts audits. ETC5: Paying taxes because they are sure they will be audited. ETC6: Paying taxes because the penalties for tax evasion are very severe. ETC7: Paying taxes because they don't know how to evade taxes without attracting attention. ETC8: Paying taxes after thinking long and hard about legal ways to save on taxes.	Ordinal (1-7)
3	Digital Tax Transformation (DTT)	The use of digital technology by the DGT to facilitate tax administration, reporting, and supervision processes. Meita & Malau[28]; Purity et al.[18]	DTT1: Easy-to-use tax application for calculating and reporting taxes. DTT2: Electronic tax deduction certificates are available. DTT3: The DGT provides digital notifications regarding tax obligations. DTT4: The DGT system is capable of detecting reporting discrepancies. DTT5: Digital systems help reduce calculation errors. DTT6: Digital transformation reduces compliance costs.	Ordinal (1-7)
4	Omnichannel Taxation (OT)	An integrated tax service system through various channels (online, applications, tax offices, telephone) that is consistent and complementary. Cahyadini et al.[3]	OT1: Access services through various channels as needed. OT2: Consistent tax information across all channels. OT3: Start the process on one channel and complete it on another. OT4: Integration of tax data from various sources. OT5: Consultation services available on various integrated channels. OT6: Personalized tax services according to your needs. OT7: The system facilitates access, reporting, and payment anytime, anywhere.	Ordinal (1-7)
5	Perceived Tax Audit Probability (TAP)	Taxpayers' perceptions of the likelihood of being audited by the tax authorities based on personal experience and observations of their surroundings. Djajanti[13]; Karakostas & Zizzo[14]	TAP1: Feeling that noncompliance is likely to be detected. TAP2: Believing that the DGT system is capable of detecting reporting inaccuracies. TAP3: Based on personal/environmental experience, audits are often conducted.	Ordinal (1-7)

RESULTS

Descriptive Statistics of Respondents

This study involved 485 respondents. Based on gender, the majority were female (51,8 %), while 48,2 %

were male. Most respondents were aged 18–35 years (53,0 %), followed by 36–55 years (39,4 %), and above 55 years (7,6 %). In terms of education, the majority had a bachelor's degree (57,3 %), followed by a postgraduate degree (16,5 %), a diploma (14,2 %), and a high school diploma or equivalent (11,1 %). The most commonly used tax return form was Form 1770 (42,1 %), followed by 1770 S (34,0 %) and 1770 SS (23,9 %). In terms of annual income, the majority were in the range of IDR 60-250 million (50,5 %), followed by ≤IDR 60 million (23,9 %), IDR 250-500 million (20,4 %), and >IDR 500 million (5,2 %).

Regarding employment status, the majority of respondents were private employees (39,0 %) and civil servants/state-owned enterprises/TNI-Polri (33,6 %), while the rest were entrepreneurs (18,1 %), professionals (7,0 %), and retirees (2,3 %). The majority filed their taxes independently through e-Filing/e-Form/e-SPT (53,4 %), while the rest used the help of the tax office (24,3 %), dropbox/tax corner (11,5 %), and tax consultants (10,7 %). The frequency of using the omnichannel digital tax platform was dominated by 1-2 times per year (59,4 %), followed by 3-5 times (24,5 %), more than 5 times (8,0 %), and never (8,0 %).

Correlation analysis between variables

A correlation analysis between latent variables was conducted to test the strength and significance of the relationships in the research model. The test results are shown in table 2.

Table 2. Correlation analysis between variables

Correlation Path	r	SE	t-value	p-value	95 % CI
ETC ⇔ DTT	0,235	0,050	4,737	< 0,001	[0,137, 0,333]
OT ⇔ DTT	0,790	0,036	22,149	< 0,001	[0,720, 0,860]
OT ⇔ ETC	0,298	0,046	6,498	< 0,001	[0,208, 0,388]
TAP ⇔ DTT	0,498	0,054	9,214	< 0,001	[0,392, 0,604]
TAP ⇔ ETC	0,528	0,042	12,445	< 0,001	[0,445, 0,611]
TAP ⇔ OT	0,509	0,052	9,866	< 0,001	[0,407, 0,611]
VTC ⇔ DTT	0,575	0,058	9,924	< 0,001	[0,461, 0,689]
VTC ⇔ ETC	0,146	0,052	2,787	0,005	[0,044, 0,248]
VTC ⇔ OT	0,618	0,051	12,157	< 0,001	[0,518, 0,718]
VTC ⇔ TAP	0,363	0,059	6,180	< 0,001	[0,247, 0,479]

Notes: r = correlation coefficient; SE = standard error; CI = confidence interval.

Based on table 2, the analysis results show that all correlations between latent variables in the research model are positive and statistically significant. The strongest correlation was found between OT and DTT (r = 0,790; p < 0,001), indicating a very strong relationship between the two constructs. Strong correlations were also observed between VTC and OT (r = 0,618; p < 0,001) and between VTC and DTT (r = 0,575; p < 0,001). Meanwhile, moderate correlations were found in the relationships between TAP and ETC (r = 0,528; p < 0,001), TAP and OT (r = 0,509; p < 0,001), and TAP and DTT (r = 0,498; p < 0,001). Relatively weaker correlations, although still significant, were observed between VTC and TAP (r = 0,363; p < 0,001), OT and ETC (r = 0,298; p < 0,001), ETC and DTT (r = 0,235; p < 0,001). The lowest correlation was found between VTC and ETC (r = 0,146; p = 0,005), but it was still significant at the 95 % confidence level. In addition, all t-statistic values ranged from 2,787 to 22,149, indicating adequate statistical power for all correlation relationships. The 95 % confidence intervals for all correlations also did not include the value zero, further strengthening the statistical significance of the results obtained.

Table 3. Model Quality and Statistical Significance Assessment

Construct	R-Square	R-Square Adjusted	T Statistics	P Values	Interpretation
Digital Tax Transformation (DTT)	0,637	0,636	11,861	0,000	63,6 % variance explained; highly significant
Voluntary Tax Compliance (VTC)	0,403	0,399	6,137	0,000	39,9 % variance explained; highly significant
Enforced Tax Compliance (ETC)	0,287	0,283	6,242	0,000	28,3 % variance explained; highly significant

The results of the model quality analysis (table 3) show that Digital Tax Transformation (DTT) has the highest

explanatory power with an Adjusted R-Square value of 0,636, indicating that 63,6 % of the variance in this construct is explained by the exogenous construct. This construct also shows the strongest statistical support with a t-statistic value of 11,861 and a P-value of 0,000, which is highly significant.

Voluntary Tax Compliance (VTC) shows moderate explanatory power of 39,9 %, with a T statistic value of 6,137 and a P value of 0,000, while Enforced Tax Compliance (ETC) has the lowest explanatory power of 28,3 %, but still shows strong statistical significance with a T statistic of 6,242 and a P value of 0,000. The minimal difference between the R-Square and Adjusted R-Square values across all constructs confirms that the model maintains good parsimony without experiencing overfitting issues.

Bootstrapping Analysis

To test the statistical significance of parameter estimates in the model, a bootstrapping procedure was performed with random resampling. This method allows for the calculation of empirical distributions of sample statistics, resulting in more accurate T-statistics and P-values, even when the assumption of data normality is not met. The bootstrapping results provide additional evidence regarding the reliability and stability of parameter estimates, while also strengthening the inferential validity of the model. All constructs analyzed showed T-statistics exceeding the critical value of 1,96 and P-values < 0,001, confirming that the relationships between constructs are statistically significant and not coincidental. The test results are shown in figure 1.

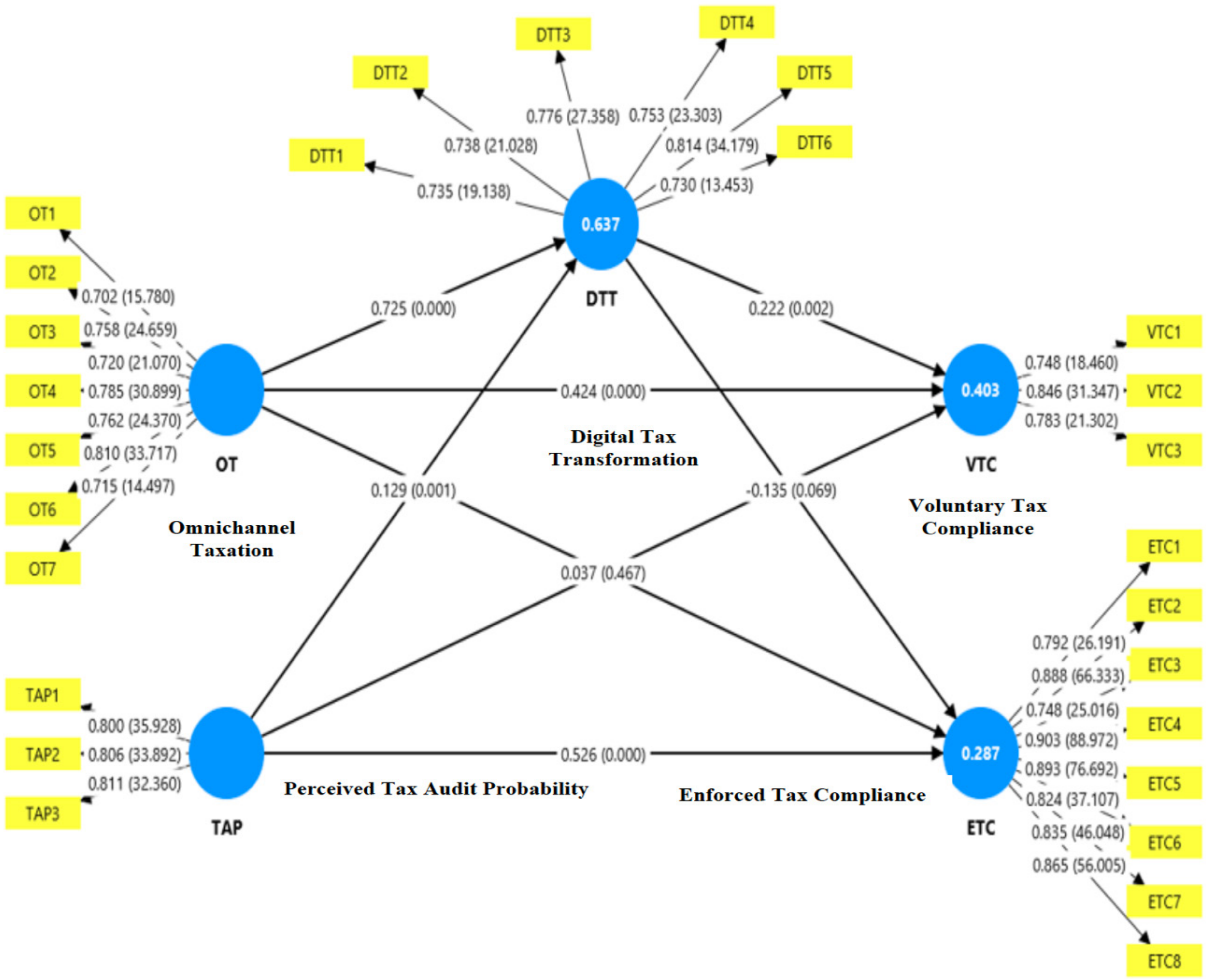

Figure 1. Bootstrapping Analysis

Figure 1 shows the structural model of the study that illustrates the causal relationships between the five main constructs in the digital taxation system: Omnichannel Taxation (OT), Perceived Tax Audit Probability (TAP), Digital Tax Transformation (DTT), Voluntary Tax Compliance (VTC), and Enforced Tax Compliance (ETC). Each construct is measured through reflective indicators with outer loadings ranging from 0,702 to 0,903, while the R^2 value shows the explanatory power of the endogenous constructs: DTT (0,637), VTC (0,403), and ETC (0,287).

The hypothesis testing results show that omnichannel taxation has a positive and significant effect on digital tax transformation (H1c) and voluntary tax compliance (H1a), while its effect on enforced tax compliance

(H1b) is not significant. In other words, OT is more effective in promoting digital transformation and voluntary compliance than enforced compliance. Perceived tax audit probability (TAP) was found to have a positive effect on digital tax transformation (H2c) and enforced compliance (H2c), but was not significant for voluntary compliance (H2a). This indicates that the perception of audit risk primarily drives enforced compliance and digital transformation, but has less influence on voluntary taxpayer behavior.

Furthermore, digital tax transformation (DTT) has a positive effect on voluntary tax compliance (H3a), but its effect on enforced compliance (H3b) is not significant. These results confirm the role of DTT as the main driver of voluntary behavior compared to enforced compliance. Mediation analysis shows that DTT significantly mediates the relationship between OT → VTC (H4a) and TAP → VTC (H4c), but does not mediate the path to coercive compliance (H4b and H4d). In other words, digital transformation acts as a reinforcing mechanism for voluntary taxpayer behavior, while its influence on coercive compliance is relatively limited.

DISCUSSION

Game Theory is an analytical framework that studies strategic interactions between rational decision-makers in situations where the outcome for each player depends not only on their own decisions but also on the decisions of other players.[21] This research adopts Game Theory because this framework is capable of explaining the dynamic interaction between taxpayers and tax authorities in the digital ecosystem, unlike traditional frameworks that emphasize linear relationships.[29] Game Theory can accommodate the complexity of simultaneous decision-making in an omnichannel digital environment, explain the paradox of why high audit probability sometimes decreases voluntary compliance but increases enforced compliance, and provide a theoretical foundation for understanding how omnichannel taxation changes the payoff structure in the tax compliance game.[30] This framework comprehensively covers all research variables: Omnichannel Taxation and Perceived Tax Audit Probability as strategic variables that alter the payoff matrix, Digital Tax Transformation as the transmission mechanism that optimizes communication channels between players, and the dual endogenous variables Voluntary Tax Compliance and Enforced Tax Compliance that represent different strategic responses in the same game setting.[20,29] Game Theory allows for the analysis of how strategic interaction produces different equilibria: cooperation equilibrium (high voluntary compliance with low enforced compliance), deterrence equilibrium (low voluntary compliance with high enforced compliance), or mixed strategy equilibrium depending on the parameters of omnichannel taxation effectiveness and perceived audit probability.[31,32]

In the context of modern taxation, the interaction between tax authorities and taxpayers can be analogized as a complex strategic game, similar to chess, in which every policy move and taxpayer response determines the balance of power.[25,33,34] This study reveals how omnichannel strategies, audit perceptions, and digital transformation influence voluntary and enforced compliance behavior through strategic game mechanisms. From a game theory perspective, every decision made by taxpayers and tax authorities reflects cooperative or non-cooperative strategies, which ultimately form the equilibrium of the digital taxation system.

The results show that omnichannel taxation (OT) strategies significantly encourage digital tax transformation (H1a, coefficient 0,725). This reflects a Nash equilibrium, where system digitalization benefits both parties by reducing uncertainty and the risk of error. The highest response appears in the indicator of the system's ability to help avoid reporting errors (DTT5), confirming that taxpayers utilize technology as a strategic risk mitigation tool.[16,28,35] Additionally, the OT strategy encourages voluntary compliance (H1b, coefficient 0,424), reflecting the dominant strategy for taxpayers to choose cooperation because compliance costs decrease and the risk of error is reduced.[36,37] Conversely, OT does not significantly affect coercive compliance (H1c, rejected), indicating that taxpayers subject to coercive compliance remain in the direct deterrence mechanism and are not influenced by positive incentives such as ease of access or increased knowledge of the system.[8] From a game theory perspective, this confirms the existence of two distinct games: a voluntary cooperative game and a coercive game that only responds to threats.

Perceived probability of audit (TAP) was found to encourage digital transformation (H2a, coefficient 0,129), indicating taxpayers' adaptive strategies to minimize the risk of detectable errors. H2b is rejected, confirming that audits do not encourage voluntary compliance because voluntary cooperative behavior is intrinsic and not influenced by external threats, in line with the concept of a pre-selected cooperative strategy. Conversely, H2c is accepted (coefficient 0,526), indicating that the perception of effective audits functions as a credible threat, increasing forced compliance through a combination of technological surveillance and the threat of heavy sanctions, in line with the deterrence mechanism in non-cooperative games.[38,39]

Digital transformation was found to encourage voluntary compliance (H3a, coefficient 0,222), with the highest response to the system's ability to avoid errors (DTT5) and accurate income reporting (VTC2). This indicates a shift from a zero-sum to a positive-sum game, where technology creates a win-win situation between tax authorities and taxpayers.[36] Conversely, digitization does not encourage coercive compliance (H3b, rejected), which remains dependent on direct deterrence mechanisms, showing that technology is more

effective as a cooperative strategy instrument than a coercive strategy.

Mediation analysis shows that digital transformation mediates the influence of OT on voluntary compliance (H4a) and audit perception on voluntary compliance (H4c), creating a coherent strategic path: ease of access or audit awareness → technology adoption → increased voluntary compliance. This path illustrates the cascading effect in strategic games, where one strategy systematically triggers the next. Conversely, digital transformation does not mediate the path to coercive compliance (H4b and H4d rejected), confirming that coercive compliance is more influenced by direct deterrence than by the technological path.[40]

This study offers four significant innovations. First, it introduces omnichannel taxation as a new variable to overcome the limitations of previous studies, which mostly focused on the implementation of separate digital channels.[3,17] Although several studies have examined individual digital channels [16,35] these studies have failed to comprehensively integrate various points of interaction. This study fills that gap by defining omnichannel taxation as an integrated ecosystem that connects online platforms, mobile applications, physical offices, and communication channels.

Second, the development of the construct of perceived probability of tax audit in the context of digitalization goes beyond traditional deterrence approaches that focus solely on the actual frequency of audits.[10,14,41] Previous studies examined the perception of audit probability without considering how digital transformation affects taxpayers' risk assessment.[13] This study advances the field by developing a digitally contextual construct that captures how technology influences taxpayers' strategic compliance calculations.

Third, the exploration of digital tax transformation fills an important gap as previous research has rarely provided a comprehensive examination of this phenomenon. Previous studies have tended to focus on the isolated implementation of technology without examining broader transformational impacts.[18,19]

This study addresses these limitations by examining digital transformation holistically as a multidimensional construct that encompasses technology adoption, process optimization, and behavioral change. Fourth, the application of game theory to analyze individual taxpayer compliance is a significant methodological advancement in developing countries, where such approaches are still limited.

Traditional research has largely used the slippery slope or deterrence theory frameworks [8,9] which view relationships linearly and fail to capture strategic interdependence. This study bridges this gap by applying game theory modeling to understand strategic interactions in Indonesia's digital taxation ecosystem.

Overall, these findings underscore the complexity of modern tax strategy game dynamics, where digital transformation creates a new equilibrium that favors voluntary compliance through certain mediating pathways, while enforced compliance remains within traditional direct deterrence mechanisms. Omnichannel strategies and audit perceptions play a key role in shaping taxpayer behavior, while digital transformation functions as a mediating strategy tool for voluntary behavior, reflecting the evolution of the tax system from a zero-sum game to a positive-sum game. The limitations of this research include its limited geographical coverage, cross-sectional design, and potential self-reporting bias, so generalizations should be made with caution, and further studies are recommended to explore additional variables and other contexts.

CONCLUSIONS

This study reveals the strategic dynamics of Indonesia's digital taxation system using a game theory perspective. The results show that omnichannel taxation encourages digital transformation and voluntary compliance, while the perception of effective audits increases enforced compliance but does not affect voluntary compliance. Digital transformation has been proven to facilitate voluntary compliance through ease of access and taxpayer trust, but it does not affect coercive compliance, confirming that coercive compliance is more influenced by direct deterrence mechanisms. These findings illustrate the evolution from a zero-sum game to a positive-sum game, where digitization creates a Nash equilibrium that benefits taxpayers and tax authorities.

Practically, this research emphasizes the importance of a dual-track strategy, namely a combination of digitization for voluntary compliance and credible deterrence for enforced compliance. This strategy serves as a guide for tax authorities in modernizing taxation systems, especially in developing countries. This research also reinforces the theoretical contribution of game theory in explaining the strategic interaction between taxpayers and tax authorities in the digital age.

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AVAILABILITY OF DATA AND MATERIALS

The data used in this study was obtained through surveys and correspondence with individual taxpayers in the Greater Jakarta area, Indonesia. Access to raw data is available upon reasonable request through the Corresponding Author: Annathasia Puji Erasashanti.

FUNDINGS

The authors received funding support from the Ministry of Education, Culture, Research, and Technology based on Master Contract No. 111/C3/DT.05.00/PL/2025 dated May 28, 2025, and Subcontract No. B/623/UN43.9/PT.00.03/2025 dated June 10, 2025.

CONFLICT OF INTEREST

The authors declare that there are no potential conflicts of interest related to the research, writing, and/or publication of this article.

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