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Innovation, Digitalization and Technology Index (INDITEC)

*A tool for benchmarking Tax Administrations
at the international level*

(Based on data from ISORA 2020 Survey)



CIAT

Santiago Díaz de Sarralde Miguez
and Dalmiro Morán



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E xecutive summary

- Information and Communication Technologies (ICT) have reached a transcendental role in the operation of Tax Administrations. Proof of this are the studies carried out by multilateral organizations such as the Inter-American Development Bank (IDB), the Organization for Economic Cooperation and Development (OECD), the World Bank or the International Monetary Fund (IMF) in the analysis of the impacts caused by digitalization and new technologies in the area of tax administration. CIAT has been working with all of them within its scope of action as, for example, recently along with the IDB, in the development of a maturity index, the OECD and the IMF -together with other organizations such as Intra-European Organization of Tax Administrations (IOTA) and the Asian Development Bank- in the International Survey on Tax Administration (ISORA) or in the annual global survey on new technologies by the OECD's Forum of Tax Administrations, among other projects. In this regard, a new index about the implementation of new technologies in Tax Administrations is presented here, using the most recent public available data, with the aim of collaborating in the joint regional and global effort for improving these organizations responsible for tax management.
- As stated, this document presents the **Innovation, Digitalization and Technology Index (INDITEC)**. This new tool aims to provide a detailed and systemic picture of the status of tax collection agencies around the world in terms of the incorporation of technological innovations to improve tax compliance and statistical information management, the digital transformation of operational processes and the strategic orientation of available financial and human resources. To this end, it takes advantage of updated information from the **International Survey on Revenue Administration (ISORA)**, compiled in 2020 with data available for fiscal years 2018 and 2019.
- The construction of synthetic indices for benchmarking Tax Administrations (TA) firstly requires defining a series of methodological issues such as **the determination of certain analysis dimensions and the selection of the most representative variables**. This includes a brief

explanation of the statistical treatment of the different components of each index and of the strategy for aggregating all the elements into a global synthetic index.

- The **identified dimensions of analysis** (over which partial indices are calculated in each case) are four. The first is called “**Technological Innovation**” and includes variables referred to the effective use of innovative techniques and tools oriented to tax management such as data analytical science, cloud computing, artificial intelligence, distributed ledger technology (*Blockchain*), application programming interfaces (APIs), digital identification technologies, virtual assistants, whole-of-government identification systems, and robotic automation of processes.
- The second dimension is linked to the adoption of advanced tools aimed at the “**Compliance Improvement**” and encompasses variables related to the use/implementation of cooperative approaches specifically targeting large taxpayers, behavioral insight methodologies or techniques, mandatory implementation of electronic invoicing (for a group or all taxpayers), requirements for using electronic fiscal devices (for a group or all taxpayers), as well as the pre-filled tax returns by the own TAs (with different variants).
- The third dimension refers to the process of “**Operational Digitalization**” and is related to different indicators that illustrate the digital transformation of the main internal processes of TAs (registration, tax returns processing, payment of liabilities), especially those where the availability of digital means is considered a relative advantage over more traditional practices or methods. This includes electronic payment ratios, electronic filing ratios for the main taxes (Income Taxes and Value Added Tax), the effective use of digital contact channels for taxpayer services, and the availability of digital tax registration channels.
- A last dimension, called “**Resources and Budget**”, aims to reflect the availability and effective use of human and economic resources available to each TA. The included variables are the staff’s academic training or education (with undergraduate and graduate university degrees), the number of inhabitants and active taxpayers in Personal Income Tax per employee, the operating expenditures on ICT relative to the GDP and to the TA’s operating budget, the level of capital expenditures and the total budget (both as a percentage of GDP), and the recurrent cost of collection as a measure of the relationship between collected tax revenues and operating expenditures.

- Once the dimensions and variables to be used were defined (all based on data from ISORA 2020), **some statistical adjustments were done to ensure a homogeneous and proportional weighting of each one of them**. In some cases, the data were normalized with a standard procedure in order to construct four indices, one for each dimension. **The aggregation procedure for the INDITEC index** was then carried out by assigning an equivalent relative weight to each of the partial indices. The resulting equation, for each country “*i*” (156) at time “*t*” (2019), is as follows:

$$INDITEC_{it} = \frac{1}{4} \times Innovation_{it} + \frac{1}{4} \times Compliance_{it} + \frac{1}{4} \times Digitalization_{it} + \frac{1}{4} \times Resources_{it}$$

- The overall results for the entire universe of the 156 countries participating in ISORA 2020** are reflected in lower average indices in the area of technological innovation (0.37) -a relatively wider scope for future improvements-, somewhat higher as regards the incorporation of tools to combat tax non-compliance (0.46) and digital transformation of TAs’ internal operations (0.46), with a better relative performance in the area of resources and budget (0.61). The INDITEC index for the “ISORA universe” stands at 0.48 with (available) data corresponding to fiscal year 2019, with a response rate -for the 29 selected variables- of around 91%.
- The analysis by different country groupings shows some interesting results. For example, the **calculated averages when disaggregating data by geographic region** reveal large gaps in terms of the use/implementation of innovative instruments for tax management and also in terms of progress in operational digitalization. In the four dimensions, the best performing regions are North America, Europe and Central Asia, and the Middle East and North Africa; Latin America and the Caribbean appears one step below except for the dimension referring to the availability and management of resources and budget, where it reaches a value close to the average of the regions composed of more developed countries or jurisdictions.
- Following the World Bank’s classification criteria, a clear positive association is detected where the **average values of all indices increase with the level of income** and reach their maximum in the group of High Income countries. The gaps are most noticeable with regard to the dimensions of technological innovation and operational digitalization. The conglomerate of CIAT member countries shows a better performance in all four dimensions compared to the countries that participated in ISORA 2020 and to those that are not members of this institution (Non-CIAT). Something similar can

be observed for the OECD countries as a whole (compared to non-members of the organization) with even more significant differences between them.

- All these general trends are confirmed **when the indices are aggregated by dimension (with equivalent weights) and combined in the INDITEC synthetic index**. By region, while some of them show average values above the global average (0.48), Latin America and the Caribbean appears slightly below (0.47) and other regions appear lagging far behind. By income level, there is a clear positive relationship, with a very significant gap between Low Income (0.30) and High Income (0.59) groups of countries. The groups of CIAT and the OECD member countries show much higher INDITEC averages than the rest of the jurisdictions.
- From the construction of the INDITEC index for the countries participating in ISORA 2020, an individual ranking was obtained (see the Statistical Appendix at the end of this report) and **the total sample was distributed into four quartiles of 39 countries each according to the achieved figures**. However, this distribution among quartiles is very different when disaggregating by groups of countries. For example, jurisdictions of Europe and Central Asia, North America and the Middle East and North Africa are mostly concentrated in the two highest quartiles (3 and 4). This unequal distribution of countries according to INDITEC index quartiles can also be seen in relative terms: among CIAT member countries, more than 70% of them (25 out of 35) are located in quartiles 3 and 4, which is magnified in the case of OECD countries where more than 95% of them fall within these two quartiles.
- In addition, **a second synthetic index of a similar nature, INDITEC 2**, was calculated, with the only difference being that it takes into account the first three dimensions mentioned above (with equivalent weights of one third each) without including the variables referring to the availability and use of human and financial resources. This alternative indicator, which calculation aims to provide robustness and statistical consistency to the original global synthetic index, is somewhat lower in all cases but maintains all the identified trends, both by geographic region and by income level.
- Once the resulting averages for different groupings of jurisdictions have been weighted, **more detailed information is presented by dimensions with emphasis on the 35 CIAT member countries that participated in the most recent edition of the ISORA 2020 Survey**. In terms of

technological innovation, Kenya (0.88), Colombia (0.81), Costa Rica, Spain and Uruguay (all three with 0.75) stand out above countries such as Canada, the United States or the Netherlands (all three reach 0.69 in that dimension). As regards the use and incorporation of tools for improving voluntary tax compliance, the cases of Ecuador, Kenya, Italy and Portugal stand out above the rest. The best results for the partial index focused on the digitalization of operational processes appear in Brazil, Ecuador, Paraguay and the Dominican Republic (with figures above 0.90). Finally, with regard to available resources and the strategic use of the TA budget, the vast majority of countries show acceptable results, although some cases stand out, such as the Netherlands (0.90), Barbados (0.90) and Costa Rica (0.81).

- The INDITEC index has also been calculated for each of the CIAT member countries, allowing their ordering within an overall ranking. Auspiciously, the majority of CIAT members, as mentioned, fall into the top two quartiles of the ISORA universe. In turn, **these jurisdictions exceed not only the average value for the total number of countries surveyed in the survey, but also the average of OECD member countries as well**, which can be considered at the forefront in these aspects of tax administration at the international level. The cases of Kenya, Peru, Portugal, Ecuador, the Netherlands, the Dominican Republic and Italy stand out with remarkable results.
- Also, in order to check the consistency of the methodological criteria used and the robustness of the individual results, **an alternative index was estimated (INDITEC 2) more specifically focused on the technological aspects associated with the digital transformation of TAs in the current context**. Despite some differences in level, it is confirmed that the ranking of CIAT countries remains practically unchanged with this new version of the synthetic indicator, except for the cases of Jamaica (dropping from quartile 3 to quartile 2) and Guatemala (moving up from quartile 3 to quartile 4).
- In short, **the INDITEC index appears as a new way of synthesizing the relative degree of progress of the different TAs in terms of technological innovation, operational digitalization and the strategic orientation of these institutions in this regard**. As with any benchmarking method, certain relative advantages and disadvantages can be recognized in comparison with other existing alternatives, particularly those based on the establishment of pre-established compliance standards and external expert assessment. In any case, this new instrument is intended

to complement and strengthen the existing ones, understanding the relevance that benchmarking has acquired in recent years as a technical diagnostic tool.

- Finally, it should be considered that the forced responses of countries in terms of tax administration to deal with the COVID-19 pandemic would represent a disruptive change that will have to reconfigure and, in many cases, accelerate and consolidate innovative practices linked to their operational functioning, which were already being used/implemented/explored by some of these agencies surveyed throughout ISORA. **Given that, in all cases, the results presented here (for the INDITEC index and the indices by dimension of analysis) refer to the relative situation corresponding to fiscal year 2019 in each jurisdiction,** they provide a picture of the respective TAs in the run-up to the “globalization” of the pandemic effects and constitute an adequate preliminary diagnosis to be able to assess in the near future (in next ISORA Survey editions) the depth of the most recent transformations in the face of an unprecedented and uncertain global context.

Introduction

In order to fulfill their main purpose -that of ensuring the effective collection of fundamental tax resources for public financing- Tax Administrations (TAs) around the world have realized over the last few years, and even more so since the COVID-19 pandemic, the increasing need to accelerate digital transformation processes in all their areas of functioning. This would allow them to make more efficient use of available financial and human resources, improve multiple tax compliance strategies and also meet the needs and preferences of taxpayers (CIAT, 2020).

In this regard, although there is a broad international consensus that recognizes the usefulness of learning about the progress and particular experiences of other countries -in order to have models or international benchmarks- in terms of the incorporation of innovative tools and technologies for multiple purposes, the diversity of cases generally limits the possibility of assessing and evaluating the pace, intensity and relative success of these transformations from a comparative perspective.

In response to this need, and as reflected in the recent publication of the Overview of Tax Administrations in CIAT Countries (Morán and Díaz de Sarralde Miguez, 2021), the International Survey on Revenue Administration (ISORA) has become a powerful information tool in this field. In its most recent edition, with data for fiscal years 2018 and 2019, it has involved 156 jurisdictions and has made it possible to obtain, from standardized data provided directly by the TAs, a very detailed picture of the main areas of these agencies, especially those related to their organizational structure, the management of available resources and their specific operational tasks.

With this first stage of analysis satisfactorily completed, the objective of this work is to advance in the construction of synthetic indices of a set of dimensions directly or indirectly linked to the aspects that make up the development and digital transformation of TAs, in such a way that comparisons can

be made between the countries participating in the ISORA 2020 Survey. What will be called here the Innovation, Digitalization and Technology Index (INDITEC) is intended to be a global indicator of the relative degree of progress of TAs in the incorporation of technical innovations (either for improving compliance or for information processing), digitalization of central operations (including the handling of tax returns, service and payment channels) as well as the availability and management of technological resources and budget in a broad sense (which includes the human resources of each TA)¹.

This document accompanies the construction process of the INDITEC Index and summarizes the main results from its calculation. Therefore, following this brief introduction, the first section describes in detail the main aspects addressed in the methodological design of this synthetic index. The second section presents the calculated values both for the averages of different groupings of jurisdictions (by geographic region and income level) and for individual cases, with special focus on CIAT member countries. Finally, it concludes with brief comments on the potential of INDITEC and a statistical appendix containing disaggregated information for all the participating countries in ISORA 2020.

1 As the latest available data correspond to fiscal year 2019 in each of the jurisdictions, it should be noted that the results will not be able (yet) to capture the effects that the COVID-19 pandemic may have had on the digital transformation of the main operational processes and taxpayer services. For that reason, the INDITEC index figures that will be presented throughout this paper can be considered as a preliminary diagnosis of the state of TAs in these aspects, just before the occurrence of such extraordinary and unfortunate event, and would serve as a point of comparison in future editions of the ISORA Survey.

1 The INDITEC Index: Aspects of methodological design

As was pointed out in the introduction to this paper, the very extensive information collected through the ISORA 2020 Survey allows to obtain a very detailed picture of the structural characteristics and operational performance of the 156 participating Tax Administrations (TAs)². From the processed data and responses (corresponding to fiscal years 2018 and 2019 for each country), it is possible to identify and analyze a series of regional and global trends and the main stylized facts referring to CIAT member countries, which also can be found in the most recent edition of the Overview of Tax Administrations in CIAT Countries (Morán and Díaz de Sarralde, 2021).

The availability of a large number of qualitative and quantitative variables referring to the TAs participating in ISORA provides the possibility of constructing synthetic indicators on different central aspects of these agencies, which can be used not only for their comparative evaluation (benchmarking) but also to make preliminary diagnoses in different dimensions, at least as a practical way of knowing the relative situation of each country with respect to others in the same region or in other latitudes with some feature in common (for example, the level of income according to conventional criteria such as those of the World Bank). The Innovation, Digitalization and Technology Index of the TAs (INDITEC) will be conceived under this same logic.

The construction of synthetic indices in the area of tax administration first requires to define a series of methodological issues in terms of determining the dimensions of analysis and the selection of the most representative variables. This includes a brief explanation of the statistical treatment of the different components of each index -to ensure their adequate weighting- and of the aggregation strategy for all the elements in a global synthetic index.

2 The International Survey on Revenue Administration (ISORA) is a standardized information collection tool on tax administration, which is part of a project conducted by five organizations: the International Monetary Fund (IMF), the Intra-European Organization of Tax Administrations (IOTA), the Organization for Economic Cooperation and Development (OECD), the Inter-American Center of Tax Administrations (CIAT) and, since 2018, the Asian Development Bank (ADB).

1.1 Dimensions of analysis and ISORA variables to be considered

In the first place, due to the diversity of the information collected throughout ISORA³, it is necessary to define a brief group of analysis dimensions that, on the one hand, should be related to the objectives that motivate the construction of synthetic indicators -contributing to show central aspects of the participating TAs operations- and, on the other hand, should be useful to englobe and order specific individual variables that will be selected with the same purpose.

Therefore, it is convenient to explain that the fundamental objective of the INDITEC index construction and calculation tries to obtain a ***synthetic indicator that shows the relative degree of development/ progress of each TA as regards the adoption of innovative tools for tax management and those ones aimed at improving tax compliance, facilitating digital transformation of its main operational processes and making a more efficient exploitation of its resources (financial and human) with emphasis on technological modernization.*** In that sense, the four dimensions that will be included in the INDITEC index are defined here, apart from the individual variables that will be included in each of the first ones, as it is forwardly noted:

1. TECHNOLOGICAL INNOVATION: In order to capture the incorporation of innovative techniques and tools oriented to tax management, which includes both taxpayer support services and statistical processing of tax information received by TAs, this dimension will include as variables the countries responses regarding the use (effective or in an implementation phase) of specific instruments, namely:

- 1) *Data science and analytical tools* (oriented to decision making and diagnosis).
- 2) *Cloud computing* (as an online service model with computational resources).
- 3) *Artificial intelligence* (including machine learning and oriented to a wide variety of cognitive tasks, e.g., detection, prediction, pattern recognition, etc.).

³ By virtue of the joint work accumulated during most of the last decade, the ISORA Survey has been simplified in its latest version (2020), reducing its size and increasing the precision of its questions, with the aim of increasing the response rates and improving the robustness of the obtained results.

- 4) *Distributed ledger technology (DLT) or Blockchain* (enabling efficient handling of large volumes of information combinable with security encryption).
- 5) *Application programming interfaces (API)* (to accelerate secure information processing and entrench seamless interaction with taxpayers)⁴.
- 6) *Digital identification technologies* (applied to taxpayer registration processes).
- 7) *Virtual assistants* (software that simulates interactions by answering questions or requests that would otherwise be handled by humans, e.g. online chatbots).
- 8) *Whole-of-government identification systems* (to streamline all types of procedures and improve the handling of information provided by taxpayers).
- 9) *Robotic Process Automation* (used to automate repetitive tasks, implying time and workload savings for tax administration staff).

B. COMPLIANCE IMPROVEMENT: Another valuable dimension of tax administration is linked to the adoption of advanced tools for improving levels of voluntary tax compliance and, simultaneously, reducing existing levels of tax evasion (which, for different reasons, affects lower-income countries more intensely). In this dimension, relevance will be given to certain variables (derived from the responses of the TAs in ISORA 2020), namely:

- 1) *Cooperative compliance approaches for large taxpayers* (justified by the relevance of this taxpayer segment in tax revenues for most countries)⁵.

4 An API is a set of software functions and procedures allowing applications to access the features and/ or data of another software solution; applications can send requests to this interface and receive responses. A significant advantage of this compared with traditional software interfaces is that complexity and sensitive information can be protected inside the software solution, since communication with other applications only goes through the API.

5 Cooperative compliance programs and approaches are typically conditional upon the taxpayer demonstrating: a) good governance of its tax affairs, including an appropriate level of validation and review of its accounting systems; and (b) a willingness to operate in an open and transparent manner and make full disclosure of its tax risks as they occur. In return, the tax administration commits to providing enhanced service to the taxpayer through, for example: (a) dedicated points of contact; (b) speedier resolution of technical and administrative issues; (c) assignment of a reduced risk rating to the taxpayer for audit purposes; and (d) reduced penalties.

- 2) *Behavioral insight methodologies or techniques* (increasing the taxpayers motivations and decisions learning related to the TA).
- 3) *Mandatory electronic invoicing* (either for a group or for all taxpayers)⁶.
- 4) *Mandatory use of electronic fiscal devices* (for a group or for all taxpayers).
- 5) *Prefilled tax returns by the TA* (with tax information or of third parties; either partial or complete filling; either with deemed acceptance or confirmation required by taxpayers)⁷.

C. OPERATIONAL DIGITALIZATION: A synthetic index that seeks to show the degree of modernization of the different TAs, in the current context, will require to survey some characteristics and modalities of their own operational functioning. In particular, one dimension to consider is related to the different indicators that illustrate the increasingly indispensable digital transformation of their internal processes (registration, tax returns processing, payment of tax liabilities), especially those where the availability of digital channels is considered a substantial relative advantage over more traditional practices or methods. In this case, the following variables were selected:

- 1) *Electronic payment ratio* (proportion of payments received through electronic means with respect to the total registered payments, taking into account its monetary value -equivalent to the TA's effective collection-).
- 2) *Electronic filing ratio in CIT* (proportion of tax returns received through electronic channels -some of which may be pre-filled by the TA- in Corporate Income Tax).
- 3) *Electronic filing ratio in PIT* (idem above for Personal Income Tax).
- 4) *Electronic presentation ratio at VAT* (idem above for Value Added Tax).

6 Further information can be found in the CIAT-IDB (2018) book on electronic invoicing.

7 More information about this tool and its potential in CIAT countries can be found in a recent CIAT-GIZ (2019) working paper on the subject.

- 5) *Digital contact channels for taxpayer services* (proportion -effective use- with respect to the total number of incoming contacts; considers the alternatives “online”, “digital assistant” and “e-mail” which are assumed to be more flexible and agile as they do not require the taxpayer to be present).
- 6) *Digital tax registration channels* (effective availability of the “online” and “e-mail” registration channels that do not require the taxpayer to be present).

D. RESOURCES AND BUDGET: A final dimension to be considered is related to the availability and effective use of human and economic resources available for TAs. In this sense, the professionalization of the staff and the allocation of part of the operating budget to the development and implementation of ICTs in different areas of tax management are highly valued, as well as the possibility of having a total budget in line with the tasks performed, measured in comparable terms. Similarly, an attempt is made to weigh the relative workload to be managed by the different TA staffs, as well as the magnitude of the operating expenses in relation to the tax revenues administered.

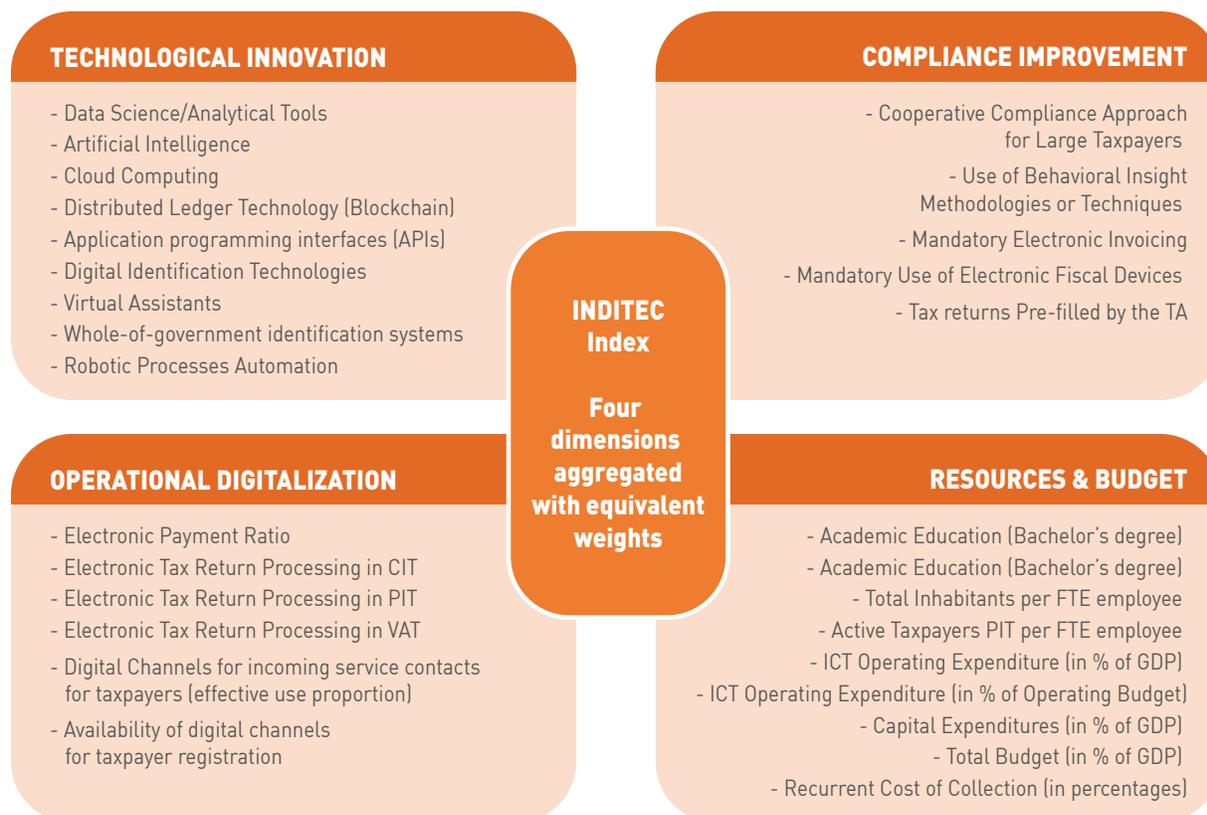
- 1) *Academic training undergraduate level* (proportion of FTE⁸ employees with a Bachelor’s degree in relation to the total TA staff).
- 2) *Academic training graduate level* (proportion of FTE employees with a graduate (Master’s) degree -in addition to a bachelor’s degree- in relation to the total TA staff).
- 3) *Total inhabitants per FTE employee* (taken with a negative connotation as it reflects, in an approximate way, the workload faced by the TA).
- 4) *Active IRP taxpayers per FTE employee* (idem above, with negative connotation, specifically focused on a widely spread tax such as Personal Income Tax).

⁸ In all cases and for better comparability, it is referred as Full-Time Equivalent (FTE). Each item of FTE employee represents the total resources equal to one staff member available full time for the entire year.

- 5) *ICT operating expenditures, as a percentage of GDP* (as an absolute and comparable measure of specific TA spending in the Information and Communications Technologies segment).
- 6) *ICT operating expenditures, as a percentage of the Operating Budget* (as a relative measure of the importance assigned to ICT segment within total operating expenditures).
- 7) *Capital expenditures, as a percentage of GDP* (as a comparable measure of total investment expenditure of the TAs, which is mainly allocated to infrastructure and material and technical resources).
- 8) *Total budget, as a percentage of GDP* (although it can be very diverse and related to the income level of the countries and the degree of institutional development of the respective TAs, this variable provides a quick picture of their total financial resource endowment).
- 9) *Recurrent cost of collection, in percentages* (as a partial indicator of the TA's efficiency in the use of available financial resources, it serves to identify gaps between countries in terms of the relationship between tax revenues received -net of VAT on imports- and related operating expenses; inverse relationship because it has a negative connotation).

In sum, ISORA Survey has a large number of individual qualitative and quantitative indicators and variables which will be concentrated in the four dimensions detailed above, all of which represent different areas of TA diagnosis and will be summarized in partial synthetic indicators (Technological Innovation, Compliance Improvement, Operational Digitalization, Resources and Budget). Finally, those four indices will be integrated in a global index using equivalent proportional weighting. Figure 1 shows a summary of the components used in the creation and calculation of INDITEC Index for benchmarking the participating TAs in ISORA 2020 Survey.

Figure 1: Dimensions and variables included in the design of INDITEC Index (based on ISORA 2020 Survey).



Source: Authors' elaboration based on ISORA 2020 Survey.

1.2 Normalization and aggregation of selected variables

Given the foreseeable diversity of the considered variables for the construction of INDITEC, added to the fact that the values recorded may present certain biases and gaps between countries that could distort the overall results, in each case it will be necessary to carry out transformations and adaptations in order to obtain homogeneous quantitative variables.

Thus, for example, with regard to the incorporation of **innovative tools**, the responses of the countries will be taken into account for each of the cutting-edge technologies considered, assigning values according to the following scale:

- 1.0: to the TAs where the example technology is implemented and used when the survey was answered;

- 0.5: to those that have declared to be at implementation phase for future use;
- 0.0: to cases where the analyzed technology is not in use, including cases where implementation has not yet begun.

Regarding the techniques to improve tax compliance, the transformation of the responses (Yes/No) will be carried out by directly considering binary variables, where affirmative answers will receive a value of 1.0 and negative answers a null value (0.0).

For the variables related to the **digital transformation of the basic processes of the TAs' operational functioning**, it will be necessary to adapt the available figures, which mostly correspond to percentages relative to the total of each variable in each particular case. To this end, most of the selected variables (electronic payment ratios, electronic filing of returns and even the number of incoming contacts received by the TA through electronic means) will be expressed in proportions continuously between 0 and 1, all with a positive valuation for those figures that are close to unity (maximum feasible). However, in the specific case referred to the availability of digital channels for taxpayer registration, values will be assigned according to the following scale: 1.0 to TAs that have the “online” and “email” channels for said procedure; 0.5 to TAs that have either of said two digital registration channels; and 0.0 for the rest of the TAs that still do not offer those alternatives to their taxpayers (at least until the closing of the fiscal year 2019, which is the latest information available in the ISORA Survey).

Finally, the efficient **use of material, financial and human resources** can be reflected in a series of quantitative variables which can be expressed as proportions of a total reference value (e.g., total staff or total operating budget) or as very different numbers of inhabitants or contributors per TA employee. Therefore, given the different nature of the considered variables and in order to avoid unnecessary biases in one direction or the other (where the “feasible” maximum may be very different depending on the specific indicator), all variables selected for this dimension of analysis will be normalized using the following equation:

$$Y_{x,it} = \frac{x_{it} - \min(x_{it})}{\max(x_{it}) - \min(x_{it})}$$

Where “ $Y_{x,it}$ ” is the normalized variable “ x ” of country “ i ” in the year “ t ”; “ $\min(x_{it})$ ” is the minimum value⁹ of variable “ x_{it} ” for the universe of 156 countries in ISORA 2020; while “ $\max(x_{it})$ ” is the highest value of “ x_{it} ” in the whole sample. It should be noted that the equation presented above would apply for all those variables that integrate this specific dimension with a positive valuation such as those referring to the academic training of employees, capital expenditure or the operating budget portion allocated to ICTs¹⁰.

On the other hand, the dimension referring to “Resources and Budget” also contains variables with a negative connotation in terms of the efficient use or availability of resources -i.e., where low values are positive in terms of the considered dimension-, such as the number of inhabitants per employee and the number of IRP taxpayers per employee (both implying heavy labor burdens for the respective workforces, beyond the possible differences in labor productivity) or the collection cost coefficient (as a very approximate measure of efficiency in the overall use of available resources). For these cases, the normalization of the figures from ISORA 2020 will be performed by applying the following inverse formula:

$$Y_{x,it} = 1 - \frac{x_{it} - \min(x_{it})}{\max(x_{it}) - \min(x_{it})}$$

It is worth clarifying that in all cases the information derived directly from the responses of the TAs themselves to the questionnaires that made up the 2020 edition of ISORA Survey will be used. Nevertheless, a comprehensive review of the figures will be carried out to detect any inconsistencies that may arise from the processing of the survey at the time of collecting the individualized statistical information. Additionally, if there is any specific case where it is feasible to have the missing information,

9 It should be noted that, especially in the quantitative variables, it has been possible to verify a variable percentage of cases with no response from the TA, which has been resolved by assigning them a null value. This is justified by the intention of not affecting or “inflating” the general averages and by groups of countries, which is why, in these cases, the value 0 has become the minimum to be considered at the time of calculating the normalization formula.

10 Although this transformation could have been applied to the variables of the dimension related to operational digitalization, the fact that all of them showed preliminary figures between 0 and 1 makes this procedure unnecessary for the purpose of having standardized and homogeneous variables. A different case is that of variables expressed according to the number of employees or in percentages of GDP, where the absence of this statistical technique could lead to an unequal allocation of the relative importance of each variable in their aggregation, first in the partial indices by dimension and, finally, in the overall calculation of the INDITEC index.

the corresponding figures will be adjusted or completed based on official information, always with the aim of improving the representativeness of the resulting individual and group averages for the synthetic indices¹¹.

An information obstacle is related to the lack of response from some TAs for certain variables, particularly those corresponding to the dimensions of operational digitalization and resource and budget management. In order to have equivalent and homogeneous average values, it was decided to fill in these “empty” cases with null values, which are precisely the minimum figures for each of the selected variables. For this reason, the averages to be calculated should also be considered as minimum values estimated from the available data in the latest edition of the ISORA Survey referring to fiscal year 2019 (or 2018 in missing cases). In order to take this detail into consideration when analyzing the results of the INDITEC Index, the response ratios (in percentages) for each country and the averages by groups of countries in the 29 selected variables will also be measured.

After defining the values assigned to each variable according to the criteria detailed above, total indices by dimension will be calculated, first in absolute terms from the sum of the individual figures for each variable. It should be noted that, given that the number of variables is different per dimension, before proceeding to their integration into a synthetic index (INDITEC), the values assigned to the different countries for each of the individual variables or considered indicators will be relativized (by the number of variables of each dimension) to ensure an equivalent contribution (in absolute terms) of each dimension.

Next, the indices by dimension will be calculated in relative terms by applying, once again, the normalization equation expressed in previous paragraphs (with a positive connotation, i.e., higher values represent better relative performance). In this way, the synthetic indices by dimension are weighted according to the maximum obtained values for each of them, which are reached by at least one of the analyzed countries.

11 The most obvious case is that of Germany where, despite not appearing in the original ISORA data, the information on the incorporation of technological innovations has been completed with an intermediate value (0.5), which implies that they are, at least, in the implementation phase for effective use in the future. Something similar occurs, specifically, with the use of digital identification systems in the cases of Argentina, Chile and Colombia.

To calculate the INDITEC index - in a process of aggregation of the four dimensions mentioned above - and after simultaneous tests with different methods to establish the weights, equivalent weightings will be applied where each partial index (per dimension) contributes a quarter of the total, as expressed in the following equation for each country “*i*” (156) at time “*t*” (2019):

$$INDITEC_{it} = \frac{1}{4} \times Innovation_{it} + \frac{1}{4} \times Compliance_{it} + \frac{1}{4} \times Digitalization_{it} + \frac{1}{4} \times Resources_{it}$$

Likewise, the average values of each synthetic index (by dimension and in total) will be determined for different groupings of countries, for example according to geographic region, income level, CIAT and OECD membership.

In addition, a second synthetic index of a similar nature, INDITEC 2, will be calculated, with the only difference of taking into account the first three dimensions mentioned above (with equivalent weightings of one third of the total) without including the variables referring to the availability and use of human and financial resources. This new indicator would place even more emphasis on the innovative tools and instruments that reflect the digital and technological transformation processes that the different TAs are currently undergoing and that they will undoubtedly have to reinforce and consolidate in the coming years. In mathematical notation, the INDITEC 2 index - which results should serve to provide robustness and statistical consistency to the original global synthetic index - will be estimated in the following terms:

$$INDITEC\ 2_{it} = \frac{1}{3} \times Innovation_{it} + \frac{1}{3} \times Compliance_{it} + \frac{1}{3} \times Digitalization_{it}$$

Finally, for the purpose of comparative evaluation of the countries -with special emphasis on CIAT members- quartiles will be calculated for INDITEC and the relative position of each particular case will be determined within the ranking of the TAs participating in ISORA 2020. The distribution by quartiles will also be previously analyzed by groups of countries to try to identify trends and general patterns according to their classification characteristics such as geographic location or income level expressed in comparable terms.

In this way, and with all the necessary precautions when drawing general conclusions, it will be possible to have an overall comparative perspective of the relative degree of modernization, technological innovation and digital transformation of TAs worldwide, which will also highlight the usefulness of this type of synthetic indicators in terms of diagnosis and benchmarking of these agencies.

2 Main results for the INDITEC Index

Based on the methodology proposed, this section will proceed to calculate a series of synthetic indices for all the countries participating in ISORA, first differentiating by each of the dimensions identified and then globally based on the INDITEC index for all the ISORA countries and for the groups of countries according to conventional classifications by geographic region and by income levels. INDITEC quartiles will also be calculated and the composition of the different groupings of jurisdictions surveyed through ISORA will be evaluated.

The same procedure will be followed with emphasis on an individual analysis of CIAT member countries with the most recent available information (year 2019). Thus, the aim is to obtain a ranking of these cases according to their results for INDITEC index, with correspondence to the estimated quartiles for the universe of 156 countries, as well as the cumulative figures in each of the four dimensions included.

Finally, the obtained results and the advantages and disadvantages that may be identified with respect to this method of benchmarking TAs around the world will be analyzed, in comparison with other existing methods, particularly those based on the establishment of pre-established compliance standards and external expert assessment.

2.1 Global and partial average figures according to the main dimensions of analysis

First, the results (simple averages) associated with different reference groupings of countries will be presented. The average values of the indices can be interpreted either as the general degree of progress in different dimensions of analysis or, alternatively, as the margin for progress with improvements in the particular variables that make up each partial or total index.

Thus, it is possible to verify that, for the entire universe of countries participating in ISORA, the indices are lower in the area of technological innovation (0.37), meaning a relatively wider scope for the introduction of improvements for the future, beyond the progress achieved in recent years. The overall

performance is somewhat higher in the areas of modern tools oriented to tackling tax non-compliance (0.46) and of digital transformation of TAs' internal operations (0.46). The average result achieved in terms of resources and budget is somewhat better (0.61), although there is still room for progress in comparison with the rest of the countries (Table 1).

In sum, the INDITEC index for the "ISORA universe" of 156 jurisdictions stands at 0.48 with (available) data for fiscal year 2019. It should be noted that the country response rate for all the variables that constitute the INDITEC (29 in total) is around 91%, which is considerably high but warns of the need for caution when assessing the accuracy of the resulting figures.

Table 1: Indices by dimensions and overall (INDITEC) and overall response rates (in percentages). Simple averages for selected groups of countries.

Code	Country Group	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources and Budget	INDITEC (Total)	Response Rate (%)
ISORA	ISORA	0.37	0.46	0.46	0.61	0.48	91%
EAP	East Asia and Pacific	0.42	0.45	0.30	0.56	0.43	87%
ECA	Europe and Central Asia	0.49	0.60	0.68	0.70	0.62	94%
LAC	Latin America and the Caribbean	0.31	0.39	0.49	0.68	0.47	95%
MENA	Middle East and North Africa	0.48	0.50	0.56	0.58	0.53	92%
NAM	North America	0.69	0.40	0.65	0.68	0.60	93%
SAS	South Asia	0.18	0.37	0.37	0.50	0.35	90%
SSA	Sub-Saharan Africa	0.25	0.36	0.25	0.49	0.34	87%
Low Income	Low Income	0.25	0.34	0.15	0.47	0.30	86%
Lower-Middle	Lower-Middle Income	0.29	0.46	0.38	0.54	0.42	88%
Upper-Middle	Upper-Middle Income	0.32	0.42	0.50	0.64	0.47	92%
High Income	High Income	0.53	0.54	0.60	0.69	0.59	94%
CIAT	CIAT members	0.46	0.53	0.64	0.66	0.57	96%
Non-CIAT	CIAT non-members	0.35	0.44	0.41	0.59	0.45	90%
OECD	OECD members	0.63	0.63	0.71	0.72	0.67	96%
Non-OECD	OECD non-members	0.29	0.41	0.38	0.58	0.41	90%

Source: Authors' elaboration based on ISORA 2020.

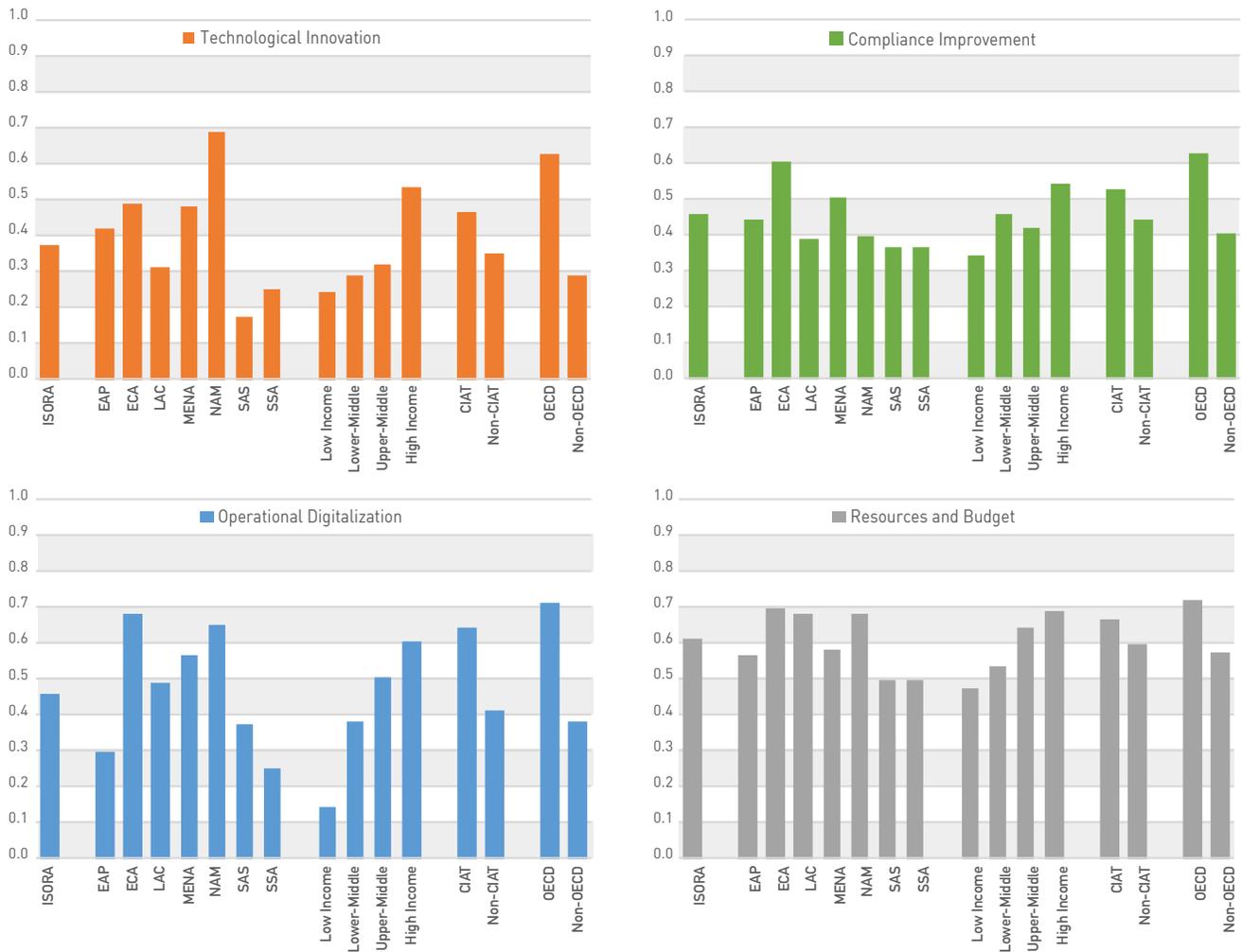
The analysis by different country groupings shows some interesting results, which could be seen as trends or stylized facts in each of the evaluated dimensions. For example, the calculated averages when disaggregating by geographic region reveal large gaps in terms of the use/implementation of innovative instruments for tax management and also progress in terms of operational digitalization (Table 1 and Figure 2). In the four dimensions, the best performing regions are North America, Europe and Central Asia, and the Middle East and North Africa; Latin America and the Caribbean appears one step below except in the dimension referring to the availability and management of resources and budget where it reaches a value of 0.68 at the same level of the regions composed of countries with a higher level of economic development¹².

If the individual results are weighted according to the income level¹³ (according to the World Bank classification criteria) of the participating countries in ISORA 2020, a clear positive association can be detected where the average values grow with income and reach their maximum in the group of High Income countries. Again, the gaps are most noticeable with regard to the dimensions of technological innovation and operational digitalization (Figure 2). The conglomerate of CIAT member countries shows better performance in all four dimensions with respect to the countries that participated in ISORA 2020 and to those which are not members of this institution (Non-CIAT). Something similar can be observed for OECD countries as a whole (compared to non-members of the organization), even though with more significant differences in all aspects. It should be noted that, although it is high and very satisfactory for all groups of countries, the response rate results slightly higher with income level and visibly higher for CIAT and OECD countries than for the rest.

12 Another factor that makes it necessary to relativize direct comparisons -and keeps them only as “indicative of trends”- is related to the very unequal number of ISORA participating countries included in each of the geographical regions identified (see Table 2 in this regard).

13 Of the total number of jurisdictions that responded to ISORA in 2020, 33% are “High Income” countries, with the majority from Europe and Central Asia, North America and some from Latin America and the Caribbean. The bulk of the countries (55%) fall into intermediate income groups (“Upper-Middle Income” with 29% and “Lower-Middle Income” with 26% of the total) which, in addition to the aforementioned regions, also include countries from Asia, Africa and Oceania. Finally, the remaining 12% corresponds to jurisdictions classified as “Low Income”, the vast majority of which are located in the Sub-Saharan Africa region.

Figure 2: Indices by dimensions of analysis (panels). Simple averages for groups of countries.



Source: Authors' elaboration based on ISORA 2020.

An alternative way of visualizing the existing gaps between groups of countries in each of the analyzed dimensions is through the use of radial graphs. Figure 3 shows that the relative differences in performance are clearer and more significant with regard to the incorporation of technological innovations and the digitalization of operational processes, especially when the average values of the estimated indices are evaluated according to countries' income level (right panel). The CIAT conglomerate shows outstanding figures, some of them close to the OECD averages (left panel).

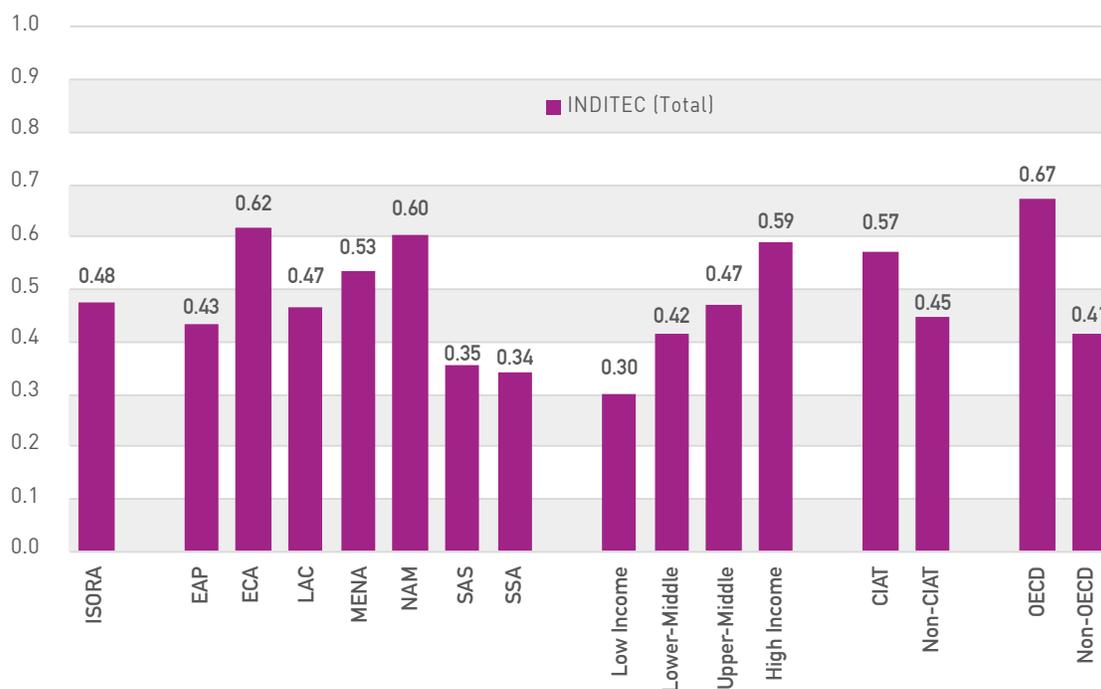
Figure 3: Indices by dimensions of analysis (panels). Simple averages for groups of countries.



Source: Authors' elaboration based on ISORA 2020.

Aggregating the indices by dimensions (with equivalent weightings) produces the synthetic INDITEC index. With respect to the global average for ISORA (0.48) and disaggregated by geographical region, differences can be observed between the averages of each group of countries: once again, North America, Europe and Central Asia, and the Middle East and North Africa show averages above this reference value; Latin America and the Caribbean are barely below (0.47); while other regions appear lagging behind the global INDITEC index (East Asia and the Pacific, South Asia and Sub-Saharan Africa). By income level, there is a clear positive relationship, with a very significant gap between Low Income (0.30) and High Income (0.59) groups of countries. For both CIAT and OECD jurisdictions, the average INDITEC values are much higher than for the group of countries that do not belong to these clusters of nations (Figure 4).

Figure 4: INDITEC Index. Simple averages for groups of countries.



Source: Authors' elaboration based on ISORA 2020.

From the INDITEC index construction for each of the countries participating in ISORA 2020 it is possible to rank the cases according to the resulting figures. In addition to an individual ranking, it is feasible to distribute the total number of countries into four quartiles of 39 countries each according to the result achieved in the INDITEC index. The reference values are 0.00-0.32 for quartile 1; 0.32-0.48 for quartile 2; 0.48-0.64 for quartile 3; and 0.64-1.00 for quartile 4¹⁴.

However, the distribution of countries among quartiles is very different when disaggregated by country classifications such as, for example, the geographic region to which they belong (Table 2). Thus, there is a high concentration of jurisdictions from the Asian (East-Pacific and South) regions and Sub-Saharan Africa in the first and second quartiles with the lowest INDITEC scores. Conversely, countries of Europe and Central Asia, North America and the Middle East and North Africa (although much smaller in number) are mostly concentrated in the two highest quartiles in terms of this synthetic index. Latin America and the Caribbean appears as a more heterogeneous region with several cases in each of the identified quartiles.

14 It should be noted that the maximum values of the INDITEC index for this edition of ISORA 2020, taking into account the information available for each variable, corresponded to Denmark (0.852) and Norway (0.845). Lesotho showed the lowest value among the 156 participating countries (0.017).

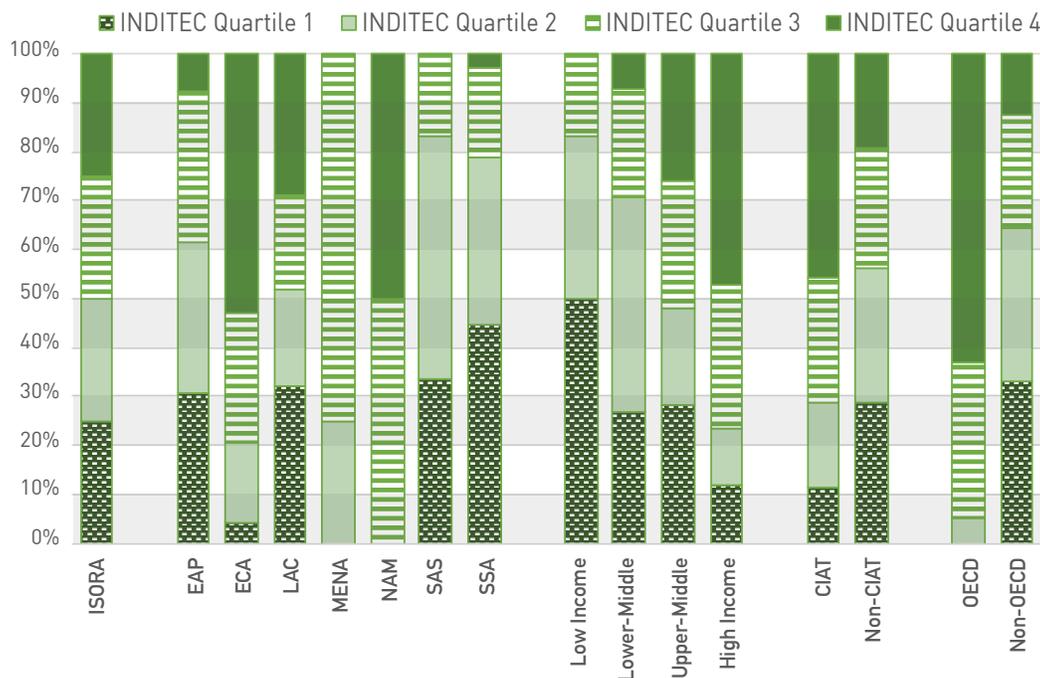
Table 2: Distribution of countries by quartile and INDITEC index total. Number of countries for selected groups of countries.

Country Groups	INDITEC Quartile 1	INDITEC Quartile 2	INDITEC Quartile 3	INDITEC Quartile 4	INDITEC Total
ISORA	39	39	39	39	156
East Asia and Pacific	8	8	8	2	26
Europe and Central Asia	2	8	13	26	49
Latin America and the Caribbean	10	6	6	9	31
Middle East and North Africa	0	1	3	0	4
North America	0	0	1	1	2
South Asia	2	3	1	0	6
Sub-Saharan Africa	17	13	7	1	38
Income Groups					
Low Income	9	6	3	0	18
Lower-Middle Income	11	18	9	3	41
Upper-Middle Income	13	9	12	12	46
High Income	6	6	15	24	51
Membership Groups					
CIAT members	4	6	9	16	35
CIAT non-members	35	33	30	23	121
OECD Groups					
OECD members	0	2	12	24	38
OECD non-members	39	37	27	15	118

Source: Authors' elaboration based on ISORA 2020.

This unequal distribution of countries according to INDITEC index quartiles can also be seen in relative terms (Figure 5). Thus, by income level, a linear relationship with the average INDITEC values can be observed. While the Low Income group has a high concentration of countries in the lowest quartiles, the situation is reversed as higher income groups are considered, especially in the High Income group where practically half of the countries are in INDITEC quartile 4. Among CIAT member countries, more than 70% (25 out of 35) are located in quartiles 3 and 4, which is magnified in the case of OECD countries where more than 95% of them fall within the two highest quartiles with no member country located in INDITEC quartile 1.

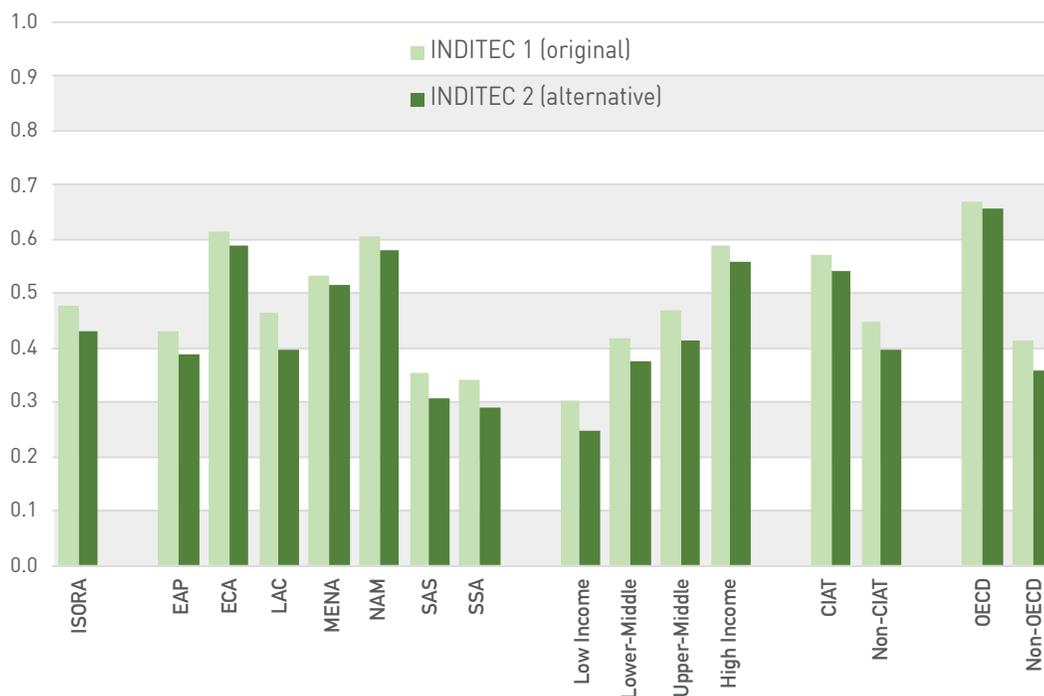
Figure 5: Distribution of countries by quartile and INDITEC index total. Proportion of countries (in percentages) for selected groups of countries.



Source: Authors' elaboration based on ISORA 2020.

As explained in the methodology, in order to provide greater robustness and consistency to the INDITEC index estimation procedure, an alternative synthetic index will be calculated, INDITEC 2, which will be made up of the same dimensions as the original version except for the one linked to the availability and application of resources and the total budget (which, on the other hand, is where a smaller relative gap between different jurisdictions and groups of countries is observed). The resulting index combines three dimensions with equivalent weights (1/3), resulting somewhat lower in all cases but maintaining all the identified trends, when the data are analyzed both by geographic region and by income level (Figure 6). In some groups, particularly in the Latin America and the Caribbean region or in the Low Income group, greater differences between the two indices can be observed, which would be indicative of the significant relative contribution of the “Resources and Budget” dimension to the overall performance of these tax revenue agencies.

Figure 6: INDITEC and INDITEC 2 indices (without “Resources”).
Simple averages for groups of countries.



Source: Authors' elaboration based on ISORA 2020.

2.2 The specific situation of CIAT member countries

Once the calculated averages for different groupings of jurisdictions have been weighted, more detailed information will be presented below, with emphasis on CIAT member countries¹⁵. As anticipated in the previous section, this conglomerate achieves values for the estimated indices that are above the global average for ISORA, even at levels close to those corresponding to groups or regions with a higher degree of economic development¹⁶.

First, Table 3 shows the figures of the indices by dimensions for the 35 countries that are part of CIAT and that participated in the most recent edition of the ISORA 2020 Survey. Although there are some

15 A statistical appendix with detailed information on the results, by dimension and overall INDITEC, for the 156 countries participating in ISORA 2020 can be found at the end of this document (Table A.1).

16 However, this group of countries also contains a great diversity of cases, realities and states of affairs. Thus, of the 35 countries, 10 of them (29%) correspond to the “High Income” group, 14 (40%) are classified as “Upper-Middle Income” and 11 (31%) belong to the “Lower-Middle Income” group, with no identifiable cases of “Low Income” countries. In addition, although the majority of CIAT countries are from the Latin America and Caribbean region, representatives from other regions of the world can also be identified.

null values (which simply reflect the lack of response by these countries in the selected variables), some other countries stand out for their encouraging results. For example, in terms of technological innovation, Kenya (0.88), Colombia (0.81), Costa Rica, Spain and Uruguay (all three with 0.75) stand out above countries such as Canada, the United States and the Netherlands (all three reach 0.69 in this dimension).

As for the incorporation of modern tools to improve tax compliance, although most of the above-mentioned countries obtain valuable results, there are other outstanding cases -with a value of 1.00- such as Ecuador, Italy and Portugal (in addition to Kenya, again). Brazil, Ecuador, Paraguay and the Dominican Republic, all with figures above 0.9, show the best results in the index specifically focused on the digitalization of operational processes. Finally, in terms of available resources and strategic use of the TA budget, the vast majority of countries show acceptable results, although some cases stand out, such as the Netherlands (0.90), Barbados (0.90) and Costa Rica (0.81).

Table 3: Individual indices by dimensions of analysis. CIAT member countries.

Code	CIAT Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources and Budget
AGO	Angola	0.50	0.00	0.50	0.57
ARG	Argentina	0.31	0.80	0.76	0.70
BRB	Barbados	0.31	0.60	0.59	0.90
BLZ	Belize	0.13	0.20	0.00	0.59
BOL	Bolivia	0.38	0.40	0.68	0.73
BRA	Brazil	0.63	0.60	0.96	0.62
CAN	Canada	0.69	0.40	0.81	0.68
CHL	Chile	0.44	0.80	0.65	0.69
COL	Colombia	0.81	0.60	0.74	0.63
CRI	Costa Rica	0.75	0.20	0.79	0.81
DOM	Dominican Rep.	0.63	0.60	0.94	0.77
ECU	Ecuador	0.38	1.00	0.91	0.75
SLV	El Salvador	0.00	0.40	0.65	0.66
FRA	France	0.50	0.80	0.81	0.66
GTM	Guatemala	0.50	0.60	0.78	0.61
GUY	Guyana	0.00	0.20	0.19	0.69
HND	Honduras	0.38	0.00	0.60	0.67
IND	India	0.63	0.60	0.51	0.49
ITA	Italy	0.44	1.00	0.77	0.71
JAM	Jamaica	0.25	0.40	0.57	0.73
KEN	Kenya	0.88	1.00	0.83	0.62
MEX	Mexico	0.63	0.80	0.66	0.63
MAR	Morocco	0.31	0.40	0.84	0.71
NLD	Netherlands	0.69	0.60	0.75	0.90
NIC	Nicaragua	0.25	0.20	0.67	0.68
NGA	Nigeria	0.56	0.20	0.20	0.47
PAN	Panama	0.13	0.20	0.27	0.51
PRY	Paraguay	0.25	0.40	0.98	0.45
PER	Peru	0.69	0.80	0.84	0.73
PRT	Portugal	0.50	1.00	0.83	0.71
ESP	Spain	0.75	0.60	0.82	0.66
SUR	Suriname	0.00	0.60	0.00	0.54
TTO	Trinidad and Tobago	0.50	0.40	0.25	0.65
USA	United States	0.69	0.40	0.49	0.68
URY	Uruguay	0.75	0.60	0.74	0.63

Source: Authors' elaboration based on ISORA 2020.

After calculating the individual indices by dimension of analysis, the INDITEC index was estimated for each of the CIAT member countries (Table 4). The homogenized results have made it possible to rank the different considered cases. Although this ranking should be taken with some caution due to the caveats and information limitations already mentioned, the determination of the quartiles for the total set of countries in ISORA 2020 provides a quick and effective image of the current state of situation (prior to the COVID-19 pandemic) of CIAT member TAs in terms of digitalization and technological innovation applied to tax management. In a certain way, the obtained results are also indicative of the relative degree of institutional development of the different TAs, given the growing relevance that the implementation of different technological advances is acquiring in the overall performance of these institutions. Auspiciously, most CIAT members are in the two highest quartiles of the ISORA universe (25 out of 35). With the exception of Suriname, Panama and India, all the countries surveyed also show a very high response rate -over 90%- for the quantitative and qualitative variables that are part of the INDITEC index.

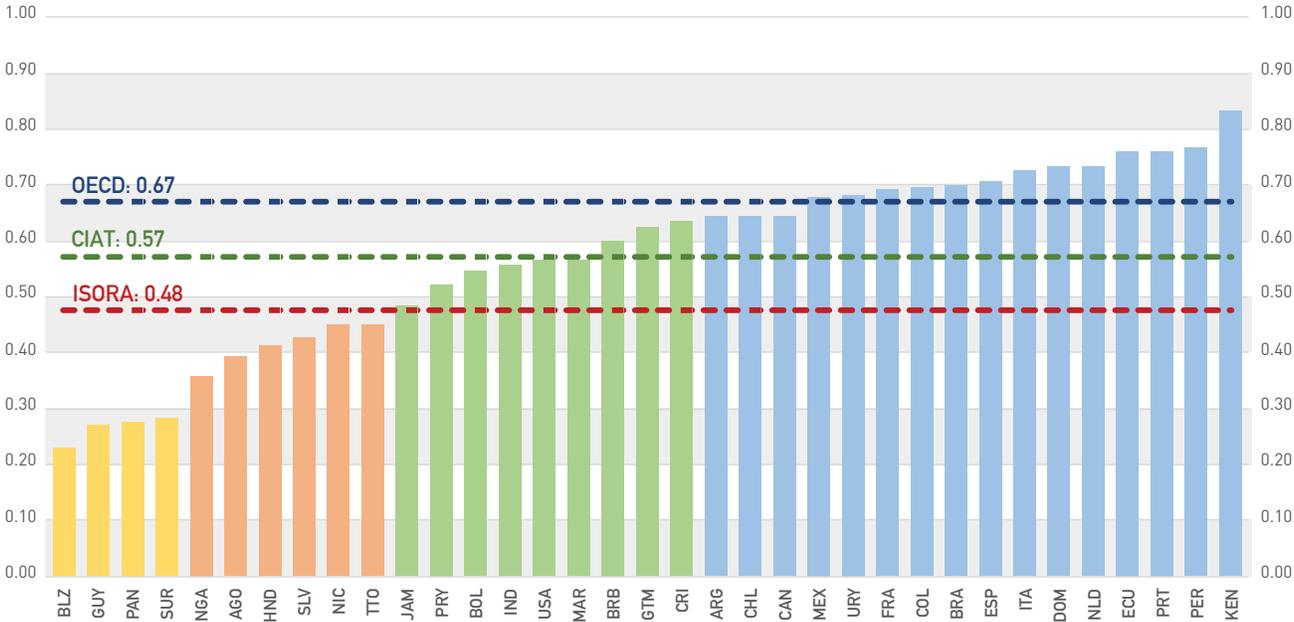
Table 4: INDITEC index, quartile and overall response rate (in percentages). CIAT member countries.

Code	CIAT Countries	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
BLZ	Belize	0.23	1	93%
GUY	Guyana	0.27	1	100%
PAN	Panama	0.28	1	86%
SUR	Suriname	0.28	1	72%
NGA	Nigeria	0.36	2	93%
AGO	Angola	0.39	2	90%
HND	Honduras	0.41	2	100%
SLV	El Salvador	0.43	2	100%
NIC	Nicaragua	0.45	2	100%
TTO	Trinidad and Tobago	0.45	2	90%
JAM	Jamaica	0.49	3	100%
PRY	Paraguay	0.52	3	93%
BOL	Bolivia	0.55	3	100%
IND	India	0.56	3	86%
USA	United States	0.56	3	93%
MAR	Morocco	0.57	3	100%
BRB	Barbados	0.60	3	100%
GTM	Guatemala	0.62	3	100%
CRI	Costa Rica	0.64	3	100%
ARG	Argentina	0.64	4	100%
CHL	Chile	0.64	4	97%
CAN	Canada	0.64	4	93%
MEX	Mexico	0.68	4	97%
URY	Uruguay	0.68	4	97%
FRA	France	0.69	4	97%
COL	Colombia	0.69	4	100%
BRA	Brazil	0.70	4	100%
ESP	Spain	0.71	4	97%
ITA	Italy	0.73	4	100%
DOM	Dominican Rep.	0.73	4	100%
NLD	Netherlands	0.73	4	100%
ECU	Ecuador	0.76	4	100%
PRT	Portugal	0.76	4	100%
PER	Peru	0.77	4	100%
KEN	Kenya	0.83	4	100%

Source: Authors' elaboration based on ISORA 2020.

A perspective view of the 35 CIAT member countries participating in ISORA 2020 shows that the countries whose INDITEC results place them in quartiles 3 and 4 (calculated at a global level) exceed the average value for the total number of countries covered by the survey, and that, more importantly, most of those in quartile 4 achieve INDITEC figures that exceed the average for the OECD member countries, which, as mentioned above, can be considered at the forefront in these aspects of tax administration at the international level (Figure 7). Among others, the cases of Kenya, Peru, Portugal, Ecuador, the Netherlands, the Dominican Republic and Italy are outstanding examples.

Figure 7: INDITEC Index, by quartiles. CIAT member countries and global averages.

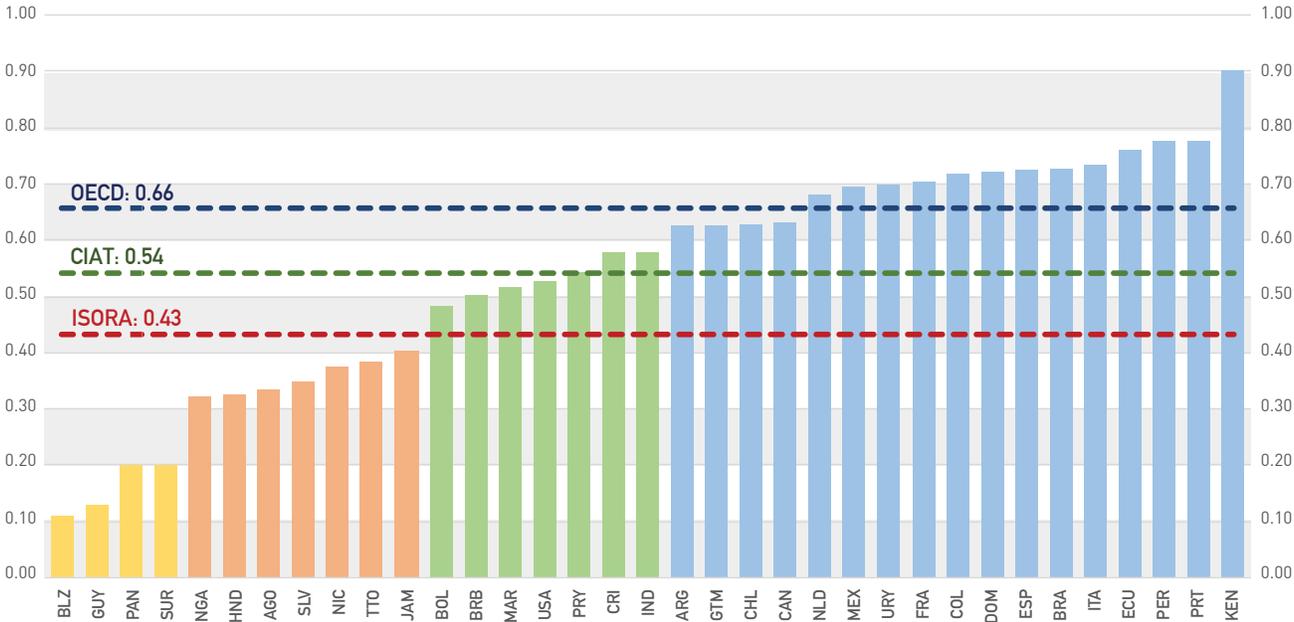


Source: Authors’ elaboration based on ISORA 2020.

As can be seen in Figure 7, the INDITEC results for the CIAT countries participating in ISORA 2020 are reasonable beyond some caveats that may exist in this regard (for example, the placement of the United States in quartile 3, associated with poor results in terms of “improved compliance” and “operational digitalization”, which, however, would not mean lack of efficiency or technological obsolescence in any case). Moreover, it should always be taken into account that the basic information comes directly from the TAs themselves, so that, in principle, they would have a high degree of statistical accuracy and it would not be expected to find significantly biased data with respect to the “real” situation, since the construction of the INDITEC index was not known beforehand.

On the other hand, as detailed in the methodology and in order to check the robustness of the individual results, an alternative index was calculated (INDITEC 2) more specifically focused on the technological aspects associated with the digital transformation of TAs in the current context. Firstly, it was found that, in general, the final values are somewhat lower in all cases compared to the full version of INDITEC (as it does not consider the “Resources” dimension where most of the countries, especially those with lower income levels, show relatively better results). Hence, as shown in Figure 6, the global averages and by groups of countries are lower: the average for ISORA is equivalent to 0.43; for CIAT, 0.54; and for OECD, 0.66. Nevertheless, and more importantly, it is confirmed that the ranking of the CIAT countries remains practically unchanged with this new version of the synthetic indicator (Figure 8), except for a repositioning in the cases of Jamaica (dropping from quartile 3 to 2) and Guatemala (moving up from quartile 3 to 4).

Figure 8: INDITEC 2 alternative index (without “Resources”), by quartiles. CIAT member countries and global averages



Source: Authors’ elaboration based on ISORA 2020.

In short, the INDITEC index emerges as a new way of synthesizing the relative degree of progress of the different TAs in terms of technological innovation, operational digitalization and the strategic orientation of these institutions in this regard. As with any benchmarking method, certain relative

advantages and disadvantages can be recognized in comparison with other existing alternatives, particularly those based on the establishment of pre-established compliance standards and external expert assessment. In any case, this new instrument is intended to complement and strengthen the existing ones, understanding the relevance that benchmarking has acquired in recent years as a technical diagnostic tool.

Logically, INDITEC's statistical dependence on the information provided by the tax collection agencies in each edition of the ISORA Survey represents its main advantage and disadvantage at the same time. This is because, on the one hand, it uses data that, in several cases, could only be generated, processed and provided by the TAs themselves (since they are not of a public nature due to their sensitivity and the compliance with tax secrecy rules). Furthermore, the information corresponds to the routine activities of the TAs, directly related to their operational performance, and does not form part of an exceptional evaluation under external parameters that need to be adapted to such requirements.

Conversely, the synthetic index depends on two factors that influence the quality and representativeness of the results: a) the response rate of the TAs for each of the questions or information requirements that constitute the fundamental basis of the selected variables that integrate the INDITEC, and b) the veracity and accuracy of these responses to guarantee reliable and precise results. However, both potential weaknesses can be minimized in future editions of ISORA as long as the interest of the countries in obtaining a quick and comparative comprehensive diagnosis of the degree of progress in digitalization and technological innovation processes within the respective TAs increases. In addition, this could be reinforced with greater accuracy of the questions in the questionnaires or, eventually, with a reciprocal system for checking the information provided by each agency under homogeneous and standardized parameters. The very high level of participation of the 156 jurisdictions in the most recent edition of ISORA is auspicious in this sense and opens up possible lines of future work to continue improving and consolidating this valuable tool.

3 Concluding remarks

The main objective of this report has been the construction and effective calculation of a synthetic index aimed at benchmarking the relative progress of different TAs around the world in terms of technological innovation and digital transformation. Based on data from the ISORA Survey in its most recent edition (2020), it constitutes a supplementary extension to the also recent Overview of Tax Administrations in CIAT Countries (Morán and Díaz de Sarralde, 2021), as well as an example about the possibilities of taking advantage of the valuable and abundant information collected through this tool in order to generate diverse diagnoses with a comparative perspective at the international level. The grouping of jurisdictions based on different criteria (geographic region, income level, CIAT or OECD membership) also makes it possible to identify trends and stylized facts in specific aspects of tax administration that provide, at the same time, technical frameworks of reference for the rest of the countries and a clear picture of the existing gaps between them in these areas.

On the one hand, in calculating the INDITEC index for the 156 jurisdictions participating in ISORA, it was essential to design an estimation methodology that emphasized the balance between the considered dimensions, the representativeness of the selected variables from ISORA's database and the homogeneity of the different ways of quantifying the available figures in each case. The methodology used also prioritizes simplicity in its calculation and represents a starting point in measurements of this type, admitting future revisions always with the aim of having a synthetic indicator that, with the maximum feasible accuracy, allows direct comparisons between the TAs by summarizing a large number of relevant partial variables.

On the other hand, the results are, for the most part and in general terms, very reasonable and in line with what can be observed in practice (at least in specific cases). At a global level, the conglomerate of countries belonging to CIAT ends up in an outstanding position in some of the evaluated dimensions, with figures very close to those obtained for the OECD developed countries. By income level, as expected, there is a clear positive association with the resulting values of all the estimated indicators,

whether by partial dimensions or the total INDITEC index. At the individual level for CIAT countries, first of all, significant gaps can be observed in each of the partial dimensions under consideration. Likewise, the distribution of the “ISORA” universe of 156 jurisdictions into quartiles shows, once again, that most CIAT countries are located in the top two quartiles, i.e., above the global average of ISORA 2020, with some of them even exceeding the estimated average for OECD countries (maximum standard).

As usual, the interpretation of the results and the drawing of general conclusions should always include some caution due to the weaknesses or inaccuracies that the base information itself may contain or carry over from the processed questionnaires of the ISORA Survey. In addition, it is not trivial that the data refer to fiscal year 2019, since it is to be expected that the forced responses of countries in terms of tax administration to the COVID-19 pandemic have modified or accelerated innovative practices linked to the operational functioning of the different TAs. In this sense, the results derived from the INDITEC calculation are also useful when considered as: a) the continuation of previous medium-term trends and b) a prior diagnosis of the TA status in these aspects just before the occurrence of this unfortunate extraordinary event of global scale.

Overall, with its own characteristics, the INDITEC index appears as a practical and novel method, complementary to other existing ones, to carry out the comparative evaluation or benchmarking of TAs from different latitudes in terms of their relative degree of progress in the incorporation of technological innovations in tax management and compliance improvement, the digitalization of their main operational functions, and the strategic orientation of the available financial and human resources available in that same sense.

Bibliographical References

CIAT (2020). *ICT as a Strategic Tool to Leapfrog the Efficiency of Tax Administrations*, Ed. CIAT, Panama. <https://biblioteca.ciat.org/opac/book/5696>

CIAT-BID (2018). *Factura electrónica en América Latina*. Ed. CIAT. <https://biblioteca.ciat.org/opac/book/5564>

CIAT-GIZ (2019). *Declaraciones tributarias pre-elaboradas, DT-02-2019*, CIAT. <https://biblioteca.ciat.org/opac/book/5651>

Morán, D. y Díaz de Sarralde Miguez, S. (2021). *Overview of Tax Administrations in CIAT Countries. Revenue, resources, performance, and digital transformation in the prelude to the COVID-19 pandemic Based on ISORA 2020 Survey results (Data for 2018-2019)* Ed. CIAT, Panama. <https://biblioteca.ciat.org/opac/book/5787>

OECD (2021). *Tax Administration: Digital Resilience in the COVID-19 Environment, OECD Policy Responses to Coronavirus (COVID-19)*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/2f3cf2fb-eN>

S tistical Appendix: Results for the ISORA 2020 participating countries

Table A.1: INDITEC global index and by dimensions, INDITEC quartiles and response ratio. ISORA 2020 participating countries. Data for fiscal year 2019 (or 2018 when not available).

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
AFG	Afghanistan. Islamic Republic of	0.00	0.20	0.00	0.61	0.20	1	83%
ALB	Albania	0.13	0.60	0.90	0.97	0.65	4	100%
AGO	Angola	0.50	0.00	0.50	0.57	0.39	2	90%
ATG	Antigua and Barbuda	0.13	0.00	0.00	0.63	0.19	1	97%
ARG	Argentina	0.31	0.80	0.76	0.70	0.64	4	100%
ARM	Armenia. Republic of	0.50	0.60	0.67	0.74	0.63	3	97%
AUS	Australia	0.94	0.60	0.11	0.70	0.59	3	86%
AUT	Austria	0.63	0.80	0.54	0.71	0.67	4	97%
AZE	Azerbaijan. Republic of	0.13	0.40	0.66	0.72	0.47	2	90%
BGD	Bangladesh	0.19	0.40	0.17	0.57	0.33	2	97%
BRB	Barbados	0.31	0.60	0.59	0.90	0.60	3	100%
BLR	Belarus	0.31	0.80	0.66	0.00	0.44	2	66%
BEL	Belgium	0.69	0.80	0.96	0.72	0.79	4	97%
BLZ	Belize	0.13	0.20	0.00	0.59	0.23	1	93%
BEN	Benin	0.13	0.80	0.75	0.64	0.58	3	93%
BTN	Bhutan	0.13	0.60	0.58	0.28	0.40	2	86%
BOL	Bolivia	0.38	0.40	0.68	0.73	0.55	3	100%
BIH	Bosnia and Herzegovina	0.00	0.00	0.39	0.45	0.21	1	90%
BWA	Botswana	0.00	0.20	0.32	0.61	0.28	1	86%
BRA	Brazil	0.63	0.60	0.96	0.62	0.70	4	100%

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
BGR	Bulgaria	0.38	0.40	0.90	0.87	0.64	4	100%
BDI	Burundi	0.31	0.20	0.00	0.66	0.29	1	100%
KHM	Cambodia	0.25	0.40	0.23	0.58	0.37	2	79%
CMR	Cameroon	0.13	0.60	0.08	0.35	0.29	1	59%
CAN	Canada	0.69	0.40	0.81	0.68	0.64	4	93%
CPV	Cape Verde	0.00	0.20	0.66	0.64	0.38	2	97%
CAF	Central African Republic	0.13	0.80	0.00	0.54	0.37	2	100%
TCD	Chad	0.19	0.40	0.00	0.12	0.18	1	83%
CHL	Chile	0.44	0.80	0.65	0.69	0.64	4	97%
CHN	China	0.75	0.60	0.24	0.53	0.53	3	86%
COL	Colombia	0.81	0.60	0.74	0.63	0.69	4	100%
COM	Comoros	0.19	0.40	0.08	0.47	0.28	1	93%
COD	Congo (Democratic Rep.)	0.00	0.00	0.00	0.25	0.06	1	86%
COG	Congo (Republic of)	0.25	0.60	0.15	0.45	0.36	2	69%
COK	Cook Islands	0.00	0.20	0.29	0.59	0.27	1	97%
CRI	Costa Rica	0.75	0.20	0.79	0.81	0.64	3	100%
HRV	Croatia	0.13	0.60	0.71	0.85	0.57	3	97%
CYP	Cyprus	0.13	0.60	0.54	0.66	0.48	3	97%
CZE	Czech Republic	0.50	0.60	0.61	0.73	0.61	3	100%
DNK	Denmark	0.88	0.60	1.00	0.93	0.85	4	93%
DMA	Dominica	0.13	0.00	0.02	0.69	0.21	1	90%
DOM	Dominican Republic	0.63	0.60	0.94	0.77	0.73	4	100%
ECU	Ecuador	0.38	1.00	0.91	0.75	0.76	4	100%
SLV	El Salvador	0.00	0.40	0.65	0.66	0.43	2	100%
EST	Estonia	0.63	0.40	0.86	0.60	0.62	3	100%
SWZ	Eswatini	0.56	0.00	0.19	0.70	0.36	2	100%
ETH	Ethiopia	0.50	0.60	0.10	0.27	0.37	2	72%

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
FJI	Fiji	0.25	0.40	0.02	0.82	0.37	2	90%
FIN	Finland	0.75	0.60	0.87	0.81	0.76	4	100%
FRA	France	0.50	0.80	0.81	0.66	0.69	4	97%
GAB	Gabon	0.00	0.00	0.08	0.32	0.10	1	69%
GMB	Gambia	0.00	0.00	0.22	0.06	0.07	1	72%
GEO	Georgia	0.56	0.60	0.72	0.74	0.65	4	100%
DEU	Germany	0.63	0.40	0.73	0.77	0.63	3	97%
GHA	Ghana	0.56	0.60	0.00	0.65	0.45	2	97%
GRC	Greece	0.44	0.40	0.84	0.67	0.59	3	100%
GRD	Grenada	0.00	0.00	0.18	0.64	0.20	1	86%
GTM	Guatemala	0.50	0.60	0.78	0.61	0.62	3	100%
GIN	Guinea	0.00	0.00	0.00	0.50	0.13	1	86%
GNB	Guinea Bissau	0.00	0.00	0.00	0.24	0.06	1	69%
GUY	Guyana	0.00	0.20	0.19	0.69	0.27	1	100%
HND	Honduras	0.38	0.00	0.60	0.67	0.41	2	100%
HKG	Hong Kong	0.38	0.20	0.35	0.64	0.39	2	97%
HUN	Hungary	0.75	1.00	0.86	0.73	0.84	4	86%
ISL	Iceland	0.50	0.40	0.67	0.73	0.58	3	97%
IND	India	0.63	0.60	0.51	0.49	0.56	3	86%
IDN	Indonesia	0.19	1.00	0.29	0.44	0.48	2	86%
IRL	Ireland	0.75	0.60	0.96	0.63	0.74	4	100%
ISR	Israel	0.56	0.60	0.59	0.75	0.62	3	100%
ITA	Italy	0.44	1.00	0.77	0.71	0.73	4	100%
JAM	Jamaica	0.25	0.40	0.57	0.73	0.49	3	100%
JPN	Japan	0.88	0.40	0.08	0.40	0.44	2	72%
KAZ	Kazakhstan	0.56	0.40	0.23	0.36	0.39	2	86%
KEN	Kenya	0.88	1.00	0.83	0.62	0.83	4	100%
KIR	Kiribati	0.00	0.20	0.19	0.45	0.21	1	93%

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
KOR	Korea (Republic of)	0.38	0.60	0.51	0.73	0.55	3	97%
KOS	Kosovo (Republic of)	0.44	0.40	0.48	0.77	0.52	3	97%
KGZ	Kyrgyz Republic	0.38	0.60	0.34	0.62	0.48	3	86%
LAO	Lao People's Democratic Republic	0.56	0.80	0.08	0.01	0.36	2	62%
LVA	Latvia	0.63	0.80	0.81	0.82	0.76	4	100%
LSO	Lesotho	0.06	0.00	0.00	0.01	0.02	1	69%
LBR	Liberia	0.06	0.40	0.03	0.72	0.30	1	90%
LTU	Lithuania	0.69	1.00	0.85	0.83	0.84	4	100%
LUX	Luxembourg	0.44	0.20	0.80	0.62	0.51	3	97%
MDG	Madagascar	0.19	0.60	0.08	0.65	0.38	2	86%
MWI	Malawi	0.19	0.40	0.26	0.58	0.36	2	97%
MYS	Malaysia	0.75	0.40	0.59	0.64	0.60	3	97%
MDV	Maldives	0.00	0.00	0.48	0.49	0.24	1	93%
MLT	Malta	0.56	0.60	0.23	0.37	0.44	2	76%
MUS	Mauritius	0.06	0.40	0.32	0.64	0.36	2	86%
MEX	Mexico	0.63	0.80	0.66	0.63	0.68	4	97%
MDA	Moldova	0.06	0.80	0.34	0.63	0.46	2	86%
MNG	Mongolia	0.44	0.60	0.67	0.73	0.61	3	100%
MNE	Montenegro	0.19	0.40	0.09	0.75	0.36	2	90%
MSR	Montserrat	0.00	0.00	0.17	0.57	0.19	1	90%
MAR	Morocco	0.31	0.40	0.84	0.71	0.57	3	100%
MOZ	Mozambique	0.13	0.20	0.24	0.32	0.22	1	79%
MMR	Myanmar	0.00	0.00	0.09	0.71	0.20	1	97%
NAM	Namibia	0.00	0.00	0.33	0.64	0.24	1	97%
NRU	Nauru	0.00	0.40	0.25	0.59	0.31	1	90%
NLD	Netherlands	0.69	0.60	0.75	0.90	0.73	4	100%
NZL	New Zealand	0.63	0.80	0.79	0.66	0.72	4	90%
NIC	Nicaragua	0.25	0.20	0.67	0.68	0.45	2	100%

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
NER	Niger	0.81	0.60	0.00	0.54	0.49	3	100%
NGA	Nigeria	0.56	0.20	0.20	0.47	0.36	2	93%
NOR	Norway	0.81	0.80	0.90	0.86	0.84	4	100%
PAK	Pakistan	0.13	0.40	0.50	0.53	0.39	2	93%
PAN	Panama	0.13	0.20	0.27	0.51	0.28	1	86%
PNG	Papua New Guinea	0.13	0.20	0.23	0.56	0.28	1	79%
PRY	Paraguay	0.25	0.40	0.98	0.45	0.52	3	93%
PER	Peru	0.69	0.80	0.84	0.73	0.77	4	100%
PHL	Philippines	0.44	0.80	0.31	0.50	0.51	3	97%
POL	Poland	0.56	0.60	0.82	0.71	0.67	4	100%
PRT	Portugal	0.50	1.00	0.83	0.71	0.76	4	100%
MKD	Republic of North Macedonia	0.00	0.80	0.63	0.69	0.53	3	93%
SRP	Republika Srpska	0.25	0.20	0.09	0.13	0.17	1	62%
ROU	Romania	0.38	0.20	0.67	0.57	0.46	2	86%
RUS	Russian Federation	0.81	0.80	0.24	0.82	0.67	4	86%
RWA	Rwanda	0.31	0.80	0.25	0.51	0.47	2	69%
WSM	Samoa	0.50	0.80	0.19	0.30	0.45	2	72%
STP	São Tomé and Príncipe	0.25	0.60	0.00	0.15	0.25	1	79%
SAU	Saudi Arabia	0.50	0.40	0.61	0.51	0.50	3	93%
SEN	Senegal	0.00	0.40	0.00	0.85	0.31	1	83%
SRB	Serbia, Republic of	0.38	0.60	0.97	0.74	0.67	4	100%
SYC	Seychelles	0.00	0.00	0.09	0.61	0.18	1	97%
SLE	Sierra Leone	0.31	0.40	0.33	0.65	0.42	2	86%
SGP	Singapore	1.00	0.60	0.93	0.75	0.82	4	100%
SVK	Slovak Republic	0.50	0.60	0.78	0.73	0.65	4	100%
SVN	Slovenia	0.75	1.00	0.69	0.88	0.83	4	97%
SLB	Solomon Islands	0.31	0.40	0.23	0.51	0.36	2	79%

Code	ISORA Countries	Technological Innovation	Compliance Improvement	Operational Digitalization	Resources & Budget	INDITEC (Total)	INDITEC Quartile	Response Rate (%)
ZAF	South Africa	0.56	0.20	0.80	0.57	0.53	3	100%
ESP	Spain	0.75	0.60	0.82	0.66	0.71	4	97%
LCA	St Lucia	0.13	0.20	0.20	0.86	0.35	2	97%
VCT	St Vincent and the Grenadines	0.00	0.00	0.01	1.00	0.25	1	86%
KNA	St. Kitts and Nevis	0.25	0.40	0.23	0.73	0.40	2	100%
SUR	Suriname	0.00	0.60	0.00	0.54	0.28	1	72%
SWE	Sweden	0.63	0.60	0.71	0.80	0.68	4	97%
CHE	Switzerland	0.50	0.20	0.17	0.41	0.32	2	72%
TWN	Taiwan	1.00	0.40	0.19	0.55	0.53	3	83%
TJK	Tajikistan	0.56	0.80	0.68	0.78	0.71	4	100%
THA	Thailand	0.75	0.00	0.49	0.73	0.49	3	97%
TLS	Timor-Leste. Dem. Rep. of	0.25	0.20	0.00	0.51	0.24	1	69%
TGO	Togo	0.63	0.40	0.34	0.66	0.51	3	86%
TON	Tonga	0.00	0.40	0.18	0.54	0.28	1	100%
TTO	Trinidad and Tobago	0.50	0.40	0.25	0.65	0.45	2	90%
TUR	Turkey	0.38	0.60	0.73	0.72	0.61	3	100%
TCA	Turks and Caicos Islands	0.00	0.00	0.17	0.53	0.17	1	79%
UGA	Uganda	0.69	0.20	0.80	0.63	0.58	3	100%
UKR	Ukraine	0.13	0.20	0.83	0.74	0.47	2	97%
GBR	United Kingdom	0.88	0.60	0.75	0.68	0.72	4	93%
USA	United States	0.69	0.40	0.49	0.68	0.56	3	93%
URY	Uruguay	0.75	0.60	0.74	0.63	0.68	4	97%
UZB	Uzbekistan	0.69	1.00	0.72	0.74	0.79	4	100%
VNM	Vietnam	0.13	0.20	0.25	0.42	0.25	1	79%
ZMB	Zambia	0.38	0.80	0.75	0.34	0.57	3	79%
ZWE	Zimbabwe	0.00	0.80	0.87	0.58	0.56	3	93%

Source: Authors' elaboration based on ISORA 2020.



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