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Electronic Fiscal Devices (EFDs)

An Empirical Study of their Impact  
on Taxpayer Compliance and  
Administrative Efficiency

by Peter Casey and Patricio Castro

I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Fiscal Affairs Department

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**This Working Paper should not be reported as representing the views of the IMF.**

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**Abstract**

Several administrations have adopted electronic fiscal devices (EFDs) in their quest to combat noncompliance, particularly as regards sales and the value-added tax (VAT) payable on sales. The introduction of EFDs typically requires considerable effort and has costs both for the administration and for the taxpayers that are affected by the requirements of the new rules. Despite their widespread use, and their considerable cost, EFDs can only be effective if they are a part of a comprehensive compliance improvement strategy that clearly identifies risks for the different segments of taxpayers and envisages measures to mitigate these risks. EFDs should not be construed as the “silver bullet” for improving tax compliance: as with any other technological improvement the deployment of fiscal devices alone cannot achieve meaningful results, whether in terms of revenue gains or permanent compliance improvements.

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## ABBREVIATIONS AND ACRONYMS

B2B	Business to business
DGII	Dirección General de Impuestos Internos
ECR	Electronic Cash Register
EFD	Electronic Fiscal Device
EFP	Electronic Fiscal Printer
ERCA	Ethiopia Revenue and Customs Authority
ESD	Electronic Signature/Sales Device
ETR	Electronic Tax Register
GDP	Gross Domestic Product
GPRS	General Packet Radio System
IDB	Inter-American Development Bank
IT	Information Technology
KRA	Kenya Revenue Authority
NTS	National Tax Service (Republic of Korea)
POS	Point of Sale system
TRA	Tanzania Revenue Authority
VAT	Value Added Tax

## EXECUTIVE SUMMARY

The primary mission of a tax administration is to collect the revenue that is due from taxpayers and needed by the government, under the country's tax laws, without hindering economic activity. The greatest challenge for any tax administration is achieving and maintaining a high degree of self-assessment and voluntary compliance by taxpayers. Well-designed taxpayer services, education programs, and creative measures can facilitate self-assessment and compliance. The vexing questions that arise from these simple statements include how to identify areas of noncompliance; how to measure the level of noncompliance; and how to address the noncompliance.

The purpose of this study is to assess the performance of a specific set of electronic devices that revenue administrations sometimes use in support of their collection efforts. In developed countries, tax administrations have embraced many technological advances used in the private sector. In this context, information technology (IT)—computerization of systems and business processes of the tax administration, data networking, and associated technological devices—is a key enabler, and its importance continues to grow, as does the pervasive role of IT in everyday life. For developing countries, the opportunities offered by technology are more elusive and the challenges are greater.

Several administrations have adopted various fiscal devices in their quest to combat non-compliance, particularly around sales and the value-added tax (VAT) payable on sales. The term *Electronic Fiscal Device (EFD)* can be used to describe a wide variety of technological devices that revenue administrations can use to help monitor business transactions. First implemented in several countries in Europe in the late 1980s, the adoption of these devices—such as electronic tax registers (ETRs) or electronic fiscal printers (EFPs)—has accelerated in recent years in Africa and other regions, following a comparative lull in implementation activity from 1994 to 2010. The technology is now largely commonly available; production facilities in a number of developing countries make the devices accessible to businesses at reasonable costs—which have decreased from thousands of dollars to hundreds of dollars. Despite their widespread use, there is little documentary evidence to determine whether they provide a cost-effective solution to address the compliance risks that tax administrations in developing countries face.

The path to successful implementation of fiscal devices is complex, requiring legislative support, effective design of administrative and technical procedures, and extensive consultation processes with key stakeholders. While administrations contemplating the implementation of these devices can leverage the growing body of experience, the adoption of these devices creates additional administrative burdens, both to the involved administrations and to taxpayers, without necessarily alleviating some of the preexisting compliance problems. Current trends in tax administration modernization suggest there may be more effective ways to achieve voluntary compliance, particularly through the adoption of



***compliance improvement models.*** It is clear that ***technology in and of itself will not change behavior.***

The underlying reasons for the growing interest in compliance improvement models is the acknowledgement that tax administrations need to adopt risk-based methods to deploy resources more effectively to meet the greatest revenue risks. At the core of the compliance improvement model is the requirement for administrations to identify risks, quantify them, and, on the basis of the risks' importance and causes, develop appropriate mitigation measures. Although the strategy and investments required to fully implement such a model are certainly long term, its adoption facilitates more efficient and effective operations by lowering expenses and raising revenues.

***A key input to this study was a survey that was administered to a number of tax administrations known to be users of EFDs.*** Thirty-seven tax administrations were approached for this project, some of which were not users of EFDs; of these, 19 agreed to participate and completed the survey. This study assesses the impact of the adoption of these devices and identifies the relative benefits of their use. In addition to the difficulties of assessing the gains derived from the use of EFDs, the biggest challenge is to isolate the impact of these devices from other reforms that may be taking place concurrently. The examples gathered from the responses to this survey indicate that there is evidence that EFDs implemented as part of a comprehensive compliance improvement strategy produced positive results, both in terms of additional revenue and improved taxpayer behavior. Conversely, in those cases in which the EFDs were implemented as a standalone measure showed few, if any, results in the medium term, despite some incidental short-term revenue gains that were unsustainable.

The underlying hypothesis for this research project was that the adoption of EFDs was a direct response by tax administrations to combat non-compliance. Analyzing the survey replies, ***the drivers for adopting fiscal devices do indeed largely center on matters of compliance***—securing information for verification, to record sales and improve VAT compliance. A number of administrations regularly measure compliance and analyze trends in this area, but the impact of individual measures, such as the use of EFDs, is not usually assessed independently. Thus, ***claims of improvements in compliance behavior because of the use of EFDs are for the most part based on anecdotal evidence and not supported by actual data.***

For purposes of this paper, the trends in VAT revenue collection as a percent of gross domestic product (GDP) is proposed as a measure of improvement after EFDs have been implemented. ***Survey data indicate that the introduction of EFDs has not been associated with noticeable increases in VAT revenue as a percentage of GDP.*** Moreover, ***more often than not, other reforms are implemented in parallel in an attempt to improve revenue performance, so that any revenue improvement cannot be directly attributed to the introduction of EFDs.***

## Conclusions

Although much remains to be explored to fully understand the impact of EFDs on compliance, these results point to *the main conclusion of this study: the implementation of EFDs can only be effective if it is a part of a comprehensive compliance improvement strategy that clearly identifies risks for the different segments of taxpayers and envisages implementing a set of measures to mitigate these risks*. EFDs should not be construed as the “silver bullet” of tax administration: as with any other technological improvement—and this applies as well to new technologies, such as e-invoicing—*the deployment of fiscal devices alone cannot by itself achieve meaningful results, whether in terms of revenue gains or permanent compliance improvements*.

*The introduction of fiscal devices presents opportunities for the tax administration to rethink its approach to business processes*, not only by automating the collection of information, but also by leveraging the new arrangements to improve compliance approaches and strategies. Another area affecting the use and deployment of EFDs is the constant evolution of the technology involved, both in terms of cost reduction and improved performance of the devices. *The emergence of new technologies is a constant challenge to established views on fiscal devices. Several countries approached for the survey indicated that after studying the effectiveness, costs, and administrative requirements of EFDs, they had decided that other technologies, in particular e-invoicing, would be more cost-effective*. Accordingly, they had decided against the mandatory deployment of EFDs. *E-invoicing advocates suggest that in this new context, EFDs—whose costs must be borne by traders in all but a few countries that have adopted them—are no longer cost-effective and will eventually fade away*.

Another key conclusion from this study is that *the introduction of EFDs requires considerable effort and is accompanied by associated costs both to the administration*—in identifying the technology, selecting the devices, overseeing their deployment, and monitoring their usage—*and to the affected taxpayers* in addressing the requirements of the new rules. Once the devices are chosen and available, *it is essential that appropriate arrangements be put in place for their installation, support, and maintenance*. Survey responses confirm that, *when these arrangements were not in place or were incomplete, the implementation of EFDs faced considerable problems*. Proper consideration of these factors is essential for a successful implementation. Moreover, *EFDs appear to suffer from similar challenges as other regimes if there are no effective follow-up and enforcement measures. Absent effective compliance monitoring and enforcement, overall VAT compliance cannot be improved, with or without EFDs*.

## I. INTRODUCTION

1. The purpose of this study is to assess the performance of a specific set of electronic devices that revenue administrations sometimes use in support of their revenue collection efforts. A key definition in this context is that “taxes are the compulsory, unrequited payments to the general government sector”—a definition that the IMF, the World Bank, and the Organisation for Economic Co-operation and Development (OECD) have adopted. The tax administration is the division of government tasked with collecting taxes. Throughout the history of tax administration, a constant tension has existed between the actions of those whose responsibility it is to ensure compliance with the laws and those who are subject to those laws. At the heart of this tension is the question of *compliance*—how to ensure that compliance is maximized; how to ensure continued compliance (identifying compliance gaps, addressing the gaps, and maintaining confidence in the system); and how to minimize the impacts, or costs, of the compliance measures.
2. The primary mission of the tax administration is to collect the tax revenues due and needed by the government, under the country’s tax laws, without hindering economic activity. In pursuing their mission, tax administrations face a number of challenges, including how to broaden the tax base by continually bringing non-registrants and non-filers into compliance, strengthening organization and management, controlling tax evasion, improving tax collection, and facilitating voluntary compliance. The greatest challenge for any tax administration is achieving and maintaining a high degree of voluntary compliance. Well-designed taxpayer services, education programs, and creative measures can facilitate the process and minimize the burden of compliance.
3. The most widely used method to determine and collect the amount of tax liability due is the self-assessment and declaration by the taxpayers themselves, coupled with effective risk-based audit programs and other verification mechanisms of the tax administration. In effect, under this scheme taxpayers are expected to voluntarily comply with the country’s tax laws, under the self-assessment/declaration method. The complexity of tax laws in most countries means that taxpayers must rely on strong and extensive service programs from the tax administration and/or assistance from professional tax practitioners to meet their obligations.
4. Modern tax administrations operate a number of core functions that include taxpayer registration, taxpayer services, returns and payments processing, audits, appeals, collection of arrears, and fraud investigations. Support functions provide the resources and guidance to the staff members that perform these functions; among these, information technology (IT)—computerization of systems and business processes of the tax administration, data networking, and associated technological devices—is a key enabler; and its importance continues to grow, as does the pervasive role of IT in everyday life.

5. A tension always exists between addressing revenue compliance risks and the cost of revenue lost. At the core of this tension lie the regulations put in place by governments in support of revenue-related activities. Regulations necessarily impose compliance costs on the private sector and administration costs on governments, even when they are well-designed and implemented. These costs should ideally be proportionate to the problem being addressed and the minimum necessary to achieve effective outcomes. These principles of proportionality, minimalism, and effectiveness are the essential backbone of the *compliance risk models* endorsed by the IMF and other organizations and proposed for use by revenue administrations.

6. To assess the impact of any technological device on the way a tax administration complies with its mandate, the operating environment in which it conducts its business processes has to be considered. “Operating environment” includes a country’s economic and technological development, the business enabling environment, the complexity of the universe of taxpayers that a tax administration needs to control, and the tax administration’s relationships and coordination with other government institutions and private sector groups that are engaged in activities related to revenue collection.

7. The primary objective of any tax administration is to encourage, facilitate, attain, and maintain a high degree of self-assessment and voluntary compliance by taxpayers. A high degree of voluntary compliance allows the tax administration to concentrate its resources on identifying and dealing effectively with those taxpayers who fail to fully comply with their tax obligations. In effect, extensive self-assessment and voluntary compliance by taxpayers, combined with targeted compliance and enforcement programs that are based on risk assessment strategies, allows the tax administration to administer the tax system effectively and efficiently by lowering administrative expenses and raising revenues.

8. In developed countries, tax administrations have for years been embracing many technological advances used in the private sector, such as electronic commerce, interactive telephone systems, and data capture via the scanning or imaging of paper documents. Tax authorities have been investing in redesigning their basic business processes and implementing electronic receipt, processing, and delivery methods. They have been facilitating increased use of the internet for transmission of information and access to tax forms by taxpayers. Direct interfaces with the sources of information, that is, with external information systems, are becoming increasingly common.

9. In developing countries, the opportunities that technology offers are more elusive and the challenges are greater for several reasons. Tax administrations are confronted with many external obstacles on the path to modernizing their organizations. Computer equipment, data networks, and communications lines are still in short supply and expensive in many countries, and governments have insufficient financial resources for their acquisition and maintenance. Accordingly, electronic and internet tax filing systems,

electronic funds transfer and payment systems, and integrated tax administration data systems that enable electronic forms processing are options available only to a limited degree for tax administrations in many developing countries that are engaged in the early stages of information technology modernization efforts.

10. The need for effectiveness and efficiency in tax administration operations is often vexing when dealing with hard-to-tax sectors of the economy. For example, small businesses, farmers, and self-employed individuals in developing as well as developed countries represent a large number of taxpayers, but they may lack the appropriate bookkeeping and accounting records to determine and self-assess their tax liabilities. It is very difficult and expensive for the tax administration to assess and collect taxes from these groups. Consequently, many small businesses in the informal economy simply elude the tax net and are not taxed at all. All tax administrations find this sector considerably burdensome, given their large number, their pervasive nature and the relatively low contribution to revenue collections. Administrations look to technology to help deal with the massive numbers of taxpayers in this sector.

11. The small and medium businesses often exhibit the highest degrees of noncompliance through underreporting, especially given the preponderance of transactions conducted for cash. A key concern to address these risks is the ability by the tax administration to use third-party information to cross-check taxpayer-declared data. Proper availability of third-party information has been shown to increase tax compliance the most. In addressing the compliance risk of under- or non-declaration of sales, some administrations have sought to increase the monitoring of transactions as close as possible to the source of the transaction.

12. The advent of ubiquitous technology, such as electronic cash registers that are able to record sales in such a way that the information is considered tamper proof, has enabled some tax administrations to attempt to undertake the monitoring of every transaction in that taxpayer segment. In essence, these devices might be seen as becoming analogous to a third party. The problem, however, is that these devices are not entirely disconnected from taxpayers. As long as taxpayers can manipulate it or conduct transactions that the device does not capture, it cannot be a reliable third-party data source.

13. The compulsory use of EFDs, such as ETRs or EFPs, has accelerated in recent years in Africa and other regions, following a comparative lull in implementation activity from 1994 to 2010. These devices are relatively costly, although they are claim to offer the ability to provide a relatively secure mechanism for the tax administration to monitor and detect non-compliance. However, the devices create additional compliance monitoring requirements for the administrations. Moreover, as an analysis of survey responses shows, EFDs appear to suffer from similar challenges as other regimes in the absence of effective follow-up and enforcement measures.

14. The available research indicates that robust data on the impact and effectiveness of fiscal devices are sparse, and publicly available data that would allow an evaluation of their effects post-implementation are similarly limited. This limitation makes it difficult to validate the claimed benefits from fiscal device initiatives. Further, changes in revenue collection trends that are claimed to be causally linked to these initiatives are not readily isolated from other activities, whether policy or administrative reforms. Known research available has not identified impacts on taxpayer compliance behavior.

15. The purpose of this project is to explore the use and impact of EFDs and associated technology on taxpayer compliance and tax administration effectiveness. The research proceeded on two fronts. In the first phase, a number of tax administrations that use this technology and their experiences were reviewed. In the second phase, an online survey was administered to a relevant sample group of administrations. The survey was supported by two additional in depth case studies that provided a more detailed understanding of country experience. Finally, to determine the compliance impacts on taxpayers, a smaller survey was conducted that focused on a few representative groups in East African countries. The results of the surveys are presented in Appendix I and Appendix II.

## **II. HISTORY OF ELECTRONIC FISCAL DEVICES**

### **A. First Wave**

16. The term “Electronic Fiscal Device” can be used to describe a wide variety of technological devices that revenue administrations can use to help monitor business transactions. These devices run the gamut from electronic intelligent seals customs uses to monitor container traffic to fiscal control devices used to control excise tax control through the automatic monitoring of production and delivery of excisable goods. In this paper, the term *EFDs* will refer to devices normally used by tax administrations to monitor business-to-consumer and business-to-business transactions that create a fiscal obligation for consumption taxes—usually for the sales tax or the value-added tax (VAT). A key element of these devices is the presence of a “fiscal memory,” a tamper-proof memory usually certified by a relevant government authority.<sup>1</sup>

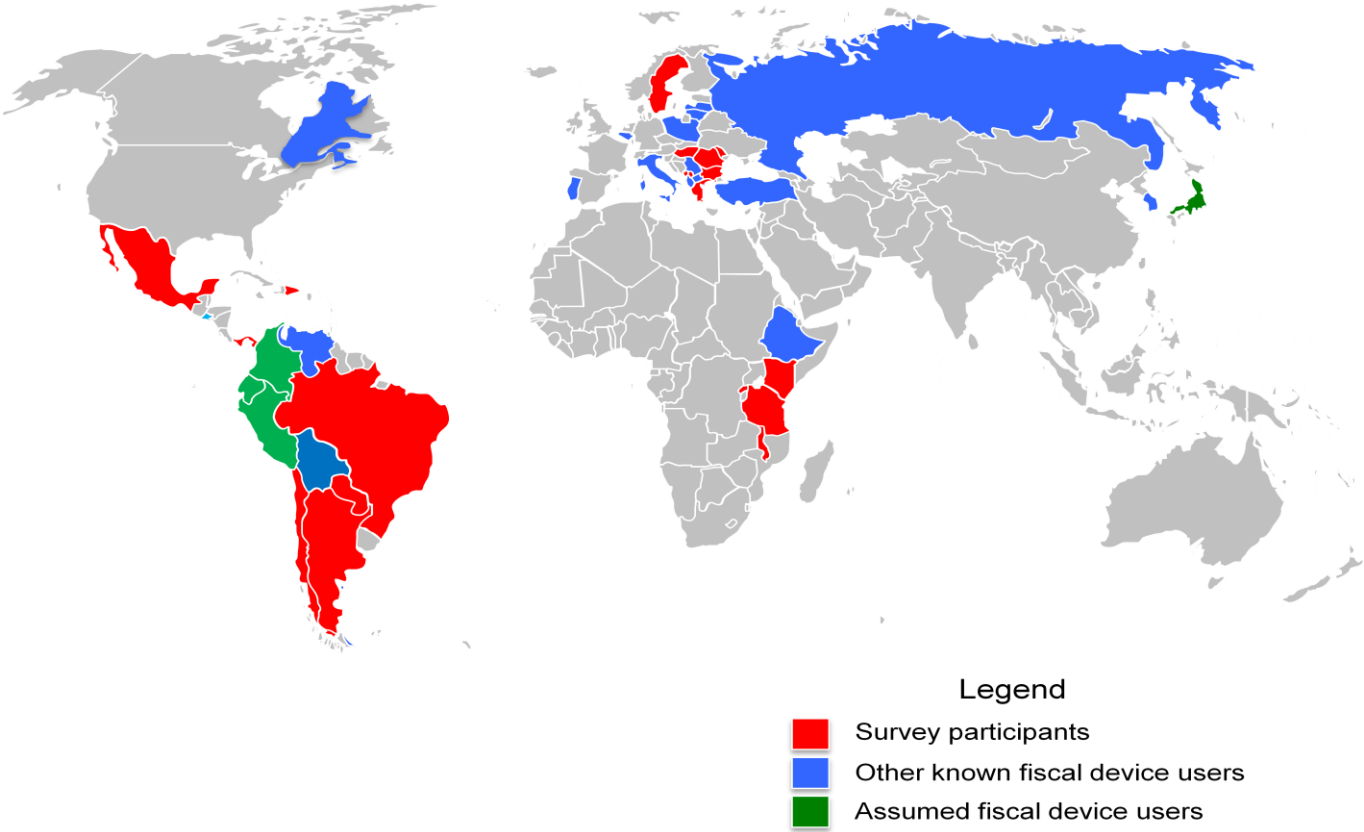
17. The most commonly used EFDs are Electronic Cash Registers (ECRs) and EFPs. The technology enabling the deployment of the first generation of ECRs became available commercially at reasonable prices in the late 1970s, and ECRs started to be used by large retailers in developed countries around that time. It is generally accepted that the first to

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<sup>1</sup> Sometimes EFDs are referred to as “Fiscal Memory Devices.” Typically, the fiscal memory contained in an EFD is an Electronically Programmable Read Only Memory (EPROM) that is sealed and can only be accessed by the tax administration or an authorized party. However, there are ways of tampering with EPROMs, as discussed later in this document.

use EFDs in support of its fiscal control strategy was the Italian administration, which adopted fiscal devices in 1983 (OECD 2013). The Greek tax agency appears to be the next administration to adopt fiscal devices, implementing them in 1988, and extending their scope to include electronic signature devices (ESDs) in addition to the fiscal registers adopted in Italy. Figure 1 shows the countries that are known to have implemented fiscal devices internationally.

**Figure 1. Adoption of EFDs Internationally**



Source: IMF and responses from revenue administrations.

**B. The Spread of EFDs**

18. In the absence of any literature describing the gradual extension of their use, it appears from anecdotal evidence and from the survey responses<sup>2</sup> that the implementation of EFDs progressed on a regional basis, spreading from its early Mediterranean base to the neighboring former Eastern Bloc countries, before crossing the Atlantic to Latin America,

<sup>2</sup> See Appendix 1, Question 6.

and then back across the Atlantic to Eastern Africa. Table 1 provides a timeline of implementation.

Table 1. Current EFD Implementations

Country	Year	Type	Scope
<b>Europe</b>			
Greece	1988	ETR, EFP, ESD	All VAT registered
Romania	Pre-2000	ECR, ESD	All VAT registered
Bulgaria	1993	EFP	All VAT registered
Hungary	2014	ECR-SCU	All VAT registered
Kosovo	2012	ECR, EFP, SCD	All VAT registered
Montenegro	2001	ETR, EFP	All VAT registered
Moldova	1993	ECR, EFP, ESD	All VAT registered
Sweden	2010	ECR	All VAT registered
<b>Asia-Pacific</b>			
South Korea	2005	ECR, EFP	All businesses
<b>North America</b>			
Mexico	Pre-2000	ECR, ESD	All VAT registered
<b>Central America</b>			
Dominican Republic	2009	EFP	All VAT registered
Panama	2012	ECR, EFP	All VAT registered
<b>South America</b>			
Argentina	1995	ECR, ETR, EFP	All VAT registered
Brazil (State level)	1994	EFP	All ICMS registered <sup>1</sup>
Chile	2003	ECR, EFP, ESD	VAT registered (optional usage)
Paraguay <sup>2</sup>	2008/9	ECR, ETR	Sector VAT registered
<b>Africa</b>			
Kenya	2005	ALL	All VAT registered
Tanzania	2010	ECR, ETR, ESD, SCD	All VAT registered
Rwanda <sup>3</sup>	2014		
Malawi <sup>4</sup>	2015(?)	To be determined	All VAT registered

Source: IMF and survey responses from revenue administrations.

Notes:

<sup>1</sup> ICMS is a state-based goods and services tax.

<sup>2</sup> Pilot project. Actual implementation on a limited basis planned for mid-2014.

<sup>3</sup> Currently in process. Implementation date is proposed in 2014.

<sup>4</sup> Under evaluation. Ministry of Finance has directed that EFDs be implemented. No firm implementation date has been set.

19. Some administrations, including the Bulgarian and Romanian tax agencies, indicated they were using fiscal devices before 2000, possibly influenced by the experience in Greece. The Argentine and Brazilian revenue administrations appear to have followed suit. In line with its status as a large federal country, Brazil has adopted these devices at the state level, although overall guidance was provided by the central tax authority; the experience of Italy's tax administration influenced the initial implementations.

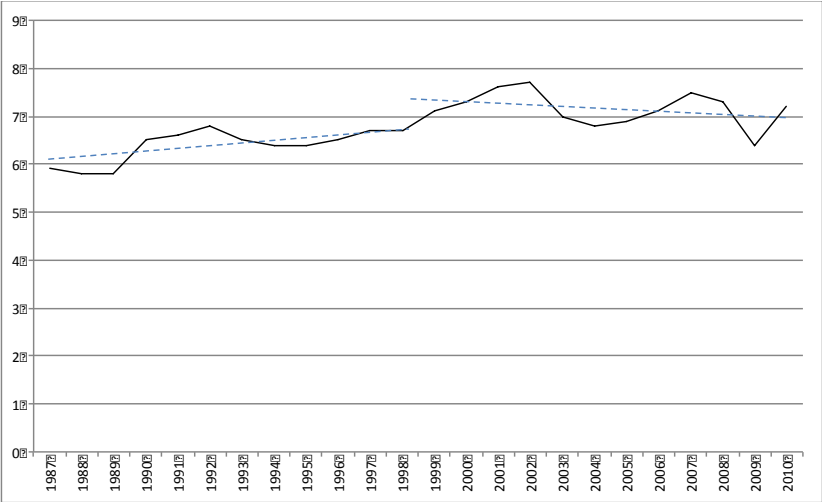


20. Following a cluster of implementations in Latin America, Kenya was the first East African country to next adopt fiscal devices, following the Mediterranean model, using Greece and Italy as reference points. These three clusters (Italy and Greece in the Mediterranean, Argentina and Brazil in South America, and Kenya in Eastern Africa) appear to have been the starting points for further adoption by neighboring countries. Given Greece’s long familiarity with the use of EFDs, additional details on its experience are presented in Box 1.

**Box 1. Greece: Experiences with EFDs—Overview of Electronic Fiscal Devices<sup>3</sup>**

The requirement to use ETRs in Greece was passed into law in 1988. The mandatory use of these devices was supported through a book and record keeping code. VAT revenue performance over the period preceding ETR adoption as well as the period afterwards is shown in Figure 2. There is no conclusive evidence associating EFDs with higher VAT to GDP ratio in Greece. The data show a trend in positive VAT growth from 1987 to 1988, with acceleration in the period following implementation of ETRs. This suggests that the introduction of EFDs could have resulted in an increase in the VAT to GDP ratio, at least in the initial years. Although plausible, this result needs to be evaluated in light of other factors, including VAT policy reforms. In particular, in 1988 the Greek authorities reduced the standard VAT rate (from 18 to 16 percent); that is likely to be a major cause behind a reduction in the VAT to GDP ratio. This was followed by the reversal of this standard VAT rate (from 16 to 18 percent) as well as an increase in both reduced and super-reduced rates that would explain the subsequent increase in the VAT ratio. Moreover, despite an initial upward movement, the overall trend from the period 1998 to 2010 has been flat or has shown negative growth, indicating that any positive impact from ETRs has not been sustained.

Figure 2. Greece: VAT as a percent of GDP, 1987-2010



Source: IMF Data, author’s elaboration

<sup>3</sup> The source of this information is a European Commission technical note on proposals to extend the use of ETRs in Greece

The economic challenges facing Greece following the debt crisis subsequent to 2009 are well documented, and these challenges are yet to abate in 2015. The Greek ministry of finance has extended the use of ETRs to all retail sectors as of January 1, 2015, requiring the users to provide monthly summaries of transactions from ETRs to a central information center.

These measures are designed to help further combat tax evasion through :

- An ability to analyze the data submitted on a monthly basis and identify trends in evasion and higher risk segments or taxpayers
- Improved security of information, since the transmission of the data to the government center makes it more difficult for businesses to adjust transaction information
- Establishment of a foundation to increase payment cycles.

Different stakeholders have challenged these proposals, requesting the ministry to reconsider expanding, and even rolling back, the requirements for ETRs. In the end, these requests were denied. The main observations were :

- ***ETRs have failed to make significant inroads in combating evasion:*** First, requirement to use ETRs have failed to address the well-documented and pervasive institutionalization of tax evasion. Extending the use of ETRs may bring about only marginal improvements, if any.. It is claimed that persons required to use these devices are finding mechanisms to thwart the recording of all transactions, from simple means such as not using the devices to record transactions, to understating the value of the transaction and using more sophisticated hacking tools such as zappers and phantom-ware (these last two are discussed in section V).
- ***Use of ETRs does not guarantee data integrity:*** Those required to use ETRs are finding ways to circumvent the capture of all transaction information. Accordingly, the requirement for traders to provide a monthly ETR summary cannot by itself secure information, particularly if this information is not captured in the first place. Moreover, the use of hacking tools prior to data transmission can still result in the alteration of captured data.
- ***Inherent institutional barriers will limit success:*** One of the key objections to the extension of the use of ETRs was that institutional arrangements are not being enhanced to either support the extended use of ETRs or to exploit the information the devices gather. Second, the revenue administration is still not well placed to leverage the data that will be gathered through these systems, and create better compliance profiles and enhanced risk strategies to target low compliance. The absence of a successful compliance model, coupled with effective enforcement that is widespread and visible, will continue to hinder improvements in compliance. Extending the use of ETRs may provide the illusion of an improved compliance mechanism, but ETRs alone cannot be the solution to the underlying causes of noncompliance. These need be addressed through administrative reform and effective compliance improvement programs.

21. Additional implementations have occurred in Asia, with South Korea adopting fiscal devices in 2005. The Central American countries followed their southern counterparts soon after the Chilean authorities introduced EFDs. Other administrations not included in the survey sample have been identified as fiscal device users. Two recent studies (Ainsworth, 2008 and OECD, 2013) highlighted the incidence of fraud-enabling tools and techniques in countries that used electronic devices to record sales. Specifically, Ainsworth noted issues in Quebec (Canada) and Japan, while the OECD study highlighted

the experiences of Germany and the Netherlands. The OECD study further listed a number of countries that have attempted to combat fraud through the use of EFDs—including Belgium, Latvia, Lithuania, Malta, Poland, Portugal, Russia, Turkey, and Venezuela.

### **C. Current Situation—Use and Technology**

22. The use of EFDs is pervasive, and the technology is largely commonplace. Production facilities are available in a number of developing countries, making the devices available to businesses at reasonable costs—which declined from thousands of dollars to hundreds of dollars. It is difficult to definitively establish the number of countries currently using any form of fiscal device, as required by the tax administration. As part of the research for this paper, several revenue administrations were identified as possible users of fiscal devices. The sample of potential users was identified from the literature, from references by revenue administrations known to use EFDs, and from direct knowledge of IMF staff. Thirty-seven tax administrations were identified and invited to participate in this study, predominantly through an online survey. Appendix III shows a list of known fiscal device users at the time of the survey, as well as a list of probable users.

23. Country responses were used as the basis for the analysis presented in the paper’s following sections. The list of respondents appears in Appendix I. The participating administrations appear on the map in Figure 1; the figure reinforces the idea that there has been a clustering effect regarding the use of EFDs.

24. The underlying technology of EFDs can vary with the adoption of specific types of devices based on the needs of the tax administration and the time of introduction. As Table 1 shows, the survey respondents use various types of EFDs. To better understand the choices available to administrations in selecting fiscal devices and the circumstances for which each device is best suited, it is worthwhile to consider the devices in greater detail. Box 2<sup>4</sup> describes the different types of EFDs that tax administrations currently require.

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<sup>4</sup> The material for these descriptions has been supplemented from several sources, including: “Ka-Ching! Ka-Ching! The History of Cash Registers,” Museum of American Heritage, <http://www.moah.org/exhibits/archives/kaching.html>; Gaperi, IMF: Fiscal Affairs Department June, 2011, Technical Note. “MALAWI: Electronic Fiscal Devices (EFD) to enhance VAT Compliance;” OECD: *Electronic Sales Suppression: A Threat To Tax Revenues*, 2013.

## Box 2. Overview of Electronic Fiscal Devices

### Origins of the Cash Register

James Ritty invented the cash register, known as the “Incorruptible Cashier,” in 1879 to prevent staff in his shop from skimming cash from any sale. Key features of this register included a display to indicate the amount of the sale, a bell to “ring up” sales, and a total adder that summed all the cash values of the key presses during a day. In 1884, the basic design was improved with the addition of a paper roll to record sales transactions, thereby creating the receipt. In 1906, the addition of an electric motor resulted in the first electric cash register.

### Electronic Cash Registers

#### *General Description*

Today, many cash registers are essentially computers. Often cash registers are attached to weighing scales, barcode scanners, and debit card or credit card terminals. These types of cash register are functioning as point of sale (POS) terminals.

Point of sale systems provide the following operations:

- Scan a product barcode for each item, and retrieve the price from a database.
- Calculate deductions for items on sale.
- Calculate any taxes.
- Calculate differential rates for preferred customers.
- Maintain inventory.
- Time and date stamp the transaction, and record the transaction in detail, including each item purchased.
- Record the method of payment.
- Keep totals for each product or type of product sold, as well as total sales for specified periods, and perform other tasks.

POS terminals will often identify the cashier on the receipt and carry additional information or offers.

### Electronic Tax Registers

#### *General Description*

ETRs are similar to electronic cash registers, but they have one key characteristic that differentiates them: ETRs contain a *fiscal memory* that captures core tax information, typically the classification of goods, value of goods sold, rate of tax, and tax value.

The fiscal memory is nonvolatile, meaning that the memory is not wiped or reset by loss of power. It can be accessed only by an appropriately authorized person with the relevant electronic key, typically by the tax administration, to download data for detailed verification and analysis. The download process does not erase the fiscal data.

#### *Characteristics*

ETRs may or may not be General Packet Radio System (GPRS)-enabled, that is, enabled to send data over the mobile telephone network. GPRS allows the ETR to be accessed remotely by the tax administration or ETR vendor for software updates, or to communicate information, for example, to

report daily totals or error situations. These later-generation devices allow the tax administration to access the data without the need for an official to be physically present.

*Benefits*

ETRs have a separate and permanent memory that cannot in theory be accessed by anyone other than the revenue administration. Any attempt to tamper with the independent and separate memory should be visible through the use of anti-tampering devices, such as seals.

*Limitations*

ETRs typically cannot process refunds, or transactions for returned goods.

*Target audience*

These devices are best suited to smaller retail establishments and retail distributors of petroleum products.

*Electronic Tax Register*



**Electronic Fiscal Printers**

*General Description*

EFPs are used in conjunction with other types of sales recording devices. Typically, larger retail institutions operate some form of POS and EFPs used in conjunction with the POS system to capture fiscal information. The printers contain a fiscal memory that exhibits the same characteristics as described for ETRs.

*Benefits*

Fiscal printers are potentially the cheapest option for a fiscal device. They will typically connect to an existing electronic cash register and provide the fiscal receipt, as well as maintain fiscal information for the revenue authority. They carry the same security features described for ETRs.

*Limitations*

EFPs must be used in conjunction with a sales recording device and are not a complete solution in their own right.

*Target audience*

The target audience for EFPs is similar to ETRs and, in conjunction with POS terminals, includes larger retailers.

## *Fiscal Printers*



ETRs have a separate and permanent memory that cannot in theory be accessed by anyone other than the revenue administration. Any attempt to tamper with the independent and separate memory should be visible through the use of anti-tampering devices, such as seals.

## **Electronic Signature Devices**

### *General Characteristics*

An ESD is a device that provides a unique “signature” to an invoice. This signature appears a hexadecimal (that is, base<sub>16</sub>) “hash” on a printed invoice/receipt. ESDs are typically used where a computerized sales and invoicing solution is in place. The ESD is plugged into the computer network, and any request to generate a receipt or invoice results in the ESD generating a hash key that is printed to the document. The key is based on a series of mathematical processes applied to key information on the invoice. As a result, no signature is ever the same. Any change to the invoice after it is generated results in a different hash key.

### *Benefits*

ESDs provide an additional level of security to invoices issued. The inclusion of a digital signature, typically composed on an algorithm based on data contained in the invoice, provides an additional level of validation. The digital signature is also stored on the issuing device, and any invoice can be validated for authenticity based on the unique signature.

### *Limitations*

The ESD requires other devices to record the sales information, as the ESD itself typically does not record detailed transaction data. It would usually be implemented in conjunction with a fiscal printer.

*Target audience*

ESDs are used in medium-sized businesses or retail situations where there is a likelihood of returned sales.

*Electronic Signature Device*



**Sales Control Devices (Modules)**

*General Characteristics*

Sales control devices (SCDs) combine the features of an ESD with the provision of a fiscalized external memory.

*Benefits*

SCDs provide all the benefits of an ESD, allowing for an easy check on the integrity of the data on the receipt. Relevant receipt data are kept securely in the control unit. A SCD allows many cash receipting devices to be connected or networked to the SCD, thereby reducing the need to deploy fiscal devices for each register or terminal.

*Limitations*

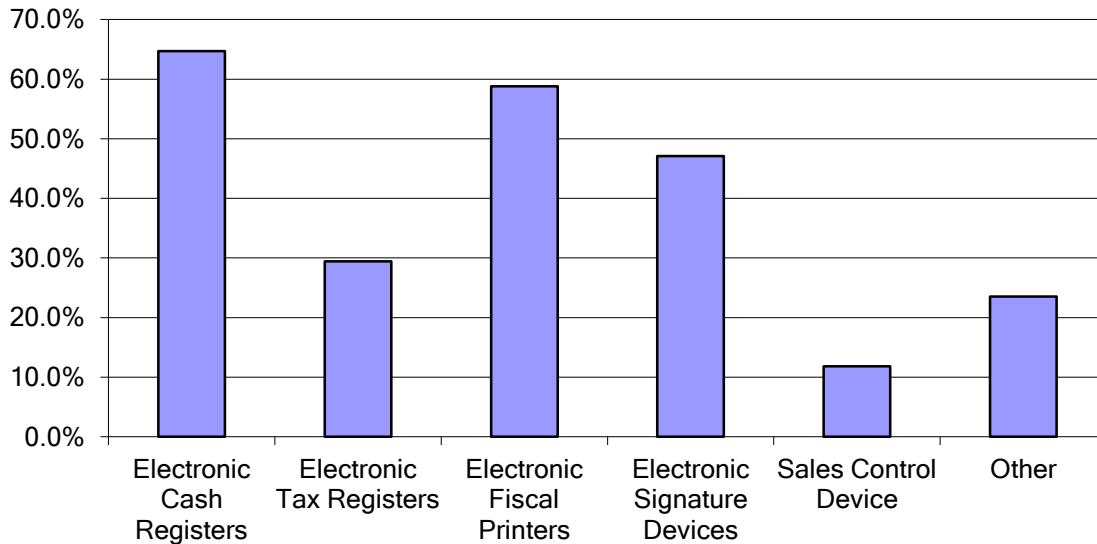
As these devices are typically designed for larger enterprises, the use of a SCD may require the implementation of an electronic signature, or encryption key, issued by either the revenue administration or a certified certificate provider. The need for such additional signatures is dependent on the trade community's broader community adoption of electronic commerce.

*Target audience*

The target audience consists of large retail networks or businesses with several geographic sites.

25. Some survey respondents mentioned other devices in use for specific purposes (for example, in vending machines), which also perform the core fiscal functions as described. Figure 3 summarizes the responses and identifies the types of devices in use. ECRs are the most common device; however, to be relevant for fiscal purposes, they need to be used in conjunction with some other form of fiscal device, typically a fiscal printer. Survey data support this assumption, as EFPs are the second most common device. Details on the "Other" category can be found in Appendix I, Question 14.

Figure 3. Types of Fiscal Devices in Use in Surveyed Countries



Source: IMF EFD Survey, author's elaboration

### III. DRIVERS FOR EFDs

26. The major limitation of documentary control of transactions for tax purposes is that every fiscally relevant document is nothing more than a declaration of the occurrence of a transaction that may or may not have taken place. The creation of such a document only depends on the good will of the taxpayer and the coincidence of interests of the economic operators involved. This limitation has been the underlying reason for the use of third-party information for cross-checking taxpayer-declared data, and for the search by tax administrations for a technological solution that can produce a reliable and transparent control reference for fiscal operations.

27. Many survey respondents have indicated that one of the main reasons for implementing EFDs was to secure tax information for audit purposes (see Appendix 1, Question 20). No additional details were given by respondents in their answers to this question on how the secured information is used in audit activities. It may be used to identify abnormal transaction behavior and thus higher risk candidates for audit purposes; it could be used to determine resource allocation for audit; or it could be used to assert that once collected by the revenue administration, that version of the data is now held as the source of “true information.” In any event, the survey does not shed light on this important issue.



28. If indeed the primary purpose for EFDs is to secure tax information for audit purposes, this should lead to an improvement in audit outcomes and potentially an improvement in audit productivity. Resources will not be assigned to low-value cases; cases selected for audit will be selected on the basis of higher risk to compliance, leading to a higher “hit” rate; the information secured is of a higher quality and cannot be altered; and taxpayer records will automatically coincide with the information held by the revenue administration. Compared with paper-based regimes, there are additional compliance requirements for taxpayers—the obligation to use an EFD, moreover, to use only *an officially approved EFD*, and the obligation to submit information as and when required. These additional requirements are the necessary price to pay for the additional level of control obtained through the use of EFDs.

29. From the tax administration’s perspective, it would be expected that the use of EFDs would lead to an improvement in audit outcomes, with the same number or even a lower number of auditors. However, according to the survey responses, some administrations have actually increased their audit resources as a consequence of introducing EFDs. It would be interesting to analyze whether any revenue improvements are the direct result of the devices or are due to the additional field compliance staff deployed in parallel with the EFDs. Unfortunately, it is not possible to distinguish the revenue impacts attributable to each initiative.

30. The responses from survey participants indicating that the devices are needed to secure information for audit purposes suggest that the administrations involved are still not fully addressing declaration risks (non-reporting and/or underreporting), or that they still want additional tools to address them.<sup>5</sup> In any event, these risks cannot be adequately addressed only through the use of EFDs.<sup>6</sup> This situation points to the need for more comprehensive reforms to leverage the benefits of these devices, eventually allowing the administration to direct attention to other priority areas. Specifically, survey results support the need for an approach based on overall compliance strategies in order for the tax administration to address these risks properly.

31. The next most common reason given for the use of EFDs is the need to record sales and transactions and to improve VAT compliance. These reasons were followed by the need to enhance data collected by the administration; to properly record cash sales; to create a stable revenue base; and, finally, to seek reductions in compliance costs, as cited

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<sup>5</sup> To get a complete picture for audit purposes, other sources of data are required, including, for example, sales and purchase invoices from clients and suppliers, and data on income and earnings. The EFD data are only one source.

<sup>6</sup> To some extent, an EFD is used as a type of third-party information source. However, it is risky to do so and consider this source as fully trustworthy, because the transaction is close to the taxpayer and far from tamper-proof.

by five administrations. Although survey respondents were able to provide alternative reasons for implementing fiscal devices, only two administrations mentioned other reasons. Both of these administrations referred to the need to address invoicing problems, either to reduce fraudulent invoices or to ensure that invoices are issued and sales are recorded. A more detailed discussion of these drivers is presented in the next section.

### **A. Mandated Implementation**

32. The survey asked respondents whether the use of fiscal devices was mandated by law (Appendix I, Question 8). With the exception of one administration, all respondents indicated that the use of fiscal devices was mandatory; in some cases, where gradual adoption was cited, this implied mandatory use was by the affected economic sector. Usually, once the legislation requiring implementation of EFDs is passed, all taxpayers who meet the stipulated criteria (for example, those who are registered for VAT or who meet a predetermined turnover threshold) must comply. It is necessary to accompany the legislation introducing the devices with the mandatory requirement that the devices be used in all circumstances and with detailed regulations to ensure that their use conforms to the needs of the tax administration.

33. These regulations can be quite complex; their preparation, regular updating, and enforcement can involve significant resources. Since any failure in requiring that all affected taxpayers adopt these devices would reduce the perceived benefits of independent verification of transactions, tax administrations have to develop enforcement strategies to ensure compliance. These strategies usually involve regular field audits and publicity campaigns encouraging consumers to request tickets for every transaction. These actions are accompanied by suitable channels to denounce noncompliance, and even by the use of “fiscal lotteries” to award prizes to consumers who collect their tickets and send them regularly to the tax administration. All of these measures can be costly and require considerable resources that often could be used elsewhere with better results.

### **B. Drive for Administrative Efficiency**

34. The use of technology has often been viewed as a major tool to reduce administrative effort and compliance costs, from the perspectives of both tax administrations and taxpayers. An underlying assumption in terms of cost reduction is the availability of appropriate infrastructure to enable the broad adoption of technological advances. A further prerequisite to obtain greater efficiencies is the adoption of a broader strategy that places fiscal devices in a framework of automation that would yield benefits for government, the tax administration, and the business community.

35. The five survey respondents indicated that a driving factor in adopting EFDs was to achieve administrative efficiencies. It is not evident from any of the responses that this particular outcome was measured, or indeed whether any administrative efficiency was

achieved at all. Interestingly, as cited in the interviews on the compliance burden (Appendix II), representatives of the business community claimed that fiscal devices were introduced in Kenya to overcome shortfalls in the ability of businesses to capitalize on new technology,<sup>7</sup> thereby providing an overall gain in administrative efficiency of the economy. However, this reason was not mentioned in the survey response from the Kenya Revenue Authority (KRA), where the claimed benefit for the adoption of EFDs was only the increased revenue achieved.

36. It is reasonable to infer that the adoption of some form of EFD, when implemented as part of a broader technology-enabled administrative reform program, would create administrative efficiencies to both taxpayers and the revenue administration. According to discussions with the National Tax Service (NTS) of South Korea, an advocate of the use of EFDs, several studies have been independently undertaken in that country to attempt to quantify the savings from implementing automated fiscal services. These studies, however, do not discriminate potential gains for the use of EFDs alone; they instead refer to broad-based technology improvements.<sup>8</sup> Further research and analysis are required to identify eventual reductions in compliance costs, and whether these reductions result in true overall savings or are merely a transfer of a cost from the administration to taxpayers.

### **C. Compliance Response and Impact of Adoption of EFDs**

37. The underlying hypothesis for this research project was that the adoption of EFDs was a direct response by tax administrations to combat non-compliance. Analyzing the survey replies, the drivers for adopting fiscal devices largely center on matters of compliance—securing information to verify, to record sales, and to improve VAT compliance. Current trends in tax administration usually describe compliance as covering four key areas of the tax cycle—registration in the system, timely filing or reporting of obligations, timely payment of obligations, and timely provision of accurate information to the tax administration. In the next section, we analyze the survey results to assess the impact of the devices in these four areas.

38. The use of EFDs, and the associated requirement that taxpayers and the tax administration only use fiscalized invoices, can be interpreted as a driver to ensure improved compliance with the formal obligation to accurately record transactions. Revenue administrations that have adopted compliance improvement strategies have sought to embed the collection of information as a key component and an automatic

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<sup>7</sup> See Budget Speech, Minister of Finance, Kenya, <http://www.statehousekenya.go.ke/speeches/budget/budget04-05.pdf>.

<sup>8</sup> For example, one study that the Korea Institute of Public Finance conducted estimated the total savings from e-invoicing (business-to-business only) as exceeding KWN 700B per annum, claiming this amount represented “tax revenue loss avoided and administrative savings.”

process in the day-to-day routine of the affected businesses. Embedding information collection on transactions automatically and independently of the actions of the taxpayer is deemed to increase the quality and reliability of information, compared with normal document-based recording of transactions.

39. Some tax administrations have implemented remote communication with the devices, either through the use of mobile phone networks or through transaction processing value-added networks. This approach would enable obtaining information regularly, typically overnight, or, as in the more ambitious schemes proposed by some administrations, on a real-time basis,<sup>9</sup> thereby addressing the timely reporting requirement. The survey did not specifically ask respondents to identify in detail the compliance challenges that administrations face prior to implementation. Further inquiry would be necessary to determine if other risks existed (other than those of inaccurate reporting), how pervasive the risks were, and what the underlying causes of the risk were to be able to more adequately assess if fiscal devices appropriately addressed the identified risks.

40. Respondents were asked to identify the benefits obtained from adopting EFDs (Appendix I, Question 40). Figure 4 summarizes the responses to this question. The most quoted benefit is “improvements in reporting of sales.” However, less than half of those administrations in the survey responding in this way have actually measured these outcomes by identifying baseline data and post-implementation upturns. In their responses to the same question, eight administrations also reported “improved compliance in filing rates” (with five actually measuring these impacts); six administrations reported an “increase in registrations” (two indicated they had measured impact in this area).

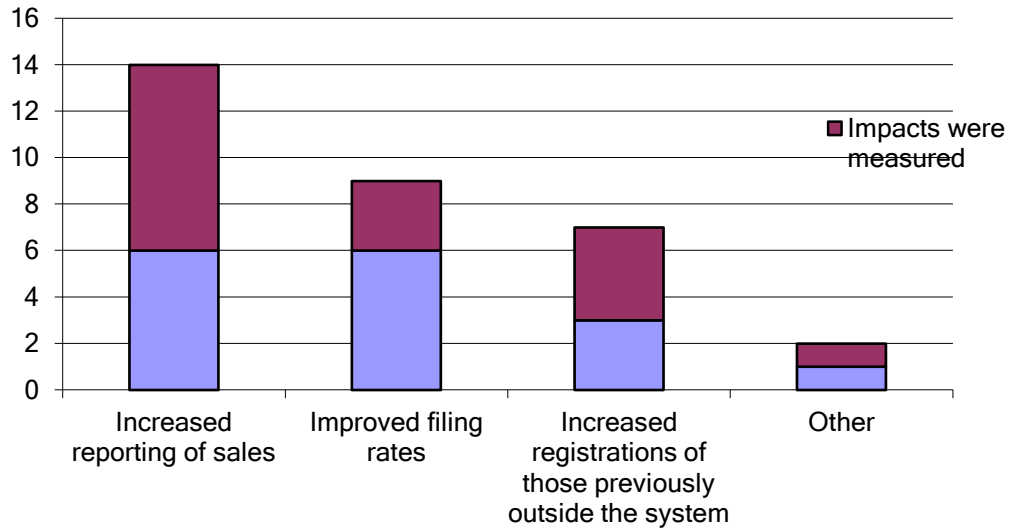
41. However, no respondents indicated that they undertook an assessment of changes in compliance behavior based exclusively on the use of these devices, comparing the situation before and after implementation.<sup>10</sup> *A number of administrations regularly measures compliance and analyze trends in this area, but the impact of individual measures such as the use of EFDs is never assessed independently.* Thus, claims of improvements in compliance behavior because of the use of EFDs are based on anecdotal evidence and are not supported by actual data.

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<sup>9</sup> The Tanzanian tax authorities originally contemplated the concept of real-time data collection but decided against it. The South Korean authorities informed that the NTS is in early discussions with cash receipt system operators to enable real-time capture. In December 2013 the Argentine authorities approved an updated regulation calling for a “new generation of devices” incorporating real-time capture of data.

<sup>10</sup> The only country that undertook such an analysis—though not giving details in the survey response—was Dominican Republic, as discussed later in Section V.A.

Figure 4. Reported Benefits of Fiscal Devices



Source: IMF EFD Survey, author's elaboration

42. In general, the aim of reform actions in either policy or administration is to improve voluntary compliance, reduce tax gaps, increase revenue collection, and raise the administrative effectiveness. All reform efforts are accompanied by estimates of the expected results; methods to measure the impact of reforms need to be developed to assess the outcomes. A reduction in the VAT gap is usually seen as a reliable measure of an improvement in compliance; however, in the absence of regular and consistent measures of the revenue gap by a reputable source, an increase in the ratio of VAT collection to overall tax collection may be considered as a general indication of improved compliance. This is especially the case in developing countries in Africa, where it is still not customary for tax administrations to measure revenue gaps regularly.

43. For the most part, tax administrations have not required the implementation of EFDs in isolation from other measures, whether policy changes, such as changing the revenue base, as in Tanzania with the removal of retail petroleum sellers from the VAT base, or other administrative reform initiatives, such as the online filing and payment process (*YESONE*) introduced in South Korea in 2006. In South Korea, the subsequent extension of the *Hometax* solution integrated some credit allowance for taxpayers based on VAT receipts captured electronically from 2004 to 2008.

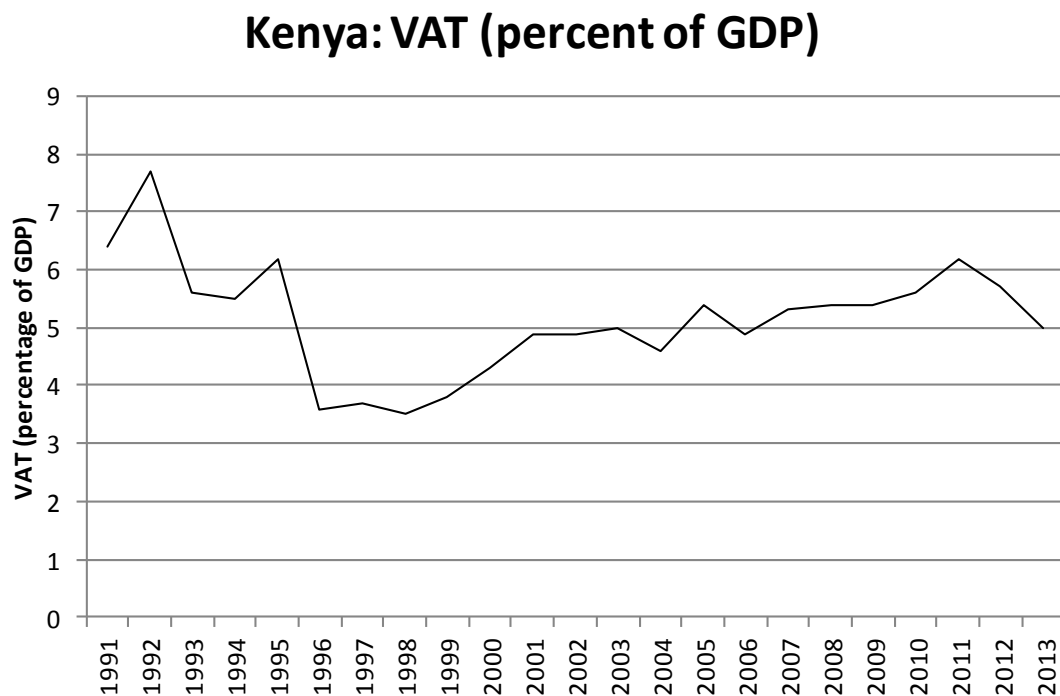
44. As indicated, the success of tax reforms is often measured through the additional revenue generated through those reforms; this has been the case with the adoption of EFDs. For example, the immediate and noticeable rebound of VAT revenue claimed in the Kenyan experience has been often cited as a success story that merits consideration by other governments and tax administrations, particularly in the neighboring countries.

Closer examination of the Kenyan experience (see Appendix IV) may suggest that the success is not as obvious as first presented. As Figure 5 shows, when viewed over a longer term, Kenya’s VAT performance is not as dynamic as claimed or as expected.

**Box 3. Kenya: Experiences with EFDs—An Analysis of Revenue Performance**

EFDs were introduced in Kenya in fiscal year 2004/05 when legislation was enacted to take effect January 1, 2005. EFDs currently used in Kenya primarily consist of ETRs that are mandatory for all businesses registered for VAT purposes. VAT revenue performance over the period preceding EFD adoption as well as the period afterwards is shown in Figure 5.

Figure 5. Kenya: VAT as a percentage of GDP, 1991–2013



Source: Author’s elaboration, based on IMF data.

The graph confirms that value-added taxation as a percentage of GDP in Kenya has shown significant variations from 1990 through to projected performance for 2013. In the period from the introduction of EFDs (2005) until around 2012, when there was a marked drop off in VAT collections, a pervasive system of VAT withholding was in place that boosted collections by almost 1 percent of GDP. The increase in VAT revenue that occurred over this period was most likely because of VAT withholding and non-payment of VAT refund claims, rather than EFDs. In sum, *the introduction of EFDs in 2005 has not generated a sustained revenue increase over a general trend of improvement since 2001*. Based on this longer-term view, it would be difficult to build a case arguing that EFDs have contributed to significant improvements in revenue performance in Kenya.

## **IV. ANALYSIS OF SURVEY RESPONSES**

### **A. Scope of Fiscal Devices**

45. The survey responses indicate that the administrations have focused on the last link in the sales chain in their attempt to curtail unreported cash sales. Thus, the scope for all administrations includes business-to-consumer transactions. In addition, administrations have also attempted to curtail irregularities such as invoice fraud by including business-to-business transactions in the coverage of their fiscal devices. The results of the survey (Appendix I, Question 16) show that 70 percent of the responding administrations require EFDs to be used for both business-to-consumer and business-to-business transaction.

46. All of the administrations that participated in the survey have adopted a VAT or a tax similar to a consumption-based tax. In some cases, as in Brazil, a federal country, the consumption tax is levied at the state level and is administered using EFDs. Argentina, another federal country, has a national VAT and state-level sales taxes that are also administered through EFDs.<sup>11</sup> Survey responses show that fiscal devices have been implemented to control and improve compliance for taxpayers registered for the VAT or its equivalent. Some administrations have extended the use of these devices beyond the VAT. The South Korean authorities, for example, have extended the requirements for EFD use to all businesses, while the Tanzanian authorities are considering options that could include an extension of EFDs to all businesses.

### **B. EFDs and the Compliance Model**

47. The introductory section of this paper discusses modern trends in the use of compliance risk models as recommended by the IMF, the World Bank, and other regional and multilateral organizations.<sup>12</sup> The underlying reasons for this growing interest in compliance improvement models is the acknowledgement that, to maximize compliance with the relevant tax laws, tax administrations need to adopt risk-based methods to deploy resources effectively to meet the greatest revenue risks. In line with this approach, survey respondents were asked to identify the key risks they faced and to indicate whether they considered alternative approaches to the use of EFDs to mitigate these risks.

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<sup>11</sup> Through special agreements with the states (provinces), the information is collected by the AFIP, the federal tax agency. Subsequently, the information on the local sales tax is transferred to the respective provincial tax administration.

<sup>12</sup> The OECD has been active in consolidating and distilling compliance initiatives across both OECD and non-OECD countries, summarizing initial views on this matter in “Compliance Risk Management: Managing and Improving Tax Compliance,” Guidance Note, 2004. This was subsequently updated in “Managing and Improving Compliance: Recent Developments in Compliance Risk Treatments,” Information Note, 2009.

48. Forty-seven percent of survey respondents indicated that they had undertaken an assessment to determine the revenue at risk from underreporting of sales. (See Appendix I, Question 21). In their responses, estimates of the revenue at risk associated with this specific type of noncompliance ranged from a high of about 50 percent of VAT revenue to about 20 percent of total VAT collection—both very significant amounts. Since the survey did not specifically ask for additional details on revenue risks, it is not clear whether the deployment of EFDs helped to mitigate these revenue risks, or if risks remained prevalent. As noted, while a number of tax administrations reported improvements in compliance, less than half of the administrations responding to the survey actually measured the alleged changes in compliance, including by measuring changes in the VAT compliance gap.

49. Table 2 lists the main risks that tax administrations identified before implementation of fiscal devices; these risks are mainly associated with the underreporting of sales and poor quality of information on sales. The table also lists the risks related to the use of EFDs that administrations identified after EFD implementation. The major risks remained unchanged, although there is no quantification of their incidence in both instances.

Table 2. Comparison of Risks Pre- and Post-Implementation of Fiscal Devices

Risks Identified Pre-Fiscal Devices			Risks Identified Post-Fiscal Devices		
Answer Options	Response Percent	Response Count	Answer Options	Response Percent	Response Count
To record cash sales (previously not recorded)	56.3	9	Traders avoid using EFDs	100.0	15
Enhance VAT compliance	75.0	12	Traders can now employ "zappers" to reduce total sales recorded	40.0	6
Enhanced sales data provided to revenue authority	62.5	10	Fines issued to traders for not using EFDs are not increasing compliance	40.0	6
Create stable revenue base	56.3	9	Traders report the machines do not work properly	47.0	7
Secure tax information for audit purposes	87.5	14			
Record sales and transactions	75.0	12			
Reduce tax collection costs	31.3	5			
Other (please specify)		2			

Source: IMF Fiscal Device Survey.

50. At the core of the compliance improvement model is the requirement for administrations to identify risks, quantify them, and, on the basis of the risks' importance



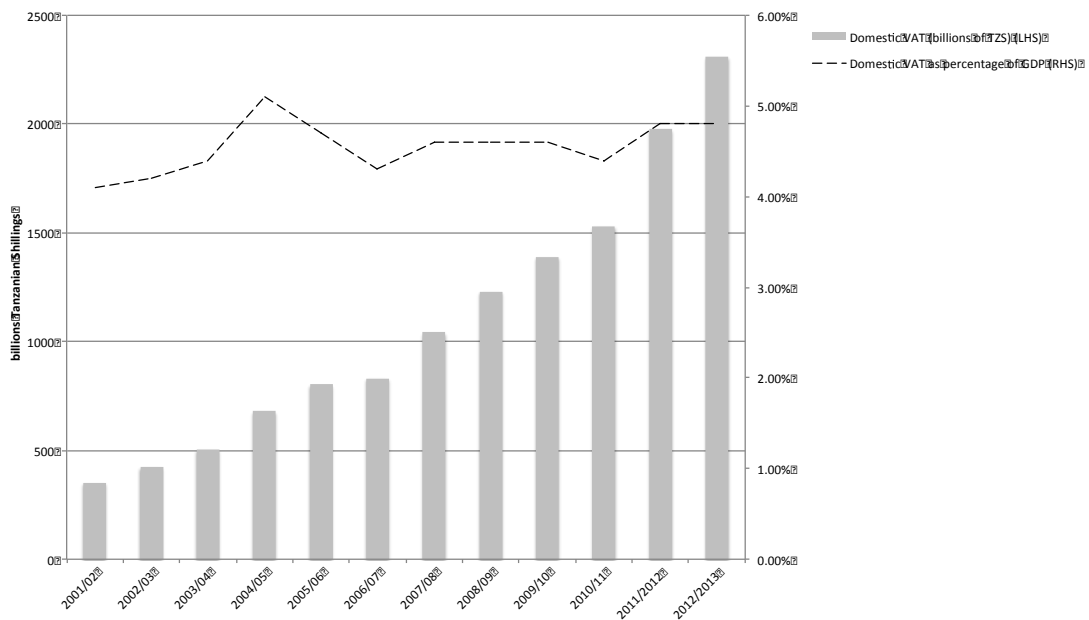
and their causes, develop appropriate mitigation measures. An implicit assumption of this study was that the implementation of EFDs is a response to specific risks. About half of the respondents undertook risk assessment and indicated that they considered alternative risk treatments (Appendix I, Question 18). The most frequently mentioned alternative measures were taxpayer education, additional audit treatments, other technology options, and alliances with business associations. It is clear from their description that, while these options were considered valid in their own right, they are complementary rather than alternative measures.

51. Most administrations chose to implement fiscal devices in conjunction with other alternative compliance measures (Appendix I, Question 19 and Question 46). Given this mix of measures in the recorded responses, reported compliance changes cannot be solely attributed to the implementation of fiscal devices. This point is highlighted in the Box 4, summarizing Tanzania’s experiences with EFDs (Appendix IV presents a full description of the case).

### Box 4. Case Study—Tanzania

The VAT was introduced in Tanzania in 1998, replacing a sales tax and a number of other indirect taxes. Although the approaches to the administration of VAT have varied, the effectiveness of the tax has never reached the levels originally anticipated. As Figure 6 shows, total VAT collection has been increasing steadily in nominal terms, but it has been relatively flat as a share of GDP.

Figure 6. Tanzania: VAT Collections (gross and percentage of total collections), 1998–2013



Source: TRA and author’s elaboration.

Note: Data for 2011/2012 are preliminary; data for 2012/2013 are projected (Source: IMF).

In response to what was perceived as a drop in overall VAT compliance, the Tanzania Revenue Authority (TRA) in 2002 mandated the use of nonfiscalized ECRs. *Figure 6 suggests that the use of*

*ECRs did not contribute to significant improvement in real VAT revenue performance from 2002 to 2008. The Tanzanian authorities announced in 2008 that they would move beyond ECRs and explore the use of EFDs to improve overall VAT compliance. Mobile telephony-enabled EFDs were adopted starting the 2009/10 fiscal year for all registered VAT taxpayers, and a nine-month window was established to implement the devices across all sectors. In a rather unusual approach to the deployment of these devices, the Government of Tanzania would reimburse to taxpayers for the costs of the first purchase of EFDs. As part of the implementation package, the TRA determined that EFD implementation should proceed according to a “big bang” approach, that is, all VAT taxpayers should start using EFDs at the same time. A number of circumstances, including a national general election that took place over the proposed deployment period, resulted in a slower than planned implementation pace, and effective operation of EFDs did not begin until January 2011.*

*It is still relatively early in the implementation cycle to allow for a definitive assessment of the Tanzanian experience. Figure 6 suggests that adoption of the requirement for VAT-registered traders to use ECRs coincided with a period of VAT revenue increases from 2002 to 2005, but that this increase did not prove to be sustainable from 2005 to 2011. Some anecdotal evidence suggests compliance difficulties in Tanzania. Despite penalties established in the regulations for taxpayers that fail to comply with their obligations, *EFDs appear to suffer from similar challenges as other regimes if there are no effective follow-up and enforcement measures. Absent effective compliance monitoring and enforcement, overall VAT compliance cannot be improved, with or without EFDs.**

### **C. Administrative Impacts**

52. The introduction of new compliance measures is typically accompanied by an associated cost to the administration in monitoring the compliance measure and to the affected taxpayers in addressing the requirements of the new rules. These costs can constitute one-off costs associated with development and implementation and additional recurrent costs to manage and support the changes. To gauge these costs, survey respondents were asked a number of questions associated with the development of regulations, the preparation of projects, and the implementation and operation of the fiscal devices. The introduction of fiscal devices was typically undertaken by a dedicated project team, with nearly 75 percent of administrations allocating dedicated resources to an implementation project (Appendix I, Question 26).

53. In addition to the dedicated project team, some survey respondents identified the need to supplement existing resources. The detail regarding the additional staffing required is included in Appendix V. Information on the additional roles that EFD project staff had to carry out appears in Questions 28 (initial staff requirements) and 39 (additional resource needs identified after EFD implementation). Eleven administrations identified the need for additional staff; the predominant area identified was the audit. The survey did not request additional details. Accordingly, no information is available on how these additional staff resources have been used, that is, to extend existing audit programs based on better targeting risks, to provide additional audit capacity for auditing fiscal

devices, or to meet the increased need resulting from additional taxpayers brought into the system—or a combination of these factors.

54. Another area that required additional staff was “managing the devices.” This included roles such as certifying devices (ensuring certain models are in compliance with the regulations), managing devices (initializing and registering), and liaising with suppliers. Some revenue administrations have outsourced the work of certifying devices, while others have established in-house technical committees or have employed staff to manage certification directly. These are typically new roles for revenue administrations and bring with them new skills. A more detailed discussion of the impact of approaches to managing EFDs is presented in the section “Decisions Regarding Technology.”

55. No administration stated that additional resources were required to *analyze* the increased information that became available to the revenue administration as a result of deploying EFDs, something not implicit under the category “additional audit resources.” It is possible that existing research or intelligence units in the administrations have taken the initiative to seek insights from this information. However, no administration identified the benefits of access to this increased volume and detailed information as a key resource for managing compliance.

56. The new workloads and the associated new staff requirements required funding through some mechanism. Details on estimates of staff numbers (projected and additional needs identified after implementation) are shown in Appendix V. Eleven administrations identified additional staffing needs. Of those, nine administrations provided details of how the additional staff was funded (see Appendix I, Question 28). One agency received additional funding for its budget, three used combined new funding and existing staff transfers, and five administrations transferred existing staff without any additional funding. No indications were provided as to where staff was transferred from or what functions were re-prioritized.

57. There was no clear indication of new or differing skills required for staff of the respective tax administrations. While this issue was not specifically investigated in the survey, administrations have indicated that they invested in internal training for staff. There are two key areas where new or different skills are likely to be needed:

- Management of the devices, from certification and testing to initial deployment and customer support.
- Enhanced audit skills to undertake computer-based audits using the newly available information obtained from the devices.

There may also be a need for computer forensic investigations in those cases where there is suspected manipulation of the recorded data.<sup>13</sup>

## **D. Implementation and Operational Considerations**

### **Setting Up**

58. The decision to implement fiscal devices may have been driven by a general government initiative, the respective ministry, or by the revenue administration itself. The survey results show a relatively even split between general government and the revenue administration as the initiator, with the Ministry of Finance a distant third (see Appendix I, Question 7). Attributing the initiative to a single source can be misleading, as there is usually a more dynamic relationship between the parties. Private sector stakeholders, including manufacturers and suppliers of the devices, can also have a role in bringing the initiative to public light. In some instances, anecdotal evidence suggested active lobbying by these groups.

59. Most administrations set up a separate project organization to develop and implement EFDs (Appendix I, Question 26), with the average project team comprising nine full time staff and 22 part-time staff. The survey responses do not identify a correlation among the size of the affected taxpayer population, the time provided for implementation, and the size of the project team.<sup>14</sup> Some administrations that reported small teams, such as the Mexican or Argentine tax agencies, have large in-house IT departments with hundreds of IT professionals as permanent staff; others have limited resources in the IT area and require additional staff in the project team. Additional factors would influence the size of the project team, including hiring rules for the public sector, the availability of short-term contractual staff, and overall resource limitations.

### **Implementation timelines**

60. One determinant of success for any major project or change initiative is the time available to prepare for the change. Survey respondents indicated that in more than 60 percent of the implementations, the preparation period was longer than 12 months; in over 50 percent, the period was 18 months or longer. Figure 7 shows a summary of the responses. Some administrations allowed for a phased approach over a longer period,

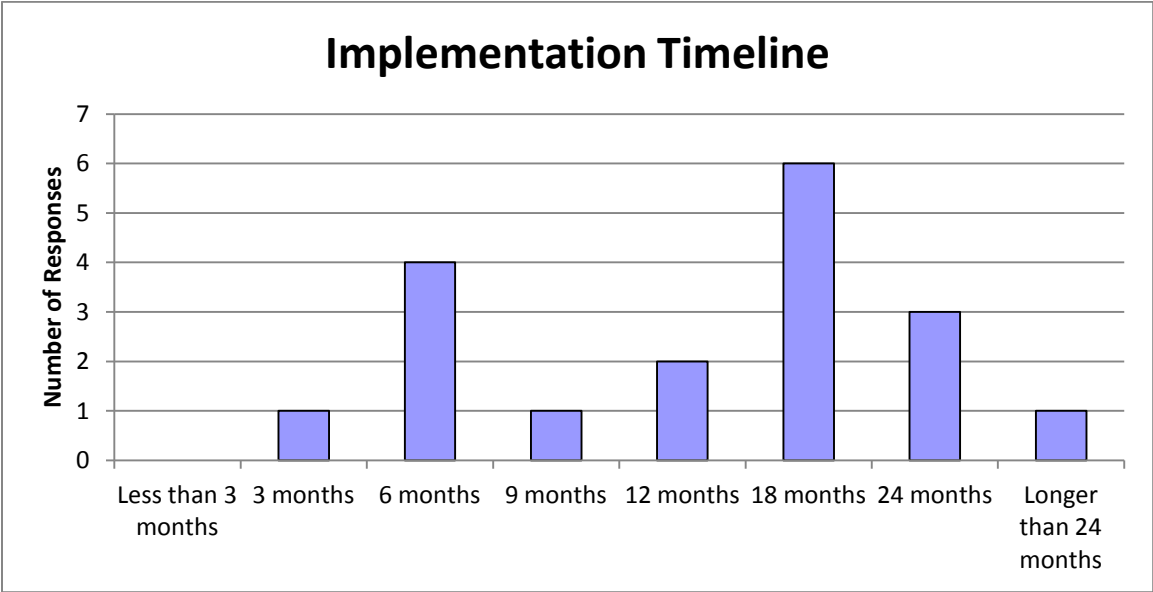
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<sup>13</sup> For these issues, see discussion in the final section “Additional Considerations” of problems with maintaining the integrity of information when taxpayers attempt to cheat, including by using “zappers” and “phantomware.”

<sup>14</sup> These range from 45 full and part-time staff for only 25 affected taxpayers with 18 months to implement (although this was a pilot project and it can be expected that upon full deployment the team would be reduced while the taxpayer population would be expanded significantly) to only five part-time staff given six months to implement fiscal devices for over 750,000 taxpayers.

allowing six months of preparation for each group of new taxpayers, which explains the cluster of responses for six months. No follow-up information is available to assess whether the longer implementation periods have resulted in better implementation outcomes; the experiences of the Kenyan business community as shown in Appendix II suggest that implementation faced considerable challenges due to the limited time available.<sup>15</sup>

Figure 7. Allowed Implementation Period



Source: IMF EFD Survey, author’s elaboration

61. From the survey responses, there seems to be no direct correlation between the size of the taxpayer population and the period of time required or allowed to implement the fiscal devices. Further investigation would be necessary to determine the impact of the implementation period on the ultimate effectiveness of the process. Effectiveness in this context would be measured through factors such as the level of acceptance by the business community, the degree of achievement of expected outcomes, and how final costs and implementation timelines compared to original estimates. Such information could provide guidance to other administrations contemplating implementation of EFDs.

<sup>15</sup> The original plan in Kenya called for providing six months to allow for implementation. Actual publication of the relevant regulations was delayed, but the original implementation date remained the same. As a result, there was considerable pressure on both the Kenya Revenue Authority and businesses to meet the deadlines. This was compounded by a growing resistance from small retailers who vigorously opposed EFDs, often due to a lack of understanding. A longer lead-time may have alleviated these tensions (see Appendix II for more details).

## **Legislative Framework**

62. Based on their responses (Appendix I, Question 29), all administrations surveyed considered that legal changes were necessary to make the new fiscal device regime effective. All but one of the administrations made the use of EFDs mandatory, which in turn required changes to existing laws. Consistent with that view, all 16 administrations mentioned that some legislative changes were required; 80 percent introduced changes to existing legislation. The remaining administrations either enacted new tax legislation, new non-tax legislation, or created new regulations. A similar proportion of administrations (73 percent) undertook changes in lower-level regulations in support of the primary legislative changes.

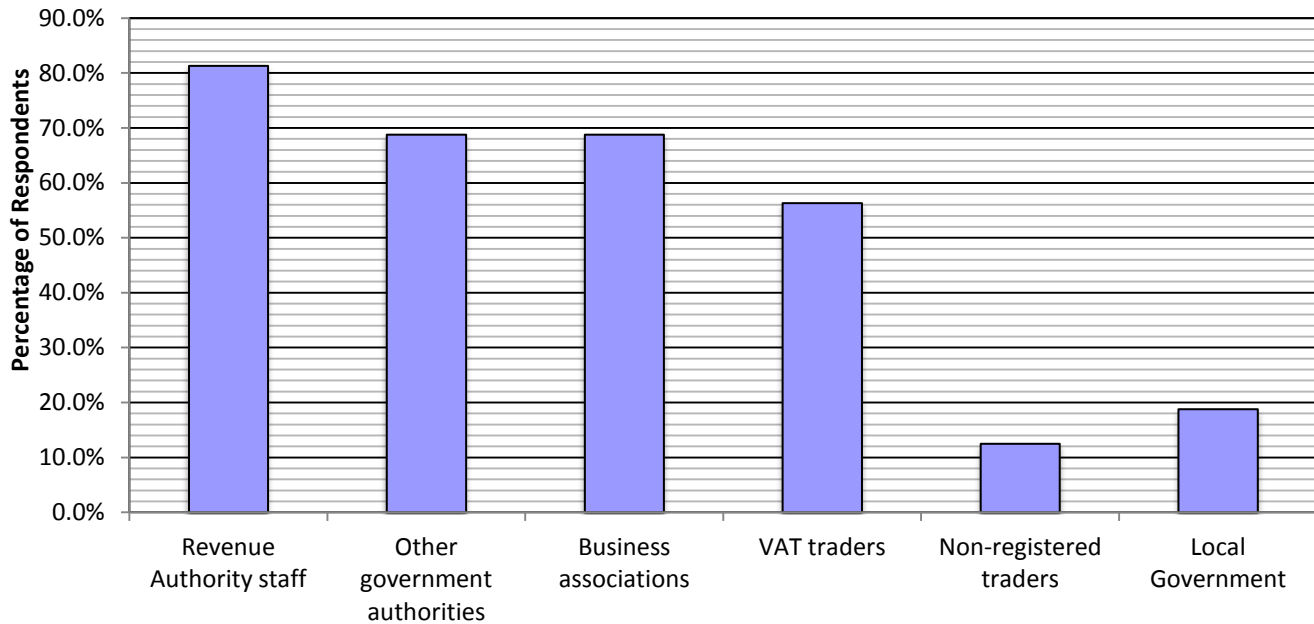
63. The survey did not seek specific information on what changes were made to the legislation. It is reasonable to assume that these changes would include details of who must use the fiscal devices, the circumstances in which devices are exempted and/or must be used, who has access to the data and when, procedural requirements, and details of offences. Regulations would also most likely specify the requirements for certifying devices, including the authorities responsible for that role. Record-keeping requirements for taxpayers would need a comprehensive review and eventual changes to adapt to the requirements of the EFDs. In addition, new regulations are likely to be needed to enable the tax administration to ensure compliance with the mandatory use of the devices. Respondents' answers to a question on the survey that addressed this matter (Appendix I, Question 50) indicate that most administrations applied traditional measures based on audits to detect non-compliance with fiscal device regulations.

## **Stakeholders**

64. The implementation of fiscal devices is a process of change, both for the revenue administration and for taxpayers directly affected. An effective program that seeks to engage affected parties in a process of dialogue can contribute positively to the overall success of the measures. Survey responses in connection with stakeholder engagement are summarized in Figure 8; a more detailed analysis can be found in Appendix I, Question 34. These responses indicate that all revenue authorities have undertaken some form of consultation with identified stakeholders; the most common stakeholders engaged have been staff of the revenue administration.

65. A significant number of revenue administrations engaged with other government departments, as well as representative groups of the affected taxpayers through their associations. Engagement with such representative groups of the business community provides a way to ensure that issues that may arise during implementation and operations are identified and resolved as early as possible.

Figure 8. Stakeholder Engagement during Implementation



Source: IMF EFD Survey, author's elaboration

### Decisions Regarding Technology

66. As the use of devices extends more broadly to the business environment, so do the types of solutions that are made available. The introduction of fiscal devices presents opportunities for the tax administration to rethink its approach to business processes by automating the collection of information, as well as by leveraging the new arrangements to improve compliance approaches and strategies.

67. Most administrations identified the need to purchase additional equipment to register the fiscal devices. In some administrations, additional equipment was required to manage the automatic collection of data and collation of information, especially in those cases when the devices are equipped with GPRS or similar network capability to automatically connect to the administrations and submit periodic summary reports. Administrations also identified the costs associated with software development to support these systems. Reported software requirements covered matters such as the process or registering devices, and the systems and databases required to capture and store the sales information (Appendix I, Question 36). Six administrations cited additional costs associated with purchasing EFD management systems and software.

68. The decision regarding which fiscal devices to implement was typically within the jurisdiction of the revenue administration. As noted in the overview of EFDs in Box 2, the type of device selected can be driven in large part by the retail environment in which it will be used. The administrations have typically created a set of specifications against

which the devices are tested. Another factor in the selection is whether the traders have to pay for their own devices, which is the approach of a large majority of respondents. A common complaint that surfaced in the discussions with industry representatives from Ethiopia and Kenya, which did not have government subsidy available to taxpayers, was that initial costs for the devices were high.<sup>16</sup> As the market stabilized and more suppliers were available, these costs did eventually fall.

69. The selection process for the devices falls into two main categories. The first is a tender regime, in which the administration issues a tender and validates responses; the second regime provides the specifications and allows vendors (or even businesses) to seek to have particular devices or individual models certified. Under the tender model, the type of device, distributors, and the support networks is limited to those that are certified by the regulating authority. Under the second model, any device can be used to comply with the legal requirements as long as it conforms to the specifications.

70. Sixty percent of survey respondents indicated that the revenue administrations had chosen the devices through a tender process. The remaining 40 percent specified a minimum set of requirements that suppliers had to meet before the devices could be supplied to taxpayers; suppliers sought certification of their devices from the relevant authority, and following certification, sold the devices to taxpayers. There were several approaches to certification: in a small number of cases, this was the responsibility of an independent body outside of the administration; in other cases, joint certification committees were established with representatives of the revenue administration and one or more external bodies that had specific technical skills.

71. The use of fiscal devices that meet standards acceptable to the tax administration is an essential element in creating trust in the devices, from both the perspectives of the administration and the business community. Some Kenyan businesses stated in their responses that the adoption of EFDs gave rise to the perception that there were less areas of dispute between small and medium businesses and the tax administration, because of the independence of the fiscal records made available by the devices. Business representatives in Tanzania expressed similar views.

72. Once the devices are chosen and made available, it is essential that appropriate arrangements be put in place for their installation, support, and maintenance over their operational life. This approach is crucial for successful deployment of the devices. For example, an often cited reason for the failure of the EFDs in Kenya to have a lasting impact is that traders outside of Nairobi found that the mandatory EFDs had been very expensive to obtain and that very little support for maintenance and repair was available.

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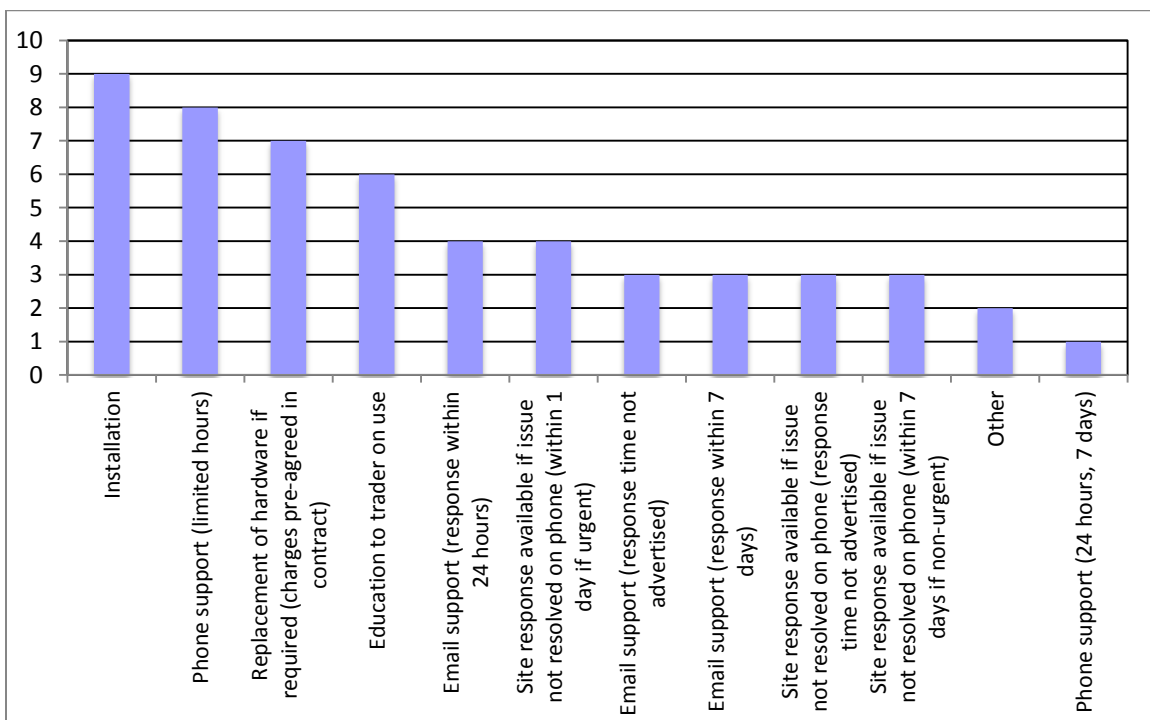
<sup>16</sup> This seems especially relevant in Kenya, where only a limited number of suppliers had been identified at the beginning of the implementation process.



The main EFD parts supplier did not offer services outside of Nairobi—a basic problem but a critical one.

73. Slightly over 50 percent of administrations have arranged for some form of maintenance agreement with the suppliers (Appendix 1, Question 32). All support and maintenance agreements provide for installation of the device, with most providing for telephone support. Figure 9 indicates the most common features included in the maintenance agreements that the revenue administration negotiated. For the remaining administrations, support agreements were arranged bilaterally between taxpayers and suppliers.

Figure 9. Maintenance and Support Agreements



Source: IMF EFD Survey, author's elaboration

### Implementation Approaches and Post-Implementation Support

74. Just as the survey showed different approaches to the time allowed in the lead-up to implementation, variations were also seen in the way fiscal devices have been introduced. There seems to be no single uniform approach to implementation of EFDs. The survey responses indicate a fairly even split between full implementation by all affected businesses and some form of staged introduction (61 percent opted for the latter, with one administration not providing details of how the devices were deployed). The only common measure that most administrations reported was the introduction of intensive

education programs in preparation for implementation. Full details of the implementation approach appear in Appendix I, Question 46.

75. Phased implementation raises the question of how these phases are determined. Most administrations, irrespective of the implementation approach, appear to have targeted specific sectors. For example, the Hungarian tax agency targeted pharmacies, catering, and accommodation and related sectors; the Dominican tax authorities targeted high cash retail sectors, such as supermarkets, restaurants, and clothing retail stores. Seventy-five percent of respondents indicated that specific sectors were targeted (details of survey responses appear in Appendix I, Question 22), although it seems that sector-based approaches to implementation were more closely aligned to address specific compliance risks.

76. There are no subsequent qualitative or quantitative questions in the survey that attempted to assess the validity of one implementation approach over another. The overall size of the economy, the relative importance of the retail sector in the taxpayer population, the available technology, the availability of a well-developed service sector to support the devices, and the overall strategy of improved compliance are all factors influencing the decision regarding the chosen implementation approach. Tax authorities in large economies such as Argentina, Brazil, and Mexico tend to prefer the phased approach for practical reasons. Further research is required to fully determine the impact of approaches to implementation on the quality and effectiveness of the outcomes.

77. The survey sought to explore whether the deployment of EFDs required additional staff and resources to support the devices once the implementation period ended (Appendix I, Questions 38 and 39). Several administrations found it necessary to incorporate additional staff to manage the devices after implementation. It would be reasonable to assume that the operational overheads were higher than anticipated, and that the need to increase compliance monitoring for these devices was also underestimated.

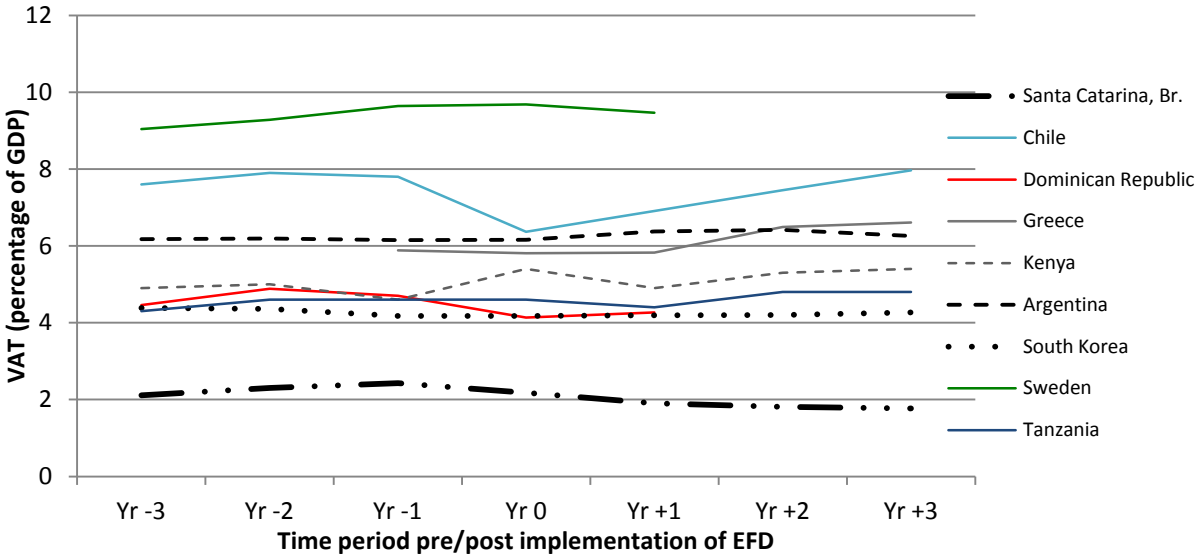
## V. OUTCOMES

78. Modern tax administrations strive to improve compliance to maximize revenue collections. The key focus is to achieve these results through an increase in voluntary compliance. Results from the survey indicate that most of the administrations that have measured the impact of the introduction of EFDs on compliance reported an improvement in accurate reporting compliance. This outcome has been discussed in section III C: Compliance Response and Impact of Adoption of EFDs. While there have also been claims of revenue increases resulting from adoption of EFDs, several questions remain concerning the actual magnitude of the alleged improvements and the costs incurred to achieve them.

79. The best approach to identify compliance improvements is to regularly measure the *compliance gap* for the relevant tax. Not all administrations regularly measure this

gap,<sup>17</sup> and other proxies to determine improvements have been used in the literature. For purposes of this paper, the trends in VAT revenue collection as a percent of GDP is proposed as a measure of improvement after EFDs have been implemented. Figure 10 highlights the impacts of EFD introduction selected countries.

Figure 10. Selected Countries: Relative Changes in VAT Revenue Collection (as a percent of GDP)



Source: IMF Data, IMF EFD Survey, author’s elaboration

80. The data presented in Figure 10 shows VAT revenue collection as a percent of GDP before and after the implementation date for EFDs; for each country, the EFD implementation year is depicted as year zero. VAT revenue as a percent of GDP is shown for the three preceding years and three succeeding years to actual implementation, when available; some countries, such as the Dominican Republic and Sweden, do not yet have three years of data available for the post-implementation period.

81. The data indicate that, with the exception of Chile (where the increase amounted to generating in the third year the same percent of revenues/GDP as generated one year before implementation), the introduction of EFDs has not been associated with noticeable increases in VAT revenue as a percentage of GDP. Moreover, it is difficult to determine any positive impact at all from the introduction of EFD, although it is also difficult to

<sup>17</sup> Although many have recently started or are now starting to do so, for example, Kenya, and more recently, Uganda, in Latin America, many countries have a history of measuring the VAT gap. But it is an aggregate measure; it is not clear that this by itself is an effective tool for analyzing the impact of specific administrative measures. The aggregate VAT gap would need to be complemented by sector-specific or other more micro-level studies (bottom-up studies based on random audits or surveys).

determine if all other factors were held constant. As highlighted in the discussion on the Tanzanian experience, other reforms are often implemented in parallel to improve revenue performance, so that revenue improvement, when it occurs, cannot be directly attributed to the introduction of EFDs.

## **A. Compliance Improvement**

### **Measuring the Impact of EFDs on Compliance**

82. Prior to this paper, three other studies related to the use of fiscal devices have been published. Martin (2010) undertook a study of the impact of fiscal devices in a regional city in Kenya. His work focused on the effectiveness of fiscal devices in contributing to improvements in VAT returns processing. This study's overall assessment was that the participants reported several positive outcomes. First, the presence of fiscal devices contributed positively to "filing compliance."<sup>18</sup> Second, taxpayers using fiscal devices were able to complete sales audits more effectively. However, the study also concluded that those not using fiscal devices reported a higher percentage of completion of sales audits (62 percent with fiscal devices, compared to 77 percent without), a counterintuitive result in light of the previous conclusion. This discrepancy was not addressed in the paper. Third, there was little factual support to the claim that fiscal devices contributed positively to stock control. Fourth, the total number of returns filed was reported to increase following the adoption of fiscal devices.

83. This study has a number of methodological problems; the most important is the absence of any baseline data against which to determine the reported change in compliance behaviors. Second, the study does not include the tax administration's perspective of these changes. Finally, the survey is short on factual evidence, relying instead on the respondents' perceptions to provide their personal perspective of changes over time.

84. Naibei (2011) conducted a similar study on the impact of fiscal devices and VAT compliance in a different regional city in Kenya. While the study does not specify how compliance was measured, it reported a much stronger correlation in terms of increased compliance through the use of fiscal devices when compared to other variables.<sup>19</sup> The same methodological problems identified in the Martin paper apply to this study, as it relies on the respondents' perceptions to assess if there have been positive changes in compliance with the use of fiscal devices, compared to outcomes without them. The

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<sup>18</sup> The paper does not define "filing compliance"; this may refer to on-time filing (e.g., less late filers), to completeness of filed returns, or to increased number of taxpayers who filed (non-filers).

<sup>19</sup> Naibei's paper suffers from similar definitional problems as the Martin study: "compliance" is not defined.

absence of baseline data to validate the perceptions of the respondents leaves the study open to interpretations that cannot be confirmed by reference to external or independent data. Nevertheless, and perhaps due to this methodological bias, both studies' conclusions are consistent in their identification of a positive impact of EFDs.

85. A more recent and methodologically robust study was undertaken to analyze the experience of fiscal devices in the Dominican Republic. Cardoza (2012) studied the impact on compliance across a number of taxpayer segments that were using fiscal devices.<sup>20</sup> The study includes a control group of taxpayers against which changes could be assessed. This was a result of the approach that the the *Dirección General de Impuestos Internos* (DGII) adopted to implementing EFDs, and the fact that the DGII has been measuring and publishing the VAT compliance gap for several years using the same methodology. Given its relevance, Appendix VI of this paper presents excerpts from the Cardoza study.

86. The DGII undertook a pilot implementation that allowed comparisons to be made to businesses outside of the pilot program. The program, launched in 2008 and implemented in phases, aimed at covering business-to-consumer transactions in the retail sector; by the end of its first phase in 2010, it had succeeded in covering about one-fourth of all consumer transactions in the country. The programs costs for the first phase were mostly covered by the Inter-American Development Bank (IDB), which funded the acquisition of the EFDs by the DGII. The second phase of the program, covering 2010–12, required that traders buy their own devices, but it allowed them to obtain full credit for their value as investment against their Income Tax or Assets Tax for the respective fiscal period. EFDs continue being rolled out to remaining businesses in the retail sector, reportedly having a positive impact on overall VAT revenue collection.

87. The key finding from this study was “... a decrease in... noncompliance of 14.7 percentage points in 2008 with respect to 2004 (the baseline year for study data).” The study does not specifically define non-compliance, but it is assumed that non-compliance refers to the non-reporting of sales. The author also reports that the group that adopted fiscal printers showed an increase in overall revenue reported of 19.6 percent, compared to an increase of only 1.0 percent in the same period for taxpayers without fiscal

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<sup>20</sup> Cardoza, *Fiscal Printers: Dominican Experience*, CIAT/AEAT/IEF Tax Administration Review No. 33 (June 2013), p. 18.

printers.<sup>21</sup> Finally, the study also tries to assess the costs and benefits of the implementation of EFDs, suggesting a positive return over the three years reported.<sup>22</sup>

88. The EFD project was but one of the components of a more comprehensive compliance improvement program started in 2004 as the “National Anti-Evasion Plan (NAEP)”. The NAEP incorporated a number of enforcement and simplification measures aimed at all taxpayer segments and yielded positive results in terms of improved revenue collection, reduced non-compliance, and a reduction of the cost-of-compliance burden. The NAEP, of which the EFDs project was just one element focusing on the retail sector, is credited with achieving a significant improved in the business climate, helping the Dominican Republic move from position 139 in 2007 to 68 in 2010 in the category “Ease of Paying Taxes” in the World Bank-IFC study “Doing Business” (one of the highest-ranking countries in Latin America in this area).

### **Compliance Burden: Analysis of the Ethiopia and Kenya Cases**

89. In order to better understand the impact on taxpayers who are required to use fiscal devices, we approached a number of business associations in Ethiopia and Kenya and Ethiopia to seek their perspectives on compliance impacts. The detailed responses appear in Appendix II. Kenyan businesses have been subject to requirements to use fiscal devices for considerably longer than their Ethiopian counterparts, and this may have affected the different parties’ views. Kenyan businesses now have a much longer experience and are therefore less subject to the vagaries of an immature implementation. Moreover, the two countries’ economies are not directly comparable. Generally, the Kenyan associations represent larger businesses, while the Ethiopian associations include a comparatively larger small to medium business segment.

90. Kenyan business associations noted that the implementation of fiscal devices was more difficult and costly than could have been the case if there had been a longer implementation period. This would have allowed the business community to better understand and appreciate the reasons for the change and the intended results. Businesses noted that at the outset of the initiative, the cost of the devices was high; this made it difficult for those businesses that were required to procure multiple devices for all their sales points. These costs were partially offset by a direct government subsidy in the first

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<sup>21</sup> Ibid, p. 25.

<sup>22</sup> Ibid, p.27. The benefits reported in the Cardoza paper were more conservatively calculated and are significantly less than the calculation based on the survey responses for the Dominican Republic that appear in Table 2, Appendix V.

12 months of operation,<sup>23</sup> although businesses remarked that purchasing the EFDs had a negative impact on cash flow.

91. No comments were made regarding barriers to entry for new businesses starting operations in the period immediately after the initial year of the subsidy, given that the cost of these devices was subsidized for existing businesses but was not in the case of new businesses. The Kenyan associations also noted that the costs for smaller businesses, which are typically the majority of traders in rural and small communities, are proportionally higher. In addition, rural businesses must often compensate for unpredictable infrastructure failures, particularly electricity, by acquiring portable or standby generators.

92. Overall, the impact of fiscal devices in Kenya was perceived as positive. The introduction of fiscal devices was seen as the mechanism that has separated legitimate businesses that have been trying to fulfill all their obligations from those businesses that attempt to stay outside the tax net. In that respect, fiscal devices are seen as the great leveler, removing any cost advantage these evaders may have previously enjoyed by bringing evaders into the system and subjecting them to the same requirements as other businesses.

93. In spite of vigorous enforcement by the tax administration, the Kenyan associations reported the emergence of a new industry —“briefcase” businesses—that specialize in the generation of fraudulent fiscalized invoices for a fee. It is not clear how prevalent this industry has become, but it serves as a reminder that no compliance strategy is fail-proof against the creativity of people wishing to evade paying tax.

94. Unlike their Kenyan counterparts, Ethiopian businesses received no subsidy for the purchase of fiscal devices. It also appears that the Ethiopian Customs and Revenue Authority (ERCA) did not fully engage with the Ethiopian businesses or their representative associations in the initial design stages, resulting in some challenges in the adopted technology, particularly the universal requirement of English as the main language in the devices. As in the case of Kenya, there was a scarcity of devices in the initial stages of implementation, and those that were available were expensive.

95. The Ethiopian business associations were more explicit in their views of the negative impact of the introduction of EFDs, especially on small and medium businesses, and were of the view that a number of small businesses in some specific industries suffered a very negative financial impact. It is not clear whether this was a consequence of

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<sup>23</sup> The cost of the device was allowed as a VAT input credit; as such, it could be deducted from output tax payable.

other legislative changes that occurred at the same time, or if it was a direct impact of the introduction of EFDs.

96. The associations also noted that ECRA could have done more to automate the reporting processes and help businesses reduce the overall compliance burden imposed through manual reporting. In summary, the assessment of the private sector representatives was that there has been a noticeable increase in the compliance burden through the additional costs (which were very high for small business) and the increased reporting frequency for all businesses, in addition to the manual monthly reports that are still required.

### B. Cost-Benefit Analysis

97. No specific conclusions can be drawn from the survey as to the cost-benefit of the deployment of EFDs. Few administrations have sufficient records to determine full costs, and even fewer can point to improvements in overall compliance that are exclusively attributable to the implementation of fiscal devices. In spite of these difficulties, some attempts were made to align costs with improvements in compliance, as measured by revenue increases; Appendix V presents some data on this issue. Part of this analysis is presented in Table 3.

Table 3. Device Implementation Costs and Return on Investment

Country	Currency	Total Implementation Costs (Tax admin. only)	Additional Staff	Projected revenue return on cost	Actual revenue return on cost
<b>Bulgaria</b>	BGN	100,000	230	-	-
<b>Chile</b>	CLP	100	5	-	-
<b>Dominican Republic</b>	DOP	100,000,000	20	20.0	30.0
<b>Greece</b>	GRD	-	0		
<b>Hungary</b>	HUF	-	0		
<b>Kenya</b>	KES	-	39	-	-
<b>Kosovo</b>	EUR	3,100,000	112	9.4	10.0
<b>Mexico</b>	MXN	101,941,947	46	-	-
<b>Moldova</b>	MLD	3,606,400	96	30.5	-
<b>Montenegro</b>	EUR	-			
<b>Panama</b>	PAB	13,107,800	75	4.2	10.6
<b>Paraguay</b>	PYG	1,300,000,000	19	0.5	0.4
<b>Romania</b>	RON	-	0		
<b>Rwanda</b>	RWF	165,800,000	3	-	-
<b>Santa Catarina, Br.</b>	BRL	61,000,000	130	35.4	-
<b>Sweden</b>	SEK	-			
<b>Tanzania</b>	TZS	38,984,756,951	0	20.5	1.8

Source: Author's analysis based on survey responses.

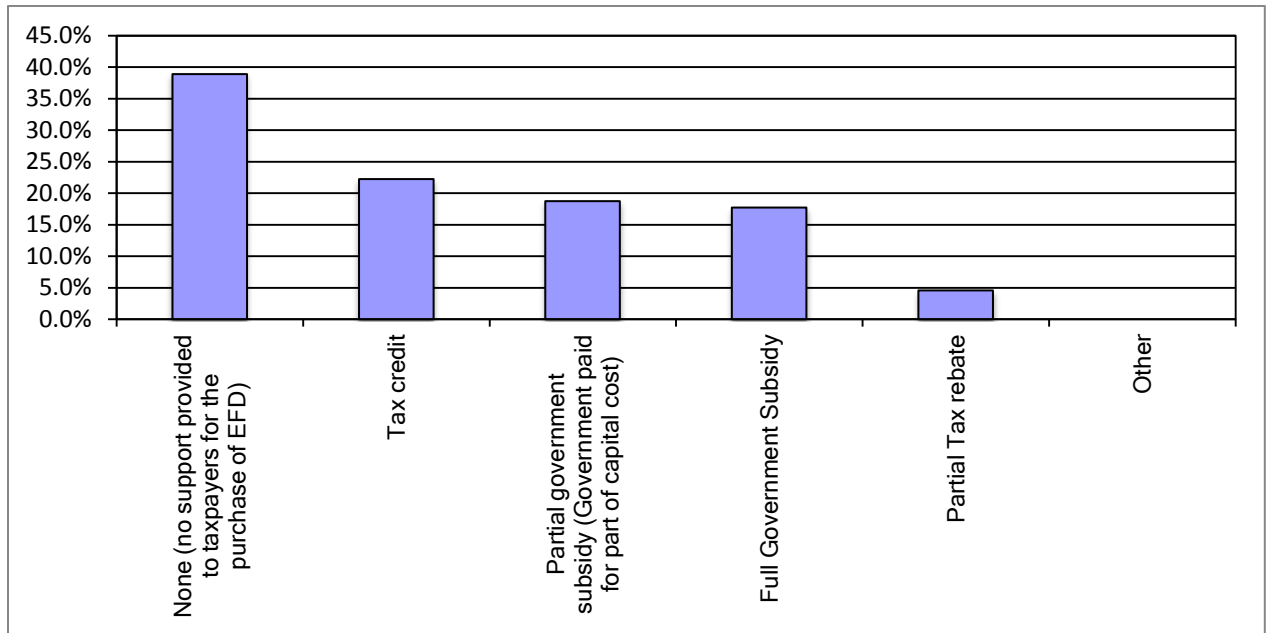


98. For those administrations that did provide data, initial calculations suggest that the additional revenue obtained exceeded the estimated costs of the adoption of EFDs. The results reported by Dominican Republic and Panama, in particular, look encouraging. However, fiscal devices are rarely the only administrative or policy change implemented. All administrations indicated that the introduction of fiscal devices was accompanied by one or more additional compliance strategies. Most of the survey respondents indicated that a number of complementary compliance strategies were introduced either around the same time or immediately prior to deployment of EFDs. When mentioning alternative risk treatments (Questions 18, 19, and 47 in Appendix I), three of the eight administrations that had considered other approaches actually adopted them at the same time as the fiscal devices.

99. A significant contributing factor to the overall cost is the purchase of the devices themselves and how this cost is financed. As discussed, either the taxpayers are required to bear in full the costs of the devices, or the government provides some form of assistance. Question 37 in Appendix I summarizes the responses to this issue. In one-third of the implementations, the taxpayer bore the full cost of the devices, together with any other cost associated with their implementation. It is not evident from the survey responses for those cases whether taxpayers were able to claim part of these costs as some form of income tax deduction, in addition to the standard depreciation rate available for capital investment.

100. In the case of the remaining 67 percent of implementations covered in the survey responses, the government provided some support, ranging from a direct subsidy to allowing part of the costs to be considered as a credit against VAT payable. In each of these scenarios, there is a cost to government in terms of direct cost and potentially reduced tax revenue or other opportunity costs. It is not evident from the responses whether any of the potential indirect related costs were included in the cost data provided. Figure 11 shows the different types of financial support that governments made available to EFD users.

Figure 11. Types of Financial Support for Fiscal Device Costs



Source: IMF EFD Survey, author's elaboration

### C. Additional Considerations

101. In parallel with the introduction of fiscal devices, new compliance challenges keep emerging. Two recent studies (Ainsworth, 2008; OECD, 2013) have described the use of new evasion techniques—the so-called “zappers” and “phantomware,” to evade the controls associated with the use of deployment of the devices in developed countries. Zappers are software programs, usually set up on external devices, which are plugged into the fiscal device after it has been installed. The zapper program allows users to activate special software functions that can selectively erase sales from the fiscal memory. Phantomware is similar; however, the malicious functions are usually embedded in the fiscal device’s software. Zappers are harder to detect, as they can be removed before an audit or inspection is conducted. Neither study claims that these evasion techniques are widespread—although they seem to be rising—but they do reinforce the fact that the more recalcitrant ends of the compliance spectrum pose a constant and evolving challenge for revenue administrations.<sup>24</sup>

<sup>24</sup> It is too early to assess the real impact of these suppression techniques, and there is very limited data available. Both Canada and Sweden have reported problems with the use of zapper programs and have adopted measures to counter this threat, which is a risk to the successful implementation of EFDs, but more time will be required to assess the results of these mitigation measures.

102. A related area that has been recently addressed in the literature is the relationship of economic “informality” with challenges to compliance. In the survey responses, several administrations highlighted the prevalence of the informal economy as a driver for the introduction of these devices. In the discussions with a number of revenue administrations in East Africa, the authorities often stated that there is a significant level of informality in the economy, with a high incidence of cash sales. This issue also arose in discussions with officials of the Tanzania Revenue Authority, who suggested that the spread of fiscal devices in East Africa stemmed from the prevalence and size of the informal economy.

103. According to these views, widespread informality in the economy leads to opportunities for underreporting, compounded by the lack of effective record-keeping. The absence of a well-developed banking system that would reduce reliance on the use of cash has been cited as a contributing factor. Nonetheless, the role of EFDs in mitigating the risks created by widespread informality is not clear. While there is clearly a strong need to combat high levels of informal economic and commercial activity, especially in the small and smaller-medium business segments, it is not obvious how fiscal devices can help to combat such informal activity, compared to other compliance responses, such as sector-based, risk-based service, and control strategies.

104. The key risk in any cash economy is the interface between the business community and consumers. In this interface, the presence of fiscal devices aims to prevent unrecorded cash sales. To address this issue, administrations that are using EFDs have also devised mechanisms to encourage consumers to seek fiscal invoices and receipts. The Bolivian, South Korean, Portuguese, and Turkish tax authorities, for example, have introduced a mechanism whereby final consumers who cannot claim input credits can obtain a discount from their personal income taxes if they report on their returns purchases that are supported by tax invoices. This incentive creates an additional demand for retailers to install and use fiscal devices and aims at benefitting from the opposition of interests between retailers and consumers. It also introduces opportunities for abuse of the system, as taxpayers seek to maximize credits to lower their tax liability. The South Korean authorities extend this incentive further up the retail chain by reimbursing the operators, who collate all fiscal transactions and pre-process them before submitting them to the National Tax Service. All of the additional costs incurred through the adoption of these schemes would need to be factored into any further analysis of the true costs and benefits of the deployment of EFDs.

105. Another area affecting use and deployment of EFDs is the constant evolution of the technology involved, both in terms of cost reduction and improved performance of the devices. The emergence of new technologies is a constant challenge to established views on fiscal devices. In fact, several countries approached for the survey indicated that after studying the effectiveness, cost, and administrative requirements of EFDs, they had decided that other technologies, in particular e-invoicing, would be more cost-effective. They had decided against the mandatory deployment of EFDs.

## VI. CONCLUSIONS

106. Although much remains to be explored to fully understand the impact of EFDs on taxpayer compliance, the main conclusion of this study is that ***the implementation of EFDs can only be effective if it is a part of a comprehensive compliance improvement strategy that clearly identifies risks for the different segments of taxpayers and envisages implementing of a set of measures to mitigate these risks.*** EFDs should not be construed as the “silver bullet” of tax administration: as with any other technological improvement—and this applies as well to new technologies such as e-invoicing—***the deployment of fiscal devices alone cannot by itself achieve meaningful results, whether in terms of revenue gains or permanent compliance improvements.***

107. The underlying hypothesis for this research project was that the adoption of EFDs was a direct response by tax administrations to combat non-compliance. Analyzing the survey replies, ***the drivers for adopting fiscal devices do indeed largely center on matters of compliance***—securing information to verify, to record sales, and to improve VAT compliance. A number of administrations regularly measure compliance and analyze trends in this area, but the impact of individual measures such as the use of EFDs is not usually assessed independently. Thus, ***claims of improvements in compliance behavior because of the use of EFDs are largely based on anecdotal evidence and not supported by actual data.***

108. For purposes of this paper, the trends in VAT revenue collection as a percentage of GDP is proposed as a measure of improvement after EFDs have been implemented. ***Survey data indicate that the introduction of EFDs has not been associated with noticeable increases in VAT revenue as a percentage of GDP.*** Moreover, ***more often than not, other reforms are implemented in parallel in an attempt to improve revenue performance, so that revenue improvement, when it occurs, cannot be directly attributed to the introduction of EFDs.***

109. Another conclusion from this study is that ***the introduction of EFDs requires considerable effort and involves costs both to the administration***—in identifying the technology, selecting the devices, overseeing their deployment, and monitoring their use—***and to the affected taxpayers*** in addressing the requirements of the new rules. Proper consideration of these factors is essential for a successful implementation. Moreover, ***EFDs appear to suffer from similar challenges as other regimes if there are no effective follow-up and enforcement measures by the tax administration. Absent effective compliance monitoring and enforcement, overall VAT compliance cannot be improved, with or without EFDs.***

110. Critical elements for success in the introduction of EFDs identified by survey responses include the following:

- ***There is a need for more comprehensive reforms to leverage the benefits of these devices***, thereby allowing the administration to direct attention to other priority areas. Specifically, survey results support the need for proper identification of risks affecting taxpayer compliance and an approach based on overall compliance strategies in order for the tax administration to address these risks properly, prior to any deployment of fiscal devices. All administrations indicated that the introduction of fiscal devices was accompanied by one or more additional measures. In fact, most of the survey respondents indicated that complementary compliance strategies were introduced, either around the same time or immediately prior to deployment of EFDs.
- ***All but one of the administrations made the use of EFDs mandatory, which in turn required changes to existing laws***. All administrations surveyed considered that legal changes were necessary to make the new fiscal device regime effective. The legislation introducing the devices needs to be complemented with detailed regulations to ensure that the use of these devices conforms to the needs of the tax administration. These regulations can be complex; their preparation, regular updating, and enforcement can involve significant resources. Tax administrations must also develop enforcement strategies to ensure compliance. All of these measures can be costly and require considerable resources that often could be used elsewhere with better results.
- One determinant of success for any major project of this nature is the time available to prepare for the change. Survey respondents indicated that in more than 60 percent of the implementations, the preparation period was longer than 12 months; in over 50 percent, the period was 18 months or longer. ***Country experiences in which less than 12 months were allocated to the project suggest that due to the limited time available, implementation faced considerable challenges***.
- Once the devices are chosen and made available, ***appropriate arrangements must be made for their installation, support, and maintenance***. Survey responses confirm that, ***when these arrangements were not in place or were incomplete, the implementation of EFDs faced considerable opposition from taxpayers***, leading in some cases to a reversal of the decision for mandatory deployment.
- ***Although the tax administration paid for the entire cost of deploying EFDs in only a few cases, about two-thirds of the respondents provided some form of subsidy to taxpayers to partially offset the additional costs*** incurred for the implementation—at least the original acquisition cost of the devices. Those countries that decided that a subsidy was required for a successful implementation tended to have a larger number of small businesses active in the retail sector, and the rationale was that the costs would be too high for the taxpayer to bear them

alone. Case studies, such as that of the Dominican Republic, tend to support these views.

- ***The introduction of fiscal devices presents opportunities for the tax administration to rethink its approach to business processes***, not only by automating the collection of information, but also ***by leveraging the new arrangements to improve compliance approaches and strategies***. The implementation of EFDs is a process of change, both for the revenue administration and for those taxpayers that are directly affected. An effective program that seeks to engage affected parties in a process of dialogue can contribute positively to the overall success of the measures. ***Survey responses indicate that all revenue authorities have undertaken some form of consultation with identified stakeholders.***
- ***Most administrations set up a separate project organization with a dedicated project team to develop and implement EFDs.*** Just as the survey showed different approaches to the time allowed in the lead-up to implementation, there are also variations in the way fiscal devices have been introduced. There seems to be no single uniform approach to implementation of EFDs. ***The survey responses indicate a fairly even split between full implementation by all affected businesses and some form of phased introduction.*** The only common measure that most administrations reported was the introduction of intensive education programs in preparation for implementation. There are two key areas where new or different skills were identified for staff: management of the devices, from certification and testing to initial deployment and customer support, including training; and the need to enhance audit skills to undertake computer-based audits using the newly available information obtained from the devices.
- In the discussions with revenue administrations in East Africa, it was suggested that the spread of fiscal devices in that region stemmed from the prevalence and size of the informal economy. Nevertheless, the role of EFDs in mitigating the risks created by widespread informality is not clear. While there is clearly a strong need to combat high levels of informal economic and commercial activity, especially in the small and smaller-medium business segments, ***it is not obvious how fiscal devices, on their own, can help to combat such informal activity, compared to other compliance responses, such as sector-based, risk-based service, and control strategies.***

## Appendices

Appendices can be accessed at the following link:

<http://www.imf.org/external/pubs/FT/WP/2015/Data/appendix/wp1573.pdf>

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