

Exploring Digital Paths towards Formalizing the Informal Economy: Synthesis of International Best Practices in Tax Administration

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Abstract:

In order to achieve comprehensive tax compliance, the tax administration uses several tools to contain the informal economy, many of which rely on modern technologies. This study aims to synthesize international best practices, in a readily useable and understandable way for policymakers. We adopted the descriptive analytical approach and used thematic coding as main research tool. We have found that technology is a necessary wherewithal to formalize the informal economy, by providing new data sources, significantly raising the detectability of informality and tax evasion, and fostering voluntary compliance through digital proximity. Likewise, we have identified 10 technological levers divided into 3 modes of action. Furthermore, we accompanied these findings with numerous practical recommendations for policymakers to enhance their efficacy, and suggested some relevant and important research paths.

Keywords: Informal Economy; e-Formalization; Policy; Tax Administration; Best Practices.

JEL Classification Codes : J08; O17; O38; K42.

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1. INTRODUCTION

Informal economy (IE) is one of the major and persistent problems of developmental economics. This giant reservoir of economic resources beyond the control of states, accounts for 58.2% of the global workforce (ILO, 2023, p. 17) and 35% of middle and low-income countries' GDP (WEF, 2024). This situation perpetuates a lose - lose relationship between the government and informal enterprises. While the former lose huge revenues that could have been spent on development, the latter are deprived of growth opportunities due to the absence of formal public services such as financing, insurance, and social protection for their human resources. Therefore, governments work to contain the IE through policies and measures that apply to several government departments, such as trade, labor, social protection. The tax administration is one of the most important departments in forefront of IE containing, as part of its mission to enforce comprehensive tax compliance.

In the era of digitalization, technology influences social and economic aspects of communities, and can offer innovative answers to persistent problems in countries. In literature, technology, mainly ICT, solutions to key tax administration challenges have been addressed: Improving and modernizing declaration system (Zambrano, 2002), tax evasion (Uyar, Nimer, Kuzey, Shahbaz, & Schneider, 2021), tax compliance and administration costs (Hesami, Jenkins, & Jenkins, 2024). Recently, some studies, like (Chacaltana, Leung, & Lee, 2018; Williams, 2021), have examined countries' practices in using technology within a strategy specifically designed to the formalization of IE. A new term is accordingly coined, "E-formalization" refers to the application of new technologies in order to facilitate public initiatives for IE formalization (Williams, 2021, p. iv). Chimilila & Leyaro (Chimilila & Leyaro, 2022) investigated the effect of ICT and e-formalization on tax mobilization efforts in sub-Saharan Africa, and found that e-formalization have enhanced these efforts. Dhanya (Dhanya, 2024) studied the e-formalization practices in India. This study seeks to synthesize international best practices for e-formalization of IE.

1.1. The Problematic

This study addresses the question: How can technology be instrumentalized effectively within an integrated strategy to formalize the informal economy? To reach all the elements to treat this problematic, a set of questions requires answers: (i) What are the various axes of an integrated IE formalization strategy? And the ones that technology can serve? (ii) According to international best practices, what are applications of technology for tax compliance and IE formalization purposes? (iii) What are the general modes by which technology contributes to IE formalization?

1.2. Study's Objectives and Importance

We aim to: (i) Precisely define what technology can and cannot do in an integrated formalization policy for the informal economy; (ii) Provide a readily useable e-formalization levers for policy makers: The study aim to screen only the proven efficient and applicable technological levers based on the international best practices, and present them in an understandable and intuitive structure (according to the main modes of action). The study's results are important to policymakers because: (i) the magnitude and the persistence of IE and its non-responsiveness to conventional policy tools (Ohnsorge & Yu, 2022, p. 69); (ii) It is important to modernize tax administration with new technologies to keep pace with the digitization of businesses; (iii) The use of technology must be informed by its potential and its mechanisms of action, which is what this study attempts to elucidate.

2. Literature Review

2.1. On Informal Economy

Informal economy is the portion of economic activity that escapes public authorities' measurement and control (Andrews, Sánchez, & Johansson, 2011, p. 7), it is therefore not subject to regulation such as registrations and licensing, taxation, labor and environmental laws (Joshi, Prichard, & Heady, 2014, p. 1327). IE results in substantial declines in tax revenues; and productivity losses in production factors due to the distorted market competition with informal low-productivity firms (Ulyssea, 2018, p. 2015) and the retention of the money supply from its optimal use through financial markets. Additionally, it erodes confidence in the integrity of public institutions' and the reliability of their statistics (Andrews, Sánchez, & Johansson, 2011, p.7). On the other hand, actors (enterprises owners and employees) in the IE are denied access to regulated financial services, social protection, and their rights to protection from the judicial system (Wirjo, Calizo, & Balbont, 2022, p. 3).

Because IE is a heterogeneous mix of enterprises and economic activities (Andrews, Sánchez, & Johansson, 2011, p. 2), understanding those different components, as well as their motivations and dynamics, is important for dealing with it effectively. Four types of enterprises make up the IE phenomena (see table 1 above). IE enterprises are generally characterized by their small size, which keeps them relatively invisible to state agencies. The growth potential of these enterprises is generally accompanied by a higher likelihood of formalization, as access to formal financing and business development services, as well as integration into formal business value chains, is a natural outcome of growth. The latter rule isn't typical as some big official enterprises may conceal some of their activity, while small IE enterprises with promising growth prospects may deliberately maintain their size to avoid formality costs. There is a spectrum of four

(04) possible types of IE enterprises depending on their growth prospects and, consequently, their responsiveness to formalization policies (see table 1).

Table 1. Typology of Informal Enterprises

Type of enterprise	Subsistence Enterprises	Unofficial Enterprises (Type 1)	Unofficial Ent ^{es} (Type 2)	Official Enterprises
Degree of Informality	100%	High proportion	Some proportion	
Technology	Labor intensive	Mostly labor intensive	Knowledge and capital intensive	
Owner profile	Poor, low education, low level of skills	Poor and non-poor, well educated, high level of skills	Non-poor, highly educated, sophisticated level of skills	
Finance needs	Working capital	Working & some investment capital, supplier credit	Investment capital and working capital, supplier credit	
Other needs	Personal insurance, social protection Personal and perhaps business insurance,		Personal & business insurance, business development services	
	Least dynamic Completely informal		Highly dynamic Partially formal	



Source: Adapted from (Djankov, Lieberman, Mukherjee, & Nenova, 2003, p. 66).

Subsistence enterprises Is the least dynamic component of IE, undertaken by individuals who lack the qualification for work in the formal economy, and whose meagre incomes prevent them from affording the costs of formality, no matter how small. Their labour-intensiveness nature and their abstinence from investment and growth limit their financing needs to working capital financing.

2.2. Formalization Policies and Measures

Formalization policies seek to achieve their goals by addressing the causes of informality, on which the literature differs, with four different approaches explaining the IE (see Table 2). Formality costs, lack of empowering and attractive business environment, low level of enforcement, and the free will of entrepreneurs are the major causes of IE according to the four (04) mainstream approaches. The disagreement over the causes of IE reflects to some extent its heterogeneous nature. This heterogeneity requires a multipronged regulatory policy, and a vast myriad of measure ranging from deterrence tools to more voluntary ones. Williams Colin (Williams, 2021) proposes a framework of such a policy (see Fig. 1). Despite the importance of an integrated approach that combines various public agencies efforts to curb the phenomenon, two distinct levers are used within any effective formalization policy: (i) action based on the formalization

of IE enterprises (firms); (ii) action based on the formalization of IE employment (Chacaltana, Leung, & Lee, 2018, pp. 3,11). Targeted measures for subsistence enterprises should prioritize the social protection of their owners and employees, rather than ensuring their strict tax compliance. According to a well-justified point of view this type of enterprise is the least responsive to formalization measures; has a weak formalization yield (income/cost); because of his vulnerability law enforcement pose moral issues (Joshi, Prichard, & Heady, 2014, p. 1329).

Table 2. Different Policy Approaches for Dealing with Informal Economy

The Model	Causes of IE	Policy Recommendations
Exclusion Model (De Soto, 2000)	Informal firms can't afford formalization costs	Simplifying registration; registration via one stop shop; cutting direct and indirect formalization costs.
Rational Exit Model (Maloney, 2004)	The decision to formalize is a tradeoff between the costs and benefits	Decreasing formalization costs; tax exemptions; facilitation of credit and other business development services.
Parasite Model (Farrell, 2004; Baily, Farrell, & Remes, 2006)	IE entrepreneurs opportunistic behavior, encouraged by low level of law enforcement	Awareness campaigns about informality risks, Intensifying inspection actions.
Dual Economy Model (La Porta & Shleifer, 2008; La Porta & Shleifer, 2014)	IE firms are small unproductive, Inoffensive to formal ones, non-responsive to formalization policies	Doing nothing; policy focus on the formal part of the economy.

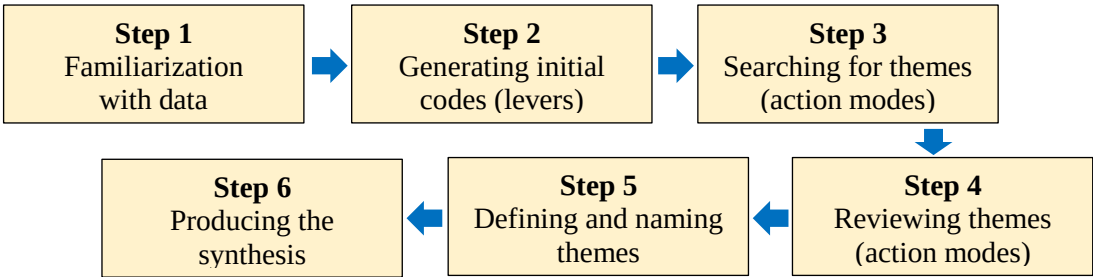
Source: Author’s compilation based on (Floridi, Demena, & Wagner, 2020, pp. 3-4).

In professional and academic circles alike, it is becoming more and more obvious that technology can contribute significantly to IE formalization. This role is growing as tax administrations attempt to adapt to the digital and platform economy, inevitably using technological tools to ensure comprehensive tax compliance (ADB, 2022, pp. 7-8). Empirical studies have found a positive impact of technology use in containing the problem of the IE (Garcia-Murillo & Velez-Ospina, 2017; Kelikume, 2021; Nguyen, Schinckus, Nguyen, & Le Tran, 2024). Similar results have been reached concerning IE formalization policy use of technology within the framework of e-government (Veiga & Rohman, 2017; Elbahnasawy, 2021). Recently, some studies, like (Chacaltana, Leung, & Lee, 2018; Williams, 2021), have examined countries’ practices in using technology within a strategy specifically designed to the formalization of IE. A new term is accordingly coined, “e-formalization” refers to the application of new technologies in order to facilitate public initiatives for IE formalization (Williams, 2021, p. iv).

3. Methodology

We adopted the descriptive analytical approach to conduct the study, and used the thematic coding (Braun & Clarke, 2006; Gibbs, 2007; Naeem, Ozuem, Howell, & Ranfagni, 2023; Ahmed, et al., 2025) as a main research tool. We got data from secondary sources (articles and reports) for the review of related literature; the search into potential applications of e-formalization; and finally, empirical evidence of their effectiveness. In order to conduct the study in an organized manner, we conceived a four (04) step method (see fig. 3) and we used William Colin’s framework (Williams, 2020, p. 19; Williams, 2021, p. 13; ILO, 2021, p. 24) as a model of an integrated formalization strategy (see also Appendice 1).

Fig. 3. The Study Steps



Source: Adapted from (Braun & Clarke, 2006, p. 87).

We subjected the observed technological levers to a screening, relying on three criteria: (i) Logic: The added value of the lever should be self-evident (obvious) without the need for further proof; (ii) Widespread or common international use: The lever be recognized by supranational institutions (e.g., OECD) or multilateral research centers (e.g., CIAT) as good international practice; (iii) Empirical evidence: Availability of empirical studies that demonstrate the lever effectiveness in containing IE or in increasing tax compliance.

4. Results

Most of our research effort has been to synthesize international best practices in the IE e-formalization. The intent was to screen proven effective technological instruments that achieve this purpose, which we call technological levers to emphasize their adaptable and customizable nature according to the specifics of the policymaker. These levers were grouped into three axes (which we called Action Modes) to make these levers more understandable, and give them the appropriate granularity for practical use.

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Table 3. A Synthesis of e-Formalization Action Modes and Levers

Action Mode	Levers	Implementing Countries	Empirical Evidences
Digitally Enabled Data Sources (new data sources enabled only by digital technologies)	e-Invoicing (automatic transfer of billing data between firms and the tax authority)	Indonesia, Kazakhstan, China, Singapore, South Korea (ADB, 2022, p. 13), Argentina, Peru, Bolivia, Brazil, Mexico, Chile, Colombia, Costa Rica, Italy, Panama, Dominican Republic, Ecuador, Panama, Guatemala (CIAT, 2020, p. 243).	Peru: Over 5% in VAT (Value-Added Tax) liabilities increase in the first e-invoicing adoption (Bellon, Dabla-Norris, Khalid, & Frederico, 2022).
	e-Payment (related data for tax compliance purposes)	Under the CESOP system, EU countries use data about electronic cross-border payments from the payment service providers in order to fight under reported VAT business liabilities (EC, 2023).	Italy: VAT fraud decreased by between 2.2 and 2.6 € billion in 2019 (Heinemann & Stiller, 2025).
	e-Devices (electronic cash registers and electronically traceable cash receipts)	Argentina, Austria, Belgium, Czech Republic, Hungary, Italy, Netherlands, Portugal, Russia, Sweden (OECD, 2019, pp. 12-13). Tanzania, Ethiopia, Rwanda (EY, 2025, p. 75).	Hungary: 15% Increase in 2014 VAT revenue in the retail and hospitality sector. Rwanda: Average of 5,4 % increase in VAT payments (EY, 2025, p. 75).
	Social Networks (relevant online traces on business activities and transactions)	Ireland, Malaysia, Singapore, Netherlands, New Zealand (OECD, 2016, p. 21).	Belgium: Carousel fraud decreased by 80 to 90% between 2001 and 2010 thanks to the use of social network analysis (Servièrè, 2015).
	Shared Databases (between government departments)	In a survey of over 100 countries , 70% reported the existence of such cross-government databases (OECD, 2024, p. 40).	See the part on data sharing, data analytics, and AI below.
Data-Driven Detection Capabilities (automated data Science tools for tax compliance purposes)	Data Matching (computerised cross-checking of multi-source data)	Theoretically, all countries with shared databases between government services, which correspond to 70% of OECD surveyed countries (OECD, 2024, p. 40), use some form of automated data matching.	Italy: VAT corresponding to 7,234 € millions of turnover recovered between 2021 and 2023 due to automated matching taxpayers' self-reported data and actual tax payments (Borghetti, 2023, p. 101).

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Action Mode	Lever	Implementing Countries	Empirical Evidences
Data-Driven Detection Capabilities (automated data Science tools to exploit big data for tax purposes)	Data Analytics & AI (Automated data Analysis tools to discover trends and insights)	Australia, Canada, Finland, France, Ireland, Malaysia, Mexico, Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland, UK and USA use data analytics for audit purposes (OECD, 2016, p. 20). 49% of the OCED surveyed countries use AI and 58% use data analytics to detect tax noncompliance (OECD, 2024, p. 91).	Italy: Reduction in VAT gap of 4,2 € billion between 2021 and 2020 thanks to the simultaneous use of data analytics and e-invoicing data (MEF, 2024, p. 37). Estonia: automatic notification letters to employers using automatic salary benchmarking through data mining has allowed the recovery of 640 € thousand (Williams, 2021, p. 26).
Digital Proximity (ICTs in the service of voluntary compliance)	e-Registration/ e-Filing (e-Channels for tax self-registering and self-reporting)	A growing number of countries (126 in 2017) providing e-filling functionalities in their e-Tax systems (Arewa & Davenport, 2022, p. 190).	Indonesia: 14.34% increase in the number of individual income tax returns filed in 2015 compared to 2014 due to e-filling (DGT, 2015).
	Pre-filing (Tax authority pre-completes tax return for taxpayer review and submission)	Applied in Belgium, Estonia, France, Lithuania, Portugal, Netherlands, Slovenia and Spain (Jensen & Wöhlbier, 2012, p. 23).	Empirical evidences suggest that prefilling combined with other measures limit the ability to evade taxes (Martinez-Vazquez & Sanz-Arcega, 2020; Fochmann, Hechtner, Kölle, & Overesch, 2021).
	e-Assistance (electronic means for notification, education and assistance)	Zambia, Jamaica, Morocco, Peru, Lebanon, Colombia, Estonia, Chile, Burundi, Brazil, Korea, Malaysia, Turkey, South Africa, Uruguay (OECD, 2015).	Brazil: 20% increase in the monthly reported income due to assisted taxpayers' self-regulation combined with firms simplified tax regime (Cafe, Yarygina, & Escalante, 2024).

Source: Author's elaboration.

The first action mode relates to data sources enabled exclusively by technology, which are used for tax purposes and specifically for IE formalization. The action mode

concerns advanced analytical capabilities used for the same purpose, that rely on advanced technologies, older generations of these technologies have not been the subject of much attention. The third and final pattern concerns a different aspect of IE formalization strategy: voluntary compliance. It incorporates a set of levers that serve to foster greater proximity and cooperation between the tax administration and taxpayers. Table 3 Summarizes these levers, the countries using them, and the empirical evidence of their effectiveness that we have found.

5. Discussion

5.1. Comments on the Results

5.1.1. Digitally Enabled Data Sources

Tax administrations use multiple data sources in order to check and complement taxpayers' reported data (Scarcella, 2019, p. 2; Arewa & Davenport, 2022, p. 184). The traditional paper-based information system poses many problems in data collection and processing (Zambrano, 2002, pp. 3-6). Not only do ICTs offer solutions for data collection, storage, and transformation, but they also provide new data sources and the technical capability to share them, which was previously impossible (OECD, 2024, p. 86). Today, tax administrations exploit a myriad of data resources (Idem): (i) Taxpayers' suppliers and customers; (ii) Banks, financial institutions, and payment service providers (PSPs); (iii) Other government agencies (e.g., customs and trade); (iv) International Partners (peer tax administrations and supranational tax unions); (v) Electronic Devices; (vi) Internet and social Media.

While e-Invoicing provides automated and real-time reporting on B2B commercial transactions (Hesami, Jenkins, & Jenkins, 2024, p. 2), its absence in the retail sector poses a tax dilemma (Awasthi, et al., 2019, p. 54). Hence, the need for electronic tax devices. It is common in European countries to require the use of electronic cash registers are directly connected or have memory cards accessible only to the tax administration. In Korea, electronically traceable cash receipts are used to capture retail transaction data (Awasthi, et al., 2019, p. 60). E-payment data reported by banks and PSPs help to trace in store and online transactions, this is particularly useful for the growing e-commerce activity. Social networks are the most recently utilized source of tax data and are instrumental in uncovering inter-person and inter-firm fraud, which is impossible with conventional closed datasets (OECD, 2016, pp. 21-22; Garcia, 2018, pp. 42-45). Many tax administrations worldwide have automated reporting systems for third-party data such as utilities, stock exchanges, and online vendors (OECD, 2024, p. 88), while others have access to databases shared by many government departments (Williams, E-formalization in Europe, 2021, pp. 14-17), allowing them to exploit the latent synergies in data collection.

5.1.2. Data-Driven Detection Capabilities

Data availability must be joined by the necessary analytical technology in order to be an asset for tax administrations. Data Analytics is a must to face tax big data (ADB, 2022, pp. 6-7) with its high data volume, velocity, and variety (Saeed & Husamaldin, 2021, p. 2). Digital solutions such as data matching, data analytics and artificial intelligence (AI) enable the partial automation of human controls, which is especially critical in light of the limited resources available for tax administrations and the expanding tax population (Fidiana, 2025, p. 280). On the other hand, the low frequency of human controls, which is common, severely undermines their deterrent role (Borghetti, 2023, p. 98), and automation is the alternative to compensate for this deficiency.

Big data has historically created a boundary between older and newer generations of data processing and analysis technologies. Data matching, for instance, is a conventional method for detecting tax noncompliance, but it was modernized by first-generation digital technologies such as data repositories and structured query language (SQL) (Garcia, 2018, p. 36). But in order to remain viable in dealing with big data, numerous newer technologies were necessary (Davenport, 2013, pp. 4-5): multiserver cloud infrastructures, open-source software, NoSQL databases for unstructured data, and semi-automated processing with machine learning.

Data analysis technologies (data matching, data analytics and AI) serve tax compliance purpose by (Garcia, 2018, pp. 36-40): (i) identifying false statements by comparison, outliers and statistical distributions of error; (ii) profiling the taxpayer population and propose candidate categories for audit; (iii) simulating the experience and criteria of human inspectors in programming audit tasks. Newer technologies are more predictive and prescriptive in nature compared to older descriptive ones. This allows for proactive measures to deter and change behaviour towards compliance, and Estonia's experience with notification letters (Williams, 2021, p. 26) is a good example of this.

5.1.3. Digital Proximity

To support voluntary compliance a service-related approach is increasingly used by tax administrations worldwide, under it, taxpayers are provided with a range of (OECD, 2024, p. 97): (i) Services: deadline reminders, notifications; (ii) Facilities: pre-filling of their declarations; and (iii) Initiatives: guidance and education. The relevance of this policy choice is supported by empirical evidences, studies like (Hardika, Wicaksana, & Subratha, 2020; Hassan, Naeem, & Gulzar, 2021; Hayat, Salameh, Al Mamun, Ali, & Makhbul, 2022) show that tax awareness, tax knowledge and simplicity are significant factors for tax compliance.

Technology can be instrumentalized to bring tax administration closer to the taxpayer, digital communication channels and tools are used, accordingly, to bring the

latter within tax compliance of his own free will and with the assistance of the tax administration. The digital proximity action mode refers to the used technological levers that serve this approach. The common services provided by the Tax Administrations are: e-registering/e-filing and pre-filing of the taxpayer liabilities. As for tax education and assistance, several channels are used, such as call centers, websites, and social media (OECD, 2015).

5.2. Pertinence of e-Formalization Mode of actions and Levers

5.2.1. Utility and Scope of Impact

Technology has a positive impact on all aspects of an integrated strategy to contain the IE (see Table 4). However, technology with its current applications has no direct benefit in some modes of influence on the IE, for example, in term of increasing the penalties on informality for example. However, this does not preclude it from having an indirect role, as it is useful in tracing recidivism (Williams, 2021, p. 28), for example, and thus in increasing penalties for perpetrators.

Table 4. Technology Impact on the various aspects of e-Formalization Strategy

Strategy Aspect			Direct Impact
Direct Controls	Deterrents (Sticks)	Improved Detection	✓
		Increased Penalties	✗
	Incentives (Carrots)	Supply-Side	✓
		Demand-Side	✗
Indirect Controls	Reduce asymmetry between formal and informal firms	Change informal firms (values, norms and beliefs)	✓
		Change formal firms (laws, regulations and codes)	✗

Source: Author’s own elaboration.

E-payment data necessitates special care, and its use must be meditated. Excessive handling of cash is a phenomenon associated with the IE (OECD, 2017, p. 17). In Algeria, for example, the IE drove permanently 34% of the M2 money supply to circulate outside the official banking system (Bank of Algeria, 2023, p. 41). The phenomenon is driven by a desire to avoid exposure to state agencies, particularly tax authorities, as electronic payments represent one of their most important data sources.

Exploiting this data source (e-payment) for countries that have reached high levels of maturity and inclusion in the use of formal financial services, particularly electronic ones, will lead to greater tradability and tax compliance, as evidenced by empirical results in Italy (Heinemann & Stiller, 2025), for example. However, its application in developing countries raises serious and justified concerns that it may hinder or inhibit their financial

inclusion agendas. In Uruguay, state efforts to increase e-payments through financial incentives on card payments had a lesser effect on non-customers, despite an immediate 50% increase in the number of card transactions, resulting in no effect on tax compliance (Brockmeyer & Somarriba, 2022). Pobee, Jibril, & Owusu-Oware (Pobee, Jibril, & Owusu-Oware, 2023) found a negative impact between taxation and mobile money use. In Kenya, a pioneer in mobile money, despite the successful implementation of a excise tax on money transfers since 2013 (Ndung'u, 2017, p. 250), this is very likely to slow and discourage the spread of electronic money services (Diouf, Carreras, & Santoro, 2023).

5.2.2. Tax Functions' Automation and e-Formalization

Many studies approach the topic of technology use within tax administration from the perspective of automation and reducing compliance costs [see (Chimilila & Leyaro, 2022)]. In our perspective, automation is a result of tax administration efforts to fight noncompliance, including the IE. In fact, many tax policies around the world are driven by a will to increase the tax base rather than increase tax rates (Gillis, McStocker, & Percival, 2015, p. 2; Borghetti, 2023, p. 99). In such a trend of favoring quantity over value, cost reduction can easily take second place to expanding the tax base. From the taxpayer perspective, the perceived reduced conformity/formality cost can easily be conceived as an intermediate goal in the quest to contain EI (De Soto, 2000; Maloney, 2004). It should be noted that this applies exclusively to the digital proximity aspect (action mode) of e-formalization, that is to say, the provision of automated, less expensive and more convenient interaction mechanisms with the taxpayers. In the other two modes of action, the automation of data collection, storage, transfer, processing and sharing serve as a mean for enforcing compliance.

5.2.3. Practical Aspects and Recommendations for Policy Makers

Neither prioritization nor hierarchization of action modes is possible in an e-formalization strategy. This is because of the existing synergies between the various technological levers. The prefilling of tax liabilities for example rely mainly on the e-invoicing data source (Hesami, Jenkins, & Jenkins, 2024, p. 2; OECD, 2024, p. 86) As well as data matching, which in turn relies on the availability of shared databases to operate efficiently. All technological levers and action modes work as a whole and should therefore be used as an integrated toolkit.

Technological levers can only operate on individuals and firms already identified by tax administration. Working as usual will limit the effect of technology on the official firms that conceal part of their activity, excluding unofficial firms that are by nature hidden from the tax administration. The availability of digital identity system (e-ID) is thus a prerequisite for tax inclusion, to ensure that tax liabilities are linked to those responsible for them, whether citizens or firms. For this purpose, the creation of a tax

identification number must be linked to routine administrative procedures (such as registering a newborn) or other public services and benefits (OECD, 2024, p. 40). Or, a national digital identity system for natural and legal persons must be established, assuring interoperability with the tax administration (OECD, 2020, p. 44). Subsistence enterprises must be the object of simplified or special regime, and approached by digital proximity action mode rather than others.

5.3. Research Perspectives

During our research, we uncovered some relevant research gaps. Addressing these gaps might provide a more complete picture of the role technology can play in containing the IE. Most studies (literature) focus on the tax administration; more studies are needed on other government departments dealing with IE. A growing body of literature is emerging on the potential role of blockchain technology in tax compliance and IE containment. Although the benefits of this technology have yet to be proven empirically, it is a promising technology that merits further research. Artificial intelligence, despite its actual use, has not yet been fully explored in this field. More research is needed to support and enrich current knowledge on the empirical efficacy of various technological levers.

Developing countries require a special share of studies due to the pervasiveness of the IE phenomenon and the potential limitations of various technological levers in terms of applicability and efficacy. Studies are needed to determine the requirements of applying an e-formalization policy in these countries and provide a detailed roadmap for its implementation. How to balance between taxing and exploiting e-payment data and transactions and financial inclusion agendas in those countries is another important research perspective.

6. Conclusion

We began this research to explore the feasibility of technology in containing the informal economy, which has been resistant to traditional containment policies and tools, in light of international best practices and within an integrated strategy. The digital age has made it clear that technology is no longer just a supplement to tax administration but a necessary asset. As businesses digitize, data proliferates, and schemes of fraud and informality grow more complex, a conventional approach is no longer effective. Technology offers powerful new levers to formalize the informal economy by providing new data sources, significantly raising the detectability of informality and tax evasion, and fostering voluntary compliance through digital proximity. We have explained within the results the ten technological levers used for these purposes.

This new reality demands a strategic shift away from a work as usual mindset. Instead, tax administrations must leverage these valuable new technological levers, to engage proactively with the informal economy. These levers must be used simultaneously

as a self-reinforcing toolkit. In order to contain the informal economy, the scope of those technological tools must be expanded to individuals and firms outside the existing taxpayer base. For this to be effective, a reliable digital identity system must be in place. However, despite the existence of coercive tax compliance tools, a distinct approach is necessary for subsistence enterprises, prioritizing digital engagement, voluntary compliance, and a protective perspective. Furthermore, e-payment data must be handled with care to avoid hindering the financial inclusion agenda, which is often advanced by these very same electronic services.

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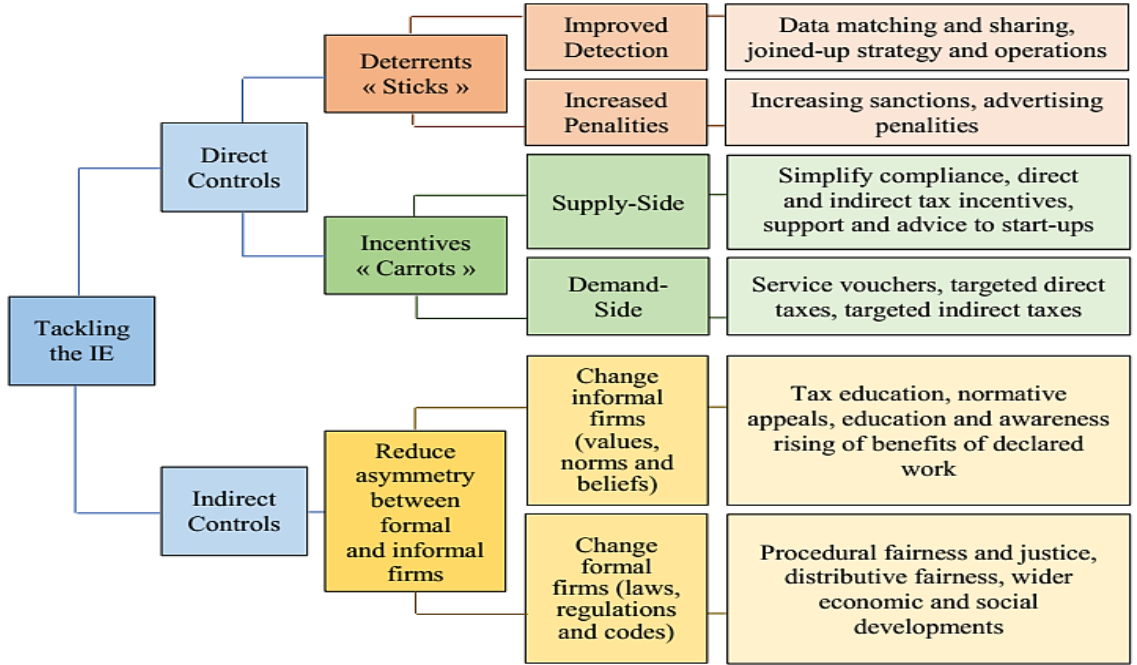
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8. Appendices

Appendice 1. An Integrated Strategy Axes and Measures for Formalization



Source: (Williams, 2021, p. 13).

