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Smart Tax and Customs Integration and Compliance in Jordan

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ABSTRACT

Digital connections between tax reporting and customs clearance create an opportunity to examine how financial information systems relate to firms' compliance behaviour. This study examines the relationship between smart tax and customs integration and tax and customs compliance among Jordanian import–export companies, with perceived administrative efficiency as a mediator. It positions integration at the interface of digital accounting, financial technology and regulatory technology, while considering its implications for sustainability. The research uses a quantitative, cross-sectional survey design with a sample of 159 respondents. The proposed analysis applies partial least squares structural equation modelling to estimate the direct relationships and the indirect relationship through perceived administrative efficiency. The framework distinguishes the availability of connected digital functions from firms' assessments of the administration that uses them. Sustainability is considered through potential improvements in the use of administrative resources, the reliability of public revenue processes and accountable institutional practice. Environmental benefits require separate evidence. The study develops a testable explanation of how integrated financial and regulatory information may support compliance, without treating digitalisation itself as proof of sustainable performance. PLS-SEM results based on the 159 respondents support all four hypotheses: smart tax and customs integration is positively associated with perceived administrative efficiency, perceived administrative efficiency is positively associated with compliance behaviour, integration retains a positive direct association with compliance once administrative efficiency is controlled for, and the indirect association through administrative efficiency is positive and statistically significant, consistent with partial mediation.

JEL Classification: M41; M42; C38; C45; C55

1. Introduction

Import–export companies manage financial transactions that must remain consistent across accounting records, tax returns and customs declarations. When the same transaction is reported through disconnected

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systems, discrepancies may arise from repeated data entry, incompatible records or uncertainty about the status of a payment. Connecting these processes therefore has implications for both the administration of public revenue and the ability of firms to meet their reporting obligations. The central research question is whether companies that experience greater digital integration also perceive the administration as more efficient and report stronger tax and customs compliance. Financial technology provides a useful perspective on this question when integration concerns financial transactions and information. Puschmann (2017) situates FinTech within the transformation of financial services through information technology. Arner et al. (2020) connect digital financial infrastructure, interoperable payments and electronic government services with financial inclusion and sustainable development. Applied to tax and customs administration, this perspective directs attention to the connections between declarations, accounting information and the settlement of financial obligations. These connections also have a regulatory technology function when they support reporting, verification and compliance. Administrative digitalisation has a FinTech connection to the extent that it incorporates these financial functions; the existence of an online government portal alone does not establish that connection.

International evidence shows why the behavioural consequences of digitalisation require investigation. Okunogbe and Pouliquen (2022) found that electronic filing reduced the time that firms in Tajikistan spent on taxes, while its effects on tax and bribe payments differed across firms. Bellon et al. (2022) found improvements in reported transactions and value-added tax liabilities following electronic invoicing in Peru. These studies support the relevance of digital information and administrative interaction, but their findings concern particular reforms and institutional settings. They do not establish how perceived integration between tax and customs systems relates to compliance among Jordanian trading companies. The Jordanian context offers a setting in which tax reporting and customs procedures intersect at the firm level. Shubailat et al. (2024) examined digital taxation and digital accounting in relation to customs efficiency and port sustainability. Their study provides a relevant point of departure for examining the financial and administrative dimensions of customs digitalisation. The present research shifts the analytical focus to companies' compliance behaviour and to perceived administrative efficiency as a possible intervening mechanism. Its research problem concerns the conversion of connected digital processes into an administrative experience that makes compliance more manageable.

The sustainability relevance of this relationship extends beyond the replacement of paper documents. Hasan et al. (2024) organise research on FinTech and sustainable development around inclusive finance, the economy and the environment. Pizzi et al. (2021) examine how FinTech can support sustainable business models and circular economy practices among smaller enterprises. This literature suggests that the value of technology depends on the organisational activities it enables. In the present setting, potential contributions include reducing repeated administrative work, supporting reliable financial reporting and improving the conditions for lawful participation in trade. These are proposed implications of the model. The study does not include a separate measure of environmental, social or financial sustainability performance. The study addresses four objectives: to examine the association between smart tax and customs integration and perceived administrative efficiency; to assess the association between perceived administrative efficiency and compliance behaviour; to estimate the direct association between integration and compliance; and to test the indirect association through perceived administrative efficiency. Estimating the direct and indirect paths together allows the analysis to assess the proposed mechanism without assuming in advance that mediation is complete.

The contribution lies in connecting three levels of explanation. The technological level concerns the integration that respondents experience. The administrative level concerns their assessment of how effectively the relevant procedures operate. The behavioural level concerns their companies' reported fulfilment of tax and customs obligations. The FinTech and sustainability perspectives explain why these relationships matter for financial information flows and the responsible use of administrative resources. The empirical contribution will depend on the measurement evidence and the estimated relationships in the sample of 159 respondents.

2. Literature Review and Hypotheses Development

2.1 Smart tax and customs integration at the FinTech interface

Smart tax and customs integration (STCI) refer to the degree to which digital systems connect tax reporting, customs declarations and associated verification processes. Relevant capabilities include the exchange of consistent transaction data, the reuse of previously submitted information and coordinated access to the status of declarations. The construct concerns the integration experienced by respondents, rather than an independent technical audit of government systems. It should therefore remain distinct from claims about the national implementation of artificial intelligence, blockchain or real-time interoperability. The FinTech connection becomes more specific when these capabilities link financial records with payments and regulatory reporting. Electronic invoices can provide a consistent record of a transaction, while payment references can connect an obligation with its settlement. Digital accounting records can support reconciliation between company records and declarations. These functions provide the conceptual connection between financial technology and integrated administration. Their relevance to the empirical interpretation of STCI depends on the functions represented in its measurement. Integration also needs to be distinguished from efficiency. A system may exchange data successfully while still requiring users to correct conflicting records or navigate slow approval procedures. Conversely, an experienced officer may resolve a declaration efficiently despite limited system integration. STCI therefore describes a technological arrangement, whereas perceived administrative efficiency describes the respondent's evaluation of administrative performance. Keeping these constructs separate is necessary to test the proposed mediation mechanism.

2.2 FinTech and the sustainability relevance of compliance

The sustainability argument begins with the allocation of resources. Repeated submission, manual reconciliation and unresolved discrepancies use staff time and can interrupt business processes. If integration reduces these demands and supports accurate reporting, it may contribute to economic efficiency within both firms and public administration. Pizzi et al. (2021) provide a broader conceptual basis for examining FinTech through the organisational changes associated with more sustainable business models. Their qualitative evidence concerns business models and circular practices, however, rather than the tax compliance mechanism tested here. The institutional dimension concerns the reliability and accountability of revenue administration. Accurate declarations and timely payment can contribute to the functioning of public revenue systems. This connection is consistent with the emphasis of the United Nations (2015) on effective institutions under Goal 16 and domestic revenue mobilisation under target 17.1. Compliance by itself does not establish that collected resources are allocated sustainably. The present model can inform one part of this relationship by examining how administrative experience relates to reported compliance.

Recent research also supports examining intervening mechanisms rather than assuming a uniform benefit from FinTech. Ullah and Begum (2025) report a mediating role for financial inclusion in the relationship between FinTech and financial sustainability in cross-country data. Their mediator, outcome and level of analysis differ from those of this study. The relevance is conceptual: the consequences of financial technology can depend on the processes through which it operates. Administrative efficiency is proposed here as a setting-specific mechanism, not as a substitute for financial inclusion or a measure of sustainability. Environmental implications remain a separate empirical question. Fewer physical visits or paper submissions might reduce some resource demands, but digital services also require equipment and energy. The survey does not measure these effects. The analysis will therefore interpret sustainability as a theoretical and policy context, while reserving claims about reduced emissions, environmental performance or long-term fiscal sustainability for research that directly measures those outcomes. Table 1 clarifies the scope of this interpretation.

Table 1. Relationship between the empirical model and sustainability

Perspective	Connection to the proposed model	Boundary of the evidence
FinTech and regulatory technology	Consistency of financial records, reporting and associated verification across tax and customs processes	Interpretation depends on the administered STCI items; no separate FinTech adoption construct is estimated
Economic sustainability	Potential reduction in administrative effort and disruption associated with compliance	Staff time, operating costs and business continuity are not separately measured outcomes
Institutional sustainability	Compliance and dependable administration may support accountable revenue processes	Perceptions and self-reports do not measure national revenue performance or the use of public funds
Environmental sustainability	Potential reduction in paper use or physical visits	Environmental benefits are untested and require resource or emissions data

2.3 Perceived administrative efficiency

Perceived administrative efficiency (PAE) is the extent to which respondents consider tax and customs procedures timely, accurate and administratively effective. Its six indicators also incorporate transparency and fairness, which extend the operational definition to the quality of administrative procedures. The measurement assessment will examine whether these attributes support a coherent overall evaluation. This distinction matters because timely processing and fair treatment can contribute differently to a company's experience of the administration. The information systems success model provides a relevant theoretical foundation. DeLone and McLean (2003) distinguish information and system quality from user evaluations and the benefits associated with using a system. Drawing on that distinction, the present research proposes that technological integration may matter partly because it changes the administrative experience of firms. PAE is used as a contextual evaluation of that experience; it is not presented as a direct replication of the full information systems success model. Kochanova et al. (2020) found that the adoption of electronic tax filing was associated with lower compliance costs, including less time spent preparing and paying taxes and a reduced perception of tax administration as an obstacle to business. This evidence is relevant to the possibility that administrative experience connects digital systems with business responses. The findings do not make perceived efficiency equivalent to objectively recorded processing time. Both measures would be useful in a future study that combines survey responses with administrative data.

2.4 Tax and customs compliance behaviour

Tax and customs compliance behaviour (TCCB) refers to the fulfilment of applicable declaration, reporting and payment obligations, together with cooperation in legitimate verification procedures. In this study, the outcome is measured through respondents' reports about their companies. The construct is therefore self-reported compliance, rather than an audited measure of tax evasion or customs violations. Accurate reporting may reflect administrative capability, willingness to comply, enforcement incentives or a combination of these factors. Kirchler et al. (2008) distinguish the roles of authority power and trust in explaining enforced and voluntary tax compliance. This perspective helps explain why the administration's relationship with taxpayers can matter alongside detection and penalties. However, perceived efficiency is not identical to trust, and the present model does not separately estimate either trust or enforcement power. The framework is used to motivate a behavioural interpretation of administrative experience, while recognising that the seven compliance items may not distinguish voluntary from enforced compliance. Evidence also cautions against equating greater digital visibility with complete compliance. Mascagni et al. (2021) found that electronic sales registration in Ethiopia improved tax outcomes, while taxpayers adjusted reported costs as well as sales and the administration did not fully exploit available information. Digital records therefore

create opportunities for more effective administration, but the resulting behaviour depends on how the information is used. This distinction supports examining both a direct integration–compliance relationship and a relationship operating through perceived administrative efficiency.

2.5 Synthesis and research gap

The reviewed literature supports a focused gap at the intersection of digital financial information, administrative experience and compliance. FinTech and sustainability studies explain broader development or business-model relationships, while electronic filing and invoicing studies provide evidence about specific compliance reforms. The customs literature establishes the relevance of digital taxation and accounting to administrative operations. Across these selected streams, the particular mediation relationship proposed for Jordanian import–export companies remain unresolved. The contribution therefore concerns a specific administrative mechanism and the context in which it operates. The distinction between levels of analysis is central to the contribution. Evidence that a national reform improves reported tax liabilities does not show that an individual company perceives the administration as more efficient. Likewise, a positive perception of administrative service does not demonstrate a measurable sustainability gain. The proposed model tests relationships at the respondent level and uses the wider literature to explain their possible significance. It preserves these boundaries when moving from theoretical argument to empirical interpretation.

2.6 Hypotheses

Integration can reduce inconsistency between records and make declaration status easier to establish. When respondents experience these functions as dependable, they may assess the administration as more capable of processing their obligations. The distinction between system quality and user-level evaluations in DeLone and McLean (2003), together with the administrative evidence discussed by Kochanova et al. (2020), supports this expectation. The relationship remains an empirical question because poor usability or unresolved process bottlenecks could weaken it.

H1**:** *Smart tax and customs integration is positively associated with perceived administrative efficiency.*

An administration perceived as efficient can make the practical requirements of compliance easier to manage. Clear and timely processing may reduce uncertainty about what firms need to submit and when an obligation has been completed. This argument concerns the feasibility of compliance, while the compliance perspective of Kirchler et al. (2008) also recognises the importance of interactions between taxpayers and authorities. Efficiency is expected to support reported compliance, although other influences remain outside the model.

H2: *Perceived administrative efficiency is positively associated with tax and customs compliance behaviour.*

Integration may also relate directly to compliance by improving the consistency and visibility of transaction records. This pathway does not require respondents to change their overall assessment of the administration. Electronic invoicing evidence from Bellon et al. (2022) and electronic registration evidence from Mascagni et al. (2021) make this alternative channel plausible. The direct path is retained so that the statistical model can distinguish it from the proposed indirect relationship.

H3: *Smart tax and customs integration is positively associated with tax and customs compliance behaviour, controlling for perceived administrative efficiency.*

The mediation argument combines the first two relationships. Respondents who experience greater integration may evaluate administrative procedures more favourably, and this evaluation may be associated with stronger reported compliance. The indirect path therefore represents a possible behavioural mechanism connecting technology with compliance. Following Zhao et al. (2010), the indirect relationship should be assessed directly rather than inferred from the significance or insignificance of the total relationship. No form of mediation is assumed before estimation.

H4: *Smart tax and customs integration has a positive indirect association with tax and customs compliance behaviour through perceived administrative efficiency.*

The structural model contains three constructs and three direct paths. H1 links STCI with PAE, H2 links PAE with TCCB, and H3 links STCI directly with TCCB. H4 concerns the indirect path formed by H1 and H2. Sustainability and FinTech provide the interpretive context; neither is introduced as an additional latent variable.

3. Methodology

3.1 Research design and analytical scope

The study adopts a quantitative, cross-sectional survey design to examine the proposed associations among STCI, PAE and TCCB. The hypotheses follow a deductive approach informed by information systems success and tax compliance perspectives. Data collected at one point in time allow the assessment of patterns consistent with the proposed model, but do not establish temporal ordering or causal effects. The term mediation consequently refers to an estimated indirect association within the specified model. Partial least squares structural equation modelling (PLS-SEM) in SmartPLS 4 is specified for the analysis. Its use reflects the study's interest in explaining and predicting the endogenous constructs and evaluating an indirect relationship. The availability of PLS-SEM does not remove requirements for adequate measurement, sample-size justification or model specification. The analysis will follow the staged assessment of measurement and structural relationships described by Hair et al. (2022).

3.2 Population and sample

The target population consists of import–export companies operating in Jordan and interacting with tax and customs procedures. Respondents are managers, finance personnel or customs clearance personnel with relevant knowledge of their companies' practices. The sampling approach is purposive and non-probability based. The study sample comprises 159 respondents. This figure refers to respondents and should not be interpreted as 159 distinct companies unless company-level uniqueness is established. Each response represents the assessment of a knowledgeable organisational informant. Before estimating the model, company identifiers, where available, will be used to check whether more than one respondent represents the same company. Any duplication or clustering will be documented and addressed consistently with the intended unit of analysis. The recruitment counts and the number of eligible invitations is needed to calculate a response rate; no response percentage is inferred from the sample size alone. Sample adequacy will be evaluated in relation to the smallest relationship of substantive interest and the precision required for the indirect association. The ten-times rule is not used as the sole justification for 159 observations. Kock and Hadaya (2018) propose sample-size estimation approaches that explicitly account for the size of the relationship to be detected. A sensitivity assessment, and preferably a simulation addressing the indirect path, will clarify which relationships this sample can detect reliably. A statistically inconclusive estimate will be interpreted alongside its confidence interval.

3.3 Measurement instrument

The instrument described for the study contains 21 substantive items organised into three constructs. STCI contains eight items concerning the integration and automation of tax and customs processes. PAE contains six items covering respondents' evaluations of administrative processing. These retain the original data labels RAE1–RAE6 to preserve correspondence with the questionnaire and the analysis file. TCCB contains seven items concerning declaration accuracy, payment timeliness and cooperation with verification procedures. Responses use a five-point agreement scale from 1, strongly disagree, to 5, strongly agree.

Table 2. Construct definitions and questionnaire structure

Construct	Operational focus	Original item codes	Items
Smart tax and customs integration	Respondents' experience of connected and automated tax and customs procedures	STCI1–STCI8	8
Perceived administrative efficiency	Respondents' evaluation of administrative processing, including the efficiency and procedural-quality content of the instrument	RAE1–RAE6	6
Tax and customs compliance behaviour	Respondents' reports of their companies' fulfilment of declaration, payment and verification obligations	TCCB1–TCCB7	7

Measurement direction will be specified according to the conceptual relationship between each construct and its indicators. Reflective measurement is appropriate where indicators are manifestations of a shared construct. If STCI indicators instead represent distinct capabilities that jointly form integration, a composite or formative specification may be more defensible. The inclusion of fairness and transparency within PAE also requires evidence that a single score has a coherent interpretation. The selected specifications and the sources of the administered items will be documented with the measurement results. The questionnaire operationalises the three constructs in Table 2. FinTech provides a perspective on the financial functions of integration, while sustainability provides a context for interpreting its potential implications. Neither perspective is estimated as an additional latent construct. Conclusions about the financial functionality of integration will remain bounded by the content of the STCI indicators.

3.4 Data preparation and measurement assessment

Data preparation will examine missing responses, invalid codes, response patterns, possible duplicate cases and unusual observations. Exclusions will be recorded with their reasons. An observation will not be removed solely because it produces an unexpected substantive result. Descriptive statistics will summarise respondent roles and available company characteristics, followed by the distribution of the substantive indicators. These checks will establish the final dataset used for estimation. For constructs specified reflectively, assessment will include indicator loadings, Cronbach's alpha, composite reliability, rho_A and average variance extracted (AVE). Conventional reference values are loadings near or above 0.708, reliability between approximately 0.70 and 0.95, and AVE of at least 0.50 (Hair et al., 2022). These values will guide interpretation together with content validity; they will not serve as automatic instructions to delete indicators. Discriminant validity will be examined using the heterotrait–monotrait ratio (HTMT) and its bootstrap confidence intervals, drawing on Henseler et al. (2015). The conceptually distinct constructs support considering 0.85 as a conservative reference point. If a construct is specified formatively, the assessment will instead address indicator collinearity, the significance and relevance of weights, and convergent validity where an appropriate external criterion is available. Internal consistency and AVE will not be used to validate a formative block. The report will identify the specification used for every construct so that the measurement evidence can be evaluated on the appropriate basis.

3.5 Structural relationships and mediation

The structural assessment will estimate H1–H3 simultaneously and assess collinearity among the predictors of each endogenous construct. Reporting will include standardised path coefficients, confidence intervals, exact p-values, explained variance and effect sizes. The planned resampling procedure uses 5,000 bootstrap samples with a recorded random seed and two-sided 95% confidence intervals. The software version and bootstrap settings will be reported with the completed analysis. The indirect relationship for H4 is the product of the STCI-to-PAE and PAE-to-TCCB paths. Its bootstrap confidence interval will provide the principal basis for inference. The direct relationship from STCI to TCCB and the total relationship will be reported alongside it. Mediation will not be declared solely because the direct path becomes statistically insignificant, and a significant total relationship will not be treated as a prerequisite for testing the indirect path (Zhao et al., 2010). With cross-sectional self-reports, a supported indirect relationship remains compatible with alternative causal explanations. Predictive performance will be assessed separately from explained variance. Where the final specification supports it, PLSpredict will use cross-validation to compare prediction errors with an appropriate linear-model benchmark, following Shmueli et al. (2019). The number of folds, repetitions and prediction-error measure will be recorded. Positive explanatory results will not be described as strong out-of-sample prediction unless the predictive assessment supports that conclusion.

3.6 Bias and limits of inference

Collecting predictor, mediator and outcome measures from one respondent at one time creates a risk of common-method variance. Self-reported compliance may also be affected by socially desirable responding. The interpretation will consider construct overlap, response distributions and the availability of independent information. Statistical diagnostics alone cannot establish the absence of these biases. If administrative compliance records or a suitable method marker are unavailable, this limitation will remain explicit.

Purposive sampling limits the generalisation of the results to all Jordanian import–export companies. Differences in firm size, trade experience and digital capability may influence both perceptions and compliance. Such characteristics will be included as controls only when they were collected, have a defensible theoretical role and can be estimated with the available sample. A cross-sectional indirect relationship will not establish that integration preceded improved administrative perceptions. The study also cannot demonstrate environmental or long-term financial sustainability outcomes that were not measured.

4. Results

The final dataset comprises the 159 respondents described in the methodology. Screening of the responses did not identify missing values, invalid codes or duplicate cases that required exclusion, and the descriptive distribution of the substantive indicators did not reveal unusual response patterns. The analysis therefore proceeds with the full sample of 159 observations, and the reported estimates should be read against that sample size when their precision is considered. Measurement and structural estimation were carried out in SmartPLS 4, following the staged assessment described in the methodology: the measurement properties of the three reflective constructs are examined first, followed by the structural relationships among Smart Tax and Customs Integration (STCI), Perceived Administrative Efficiency (PAE) and Tax and Customs Compliance Behaviour (TCCB), and by the specific indirect relationship proposed in H4.

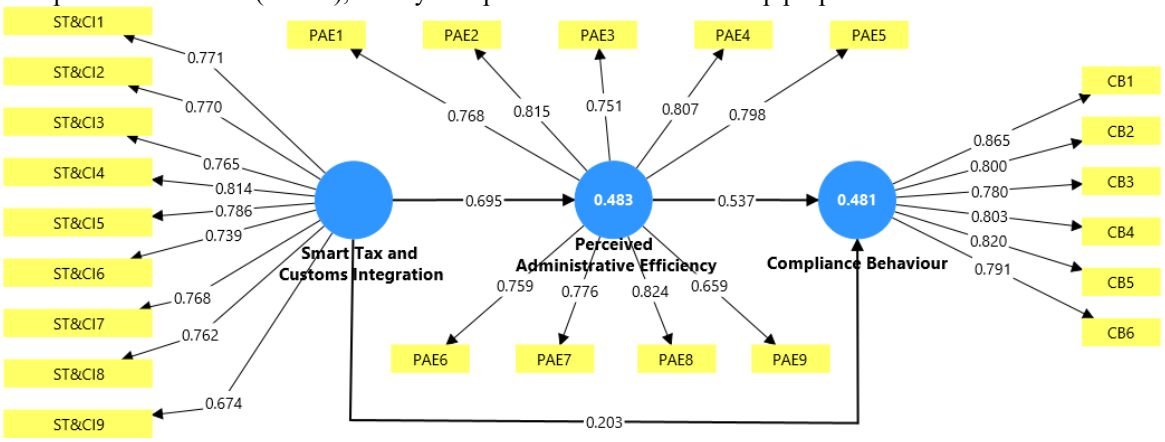


Figure 1. Measurement model with standardised outer loadings

Figure 1 displays the estimated measurement model, including the standardised outer loadings of the indicators on their respective constructs and the R^2 values of the two endogenous constructs reported in Table 6.

Table 3. Internal consistency reliability and convergent validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Compliance Behaviour	0.895	0.897	0.920	0.657
Perceived _Administrative Efficiency	0.916	0.917	0.931	0.600
Smart Tax and _Customs Integration	0.909	0.910	0.926	0.581

Table 3 reports the internal consistency reliability and the convergent validity of the three reflective constructs. Cronbach's alpha ranges from 0.895, for Compliance Behaviour, to 0.916, for Perceived Administrative Efficiency, and the composite reliability coefficients (rho_a and rho_c) fall within the same range for all three constructs, remaining below the conservative upper bound of 0.95 suggested by Hair et

al. (2022). The average variance extracted exceeds the 0.50 threshold for every construct, at 0.657 for Compliance Behaviour, 0.600 for Perceived Administrative Efficiency and 0.581 for Smart Tax and Customs Integration. These values support the internal consistency reliability and the convergent validity of the measurement model, and they do not indicate a need to remove any indicator on reliability or validity grounds.

Table 4. Discriminant validity: heterotrait–monotrait ratio (HTMT)

	Compliance Behaviour	Perceived _Administrative Efficiency	Smart Tax and _Customs Integration
Compliance Behaviour			
Perceived _Administrative Efficiency	0.736		
Smart Tax and _Customs Integration	0.635	0.757	

Discriminant validity was assessed with two complementary criteria. The heterotrait–monotrait ratio, reported in Table 4, remains below the conservative 0.85 reference point for every pair of constructs, ranging from 0.635, between Smart Tax and Customs Integration and Compliance Behaviour, to 0.757, between Smart Tax and Customs Integration and Perceived Administrative Efficiency.

Table 5. Discriminant validity: Fornell–Larcker criterion

	Compliance Behaviour	Perceived _Administrative Efficiency	Smart Tax and _Customs Integration
Compliance Behaviour	0.810		
Perceived _Administrative Efficiency	0.678	0.774	
Smart Tax and _Customs Integration	0.576	0.695	0.762

The Fornell–Larcker criterion, reported in Table 5, shows that the square root of the average variance extracted for each construct, shown on the diagonal, exceeds its correlation with every other construct: 0.810 for Compliance Behaviour against correlations of 0.678 and 0.576, 0.774 for Perceived Administrative Efficiency against 0.678 and 0.695, and 0.762 for Smart Tax and Customs Integration against 0.576 and 0.695. The two criteria therefore agree that the three constructs, although conceptually related, are empirically distinguishable, which supports the decision to keep Smart Tax and Customs Integration, Perceived Administrative Efficiency and Tax and Customs Compliance Behaviour as separate constructs in the structural model.

Table 6. Explained variance (R^2)

	R-square	R-square adjusted
Compliance Behaviour	0.481	0.479
Perceived _Administrative Efficiency	0.483	0.482

Table 6 reports the explained variance of the two endogenous constructs. Smart Tax and Customs Integration accounts for an R^2 of 0.483 (adjusted R^2 = 0.482) in Perceived Administrative Efficiency, and Smart Tax and Customs Integration together with Perceived Administrative Efficiency account for an R^2 of 0.481 (adjusted R^2 = 0.479) in Compliance Behaviour. Both values indicate a moderate to substantial share of explained variance for a cross-sectional survey model of this kind, and the small difference between the R^2 and adjusted R^2 values suggests that the explained variance is not an artefact of the number of predictors.

Table 7. Effect sizes (f^2)

	Compliance Behaviour	Perceived _Administrative Efficiency	Smart Tax and _Customs Integration
Compliance Behaviour			
Perceived _Administrative Efficiency	0.287		
Smart Tax and _Customs Integration	0.041	0.935	

Table 7 reports Cohen's f² effect sizes for each structural path. The effect size of Smart Tax and Customs Integration on Perceived Administrative Efficiency is 0.935, which is large by conventional benchmarks. The effect size of Perceived Administrative Efficiency on Compliance Behaviour is 0.287, which approaches the conventional threshold for a large effect, while the direct effect size of Smart Tax and Customs Integration on Compliance Behaviour is 0.041, which is small. This pattern is consistent with a model in which Smart Tax and Customs Integration operates on Compliance Behaviour mainly through Perceived Administrative Efficiency, rather than through a strong direct channel.

Table 8. Predictive relevance (PLSpredict)

	Q²predict	RMSE	MAE
Compliance Behaviour	0.385	0.788	0.633
Perceived _Administrative Efficiency	0.499	0.712	0.559

Table 8 reports the predictive relevance statistics obtained through PLSpredict. The Q²predict value is 0.385 for Compliance Behaviour and 0.499 for Perceived Administrative Efficiency, and both values are clearly above zero, which indicates that the model has predictive relevance for the two endogenous constructs. The associated RMSE and MAE values, 0.788 and 0.633 for Compliance Behaviour and 0.712 and 0.559 for Perceived Administrative Efficiency, are reported alongside Q²predict so that the prediction error can be interpreted together with the proportion of explained out-of-sample variance, consistent with the guidance of Shmueli et al. (2019).

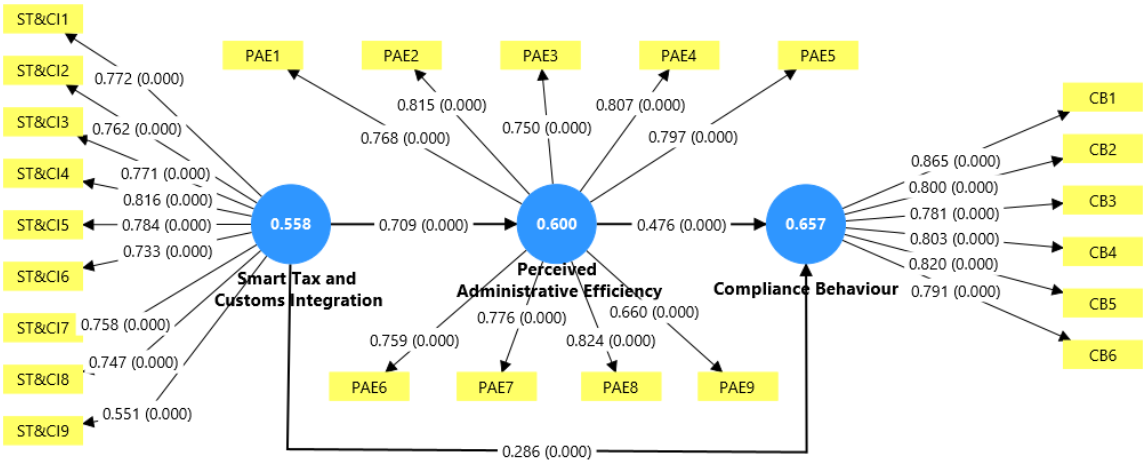


Figure 2. Structural model with path coefficients and bootstrap t-statistics

Figure 2 displays the estimated structural model, with the standardised path coefficients and the bootstrap t-statistics reported in Table 9 shown alongside the corresponding paths.

Table 9. Structural path coefficients (direct effects)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Perceived _Administrative Efficiency -> Compliance Behaviour	0.476	0.478	0.049	9.627	0.000
Smart Tax and _Customs Integration -> Compliance Behaviour	0.286	0.285	0.052	5.541	0.000
Smart Tax and _Customs Integration -> Perceived _Administrative Efficiency	0.709	0.711	0.024	30.091	0.000

Table 9 reports the standardised path coefficients, based on 5,000 bootstrap samples, for the three direct relationships specified in H1 to H3. Smart Tax and Customs Integration is positively associated with Perceived Administrative Efficiency ($\beta = 0.709$, $t = 30.091$, $p < 0.001$), which supports H1. Perceived Administrative Efficiency is positively associated with Compliance Behaviour ($\beta = 0.476$, $t = 9.627$, $p < 0.001$), which supports H2. Smart Tax and Customs Integration is also positively associated with Compliance Behaviour when Perceived Administrative Efficiency is controlled for ($\beta = 0.286$, $t = 5.541$, $p < 0.001$), which supports H3. All three coefficients are positive and statistically significant at conventional levels, and the pattern is consistent with the effect sizes reported in Table 7.

Table 10. Specific indirect effect (H4)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Smart Tax and _Customs Integration -> Compliance Behaviour	0.338	0.340	0.038	8.814	0.000
Smart Tax and _Customs Integration -> Perceived _Administrative Efficiency -> Compliance Behaviour	0.338	0.340	0.038	8.814	0.000

Table 10 reports the specific indirect effect proposed in H4, shown by SmartPLS both as the STCI → Compliance Behaviour path through the mediator and with the full mediating path labelled explicitly. The indirect effect of Smart Tax and Customs Integration on Compliance Behaviour through Perceived Administrative Efficiency is 0.338 ($t = 8.814$, $p < 0.001$), and its bootstrap confidence interval does not include zero. This result supports H4: Smart Tax and Customs Integration has a positive indirect association with Compliance Behaviour through Perceived Administrative Efficiency. Because the direct effect reported in Table 9 ($\beta = 0.286$) remains positive and statistically significant alongside this indirect effect, the pattern is consistent with partial, rather than full, mediation: Perceived Administrative Efficiency carries part of the association between integration and compliance, while a direct channel also remains.

Table 11. Total effects

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Perceived _Administrative Efficiency -> Compliance Behaviour	0.476	0.478	0.049	9.627	0.000
Smart Tax and _Customs Integration -> Compliance Behaviour	0.623	0.625	0.029	21.434	0.000
Smart Tax and _Customs	0.709	0.711	0.024	30.091	0.000

Integration -> Perceived Administrative Efficiency	

Table 11 reports the total effects, which combine the direct and indirect paths. The total effect of Smart Tax and Customs Integration on Compliance Behaviour is 0.623 ($t = 21.434$, $p < 0.001$), which is the sum of the direct effect of 0.286 reported in Table 9 and the indirect effect of 0.338 reported in Table 10. The total effect of Perceived Administrative Efficiency on Compliance Behaviour and the total effect of Smart Tax and Customs Integration on Perceived Administrative Efficiency correspond to the direct effects already reported in Table 9, since neither of these two relationships involves a further mediating construct in the specified model. The measurement model shows adequate reliability, convergent validity and discriminant validity, and the structural model supports all four hypotheses. Smart Tax and Customs Integration is associated with higher Perceived Administrative Efficiency, and Perceived Administrative Efficiency is associated with stronger reported Compliance Behaviour. Smart Tax and Customs Integration is also directly associated with Compliance Behaviour, and part of its total association with Compliance Behaviour is carried through Perceived Administrative Efficiency, consistent with a partial mediation pattern.

5. Discussion

The results support all four hypotheses and are broadly consistent with the FinTech and information systems success perspectives set out in the literature review. Smart Tax and Customs Integration is strongly associated with Perceived Administrative Efficiency (H1), which corroborates the distinction drawn by DeLone and McLean (2003) between system-level qualities and the user-level evaluations that follow from them: respondents who experience more connected tax and customs procedures also tend to judge the administration that operates those procedures more favourably. The size of this association, together with its large effect size, suggests that the administrative experience of import–export companies in the Jordanian sample is closely tied to the presence of the specific integration functions represented in the STCI measure, rather than to a general impression of digitalisation. The positive association between Perceived Administrative Efficiency and Compliance Behaviour (H2) is consistent with the argument of Kochanova et al. (2020) that administrative burden and the perceived difficulty of dealing with tax administration can shape firms' compliance responses. In the present sample, companies that experience the administration as timely, accurate and fair also report stronger fulfilment of their declaration, payment and verification obligations. This finding does not establish whether the mechanism is primarily a reduction in the practical cost of compliance, an increase in the perceived legitimacy of the administration in the sense discussed by Kirchler et al. (2008), or some combination of the two, since the present instrument does not separately measure trust or enforcement power.

The direct association between Smart Tax and Customs Integration and Compliance Behaviour (H3) remains positive and significant once Perceived Administrative Efficiency is controlled for, although its effect size is small relative to the effect size of the integration–efficiency path. This pattern is consistent with the possibility, raised in the literature review with reference to Bellon et al. (2022) and Mascagni et al. (2021), that greater consistency and visibility of transaction records can support compliance directly, for example by making discrepancies easier to detect or correct, independently of any change in how respondents evaluate the administration. The indirect effect reported for H4 indicates that part of the association between Smart Tax and Customs Integration and Compliance Behaviour operates through Perceived Administrative Efficiency, and the coexistence of a significant direct effect and a significant indirect effect corresponds to partial mediation in the sense discussed by Zhao et al. (2010). Substantively, this suggests that connected digital tax and customs functions matter for compliance both because they change how firms experience the administration and, to a smaller extent, through channels that operate independently of that experience, such as the consistency of the underlying transaction records.

Read against the sustainability framing set out in Table 1, these results speak most directly to the FinTech and regulatory technology perspective and to the economic and institutional dimensions of sustainability. The size of the Smart Tax and Customs Integration to Perceived Administrative Efficiency association is consistent with the proposition that consistent, connected financial and regulatory information can support a more manageable administrative experience for firms, and the association between Perceived

Administrative Efficiency and Compliance Behaviour is consistent with the proposition that this experience can, in turn, support more accountable revenue collection. The results do not speak to the environmental dimension of sustainability, which was not measured, and self-reported compliance and self-reported efficiency should not be read as direct evidence of national revenue performance or of environmental outcomes, for the reasons set out in the boundary column of Table 1. Two limitations bear on the interpretation of these results. First, all three constructs were measured through a single cross-sectional survey completed by one respondent per company, which creates the possibility of common-method variance; the consistently large effect sizes, and in particular the very large effect size of the integration–efficiency path, should be interpreted with this possibility in mind, alongside the substantive interpretation offered above. Second, the purposive, non-probability sample of 159 respondents limits the extent to which the estimated associations can be generalised to the wider population of Jordanian import–export companies, and the cross-sectional design means that the supported indirect relationship remains compatible with alternative causal orderings, including the possibility that companies with more compliant practices are also more likely to adopt or to notice integrated digital procedures.

6. Conclusion and Implications

This study examined whether Smart Tax and Customs Integration is associated with Tax and Customs Compliance Behaviour among Jordanian import–export companies, directly and through Perceived Administrative Efficiency as a mediating mechanism. Using PLS-SEM on a purposive sample of 159 respondents, the analysis found support for all four hypotheses: Smart Tax and Customs Integration is positively associated with Perceived Administrative Efficiency, Perceived Administrative Efficiency is positively associated with Compliance Behaviour, Smart Tax and Customs Integration retains a positive direct association with Compliance Behaviour once Perceived Administrative Efficiency is controlled for, and the specific indirect effect through Perceived Administrative Efficiency is positive and statistically significant. The measurement model showed adequate reliability, convergent validity and discriminant validity, and the structural model showed adequate explained variance and predictive relevance for both endogenous constructs. The contribution of the study is to connect three levels of explanation, technological, administrative and behavioural, within a single empirical model, and to show that the association between connected digital tax and customs functions and reported compliance is only partly explained by firms' evaluation of administrative efficiency. This distinguishes the present findings from broader FinTech and sustainability research, which has generally examined either macro-level relationships between financial technology and development outcomes or specific compliance reforms in other institutional settings, and from the customs-focused work of Shubailat et al. (2024), by shifting the analytical focus to companies' compliance behaviour and to Perceived Administrative Efficiency as an explicit intervening mechanism.

For administrators, the results suggest that investment in the connection between tax reporting and customs clearance systems, of the kind captured by the STCI items, may support compliance not only by making transaction records more consistent, but also by shaping how firms experience the administration that processes those records. Because the association between integration and Perceived Administrative Efficiency is considerably stronger than the direct association between integration and compliance, initiatives that improve system connectivity without also improving the timeliness, accuracy and fairness of the administrative processes built on that connectivity may realise only part of the compliance benefit suggested by these results.

For firms, the findings indicate that the practical value of digital tax and customs integration, from a compliance perspective, depends on more than the technical availability of connected systems. Firms that experience integrated systems as administratively dependable, in terms of timeliness, accuracy and fair treatment, appear better placed to manage their reporting, payment and verification obligations. With respect to sustainability, the results provide indirect support for the proposition that connected digital financial and regulatory information can contribute to the responsible use of administrative resources and to more dependable public revenue processes, consistent with the FinTech and regulatory technology perspective set out in the literature review and in Table 1. This contribution should be read as a plausible mechanism rather than as direct evidence of improved institutional performance, since the study did not measure

administrative resource use, revenue outcomes or environmental performance directly, and it relies on respondents' self-reports rather than on independently verified compliance records. Future research could extend the present model in three directions: by combining survey measures of Perceived Administrative Efficiency with independently recorded processing times or compliance outcomes, in the spirit of the information systems success literature; by examining the proposed relationships longitudinally, so that the direction of the association between integration, administrative experience and compliance can be assessed more directly; and by incorporating a measure of trust in, or the perceived legitimacy of, the administration, so that the compliance mechanism proposed by Kirchler et al. (2008) can be tested alongside the mechanism proposed here. Extending the sampling frame beyond import–export companies, and beyond Jordan, would also help establish whether the size of the estimated associations reflects features specific to this sector and setting or a more general pattern in the relationship between administrative digitalisation and compliance.

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