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Can E-Filing Reduce Tax Compliance Costs in Developing Countries?

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Abstract

The purpose of this study is to investigate the association between electronic filing (e-filing) and the total tax compliance costs incurred by small and medium size businesses in developing countries, based on survey data from South Africa, Ukraine, and Nepal. A priori, most observers expect that use of e-filing should reduce tax compliance costs, but this analysis suggests that the assumption should be more nuanced. In particular, policies that require business taxpayers to submit paper-based information in addition to their e-filing roughly negate savings that would otherwise be realized. In addition, adoption of e-filing requires an up-front investment by the business not only in capital assets, but also in the time, effort, and resources required to learn how to use e-filing properly and efficiently. Small businesses, in particular, are likely to face a steep "learning curve" and should probably not be forced to use e-filing before the majority of them have access to computers (with reliable electricity service) and have had a chance to become familiar with both computer use and the Internet.

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1. Introduction

Tax compliance costs (TCC), defined briefly as the costs of complying with tax regulations, are usually highly regressive in firm size and therefore are a notorious burden, especially for small and medium size businesses (SMEs).[1] By reducing these costs, firms can allocate more resources towards productive activities.[2] In this respect, electronic filing (e-filing) is a promising candidate that can reduce TCC for taxpayers, by making the reporting process easier and less prone to errors and reducing visits to the tax office.[3] This paper takes the first steps to investigate whether, and under what circumstances, the adoption of electronic filing decreases tax compliance costs (TCC) for small and medium size enterprises (SME) in developing countries.

Superficial consideration may suggest that e-filing should reduce TCC since it simplifies the workload of tax compliance (TC) with respect to (mainly) filling out and submitting tax forms. However, the results of this paper show that there may be offsetting costs associated with e-filing such as additional capital that may need to be invested to adopt e-filing, the time required to learn the system and practical implementation of the policy in the country.[4] In particular, a learning curve associated with e-filing experience is evident: as firms gain more experience with e-filing, they enjoy further reductions in TCC in the long-run. However, the curve is concave, which simply implies that the learning effect diminishes over time.[5] Our interpretation of this result is that e-filing can potentially decrease TCC in the long-

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[1] Sanford (1994 and 1995), James (2003), Evans (2003) and Coolidge (2012) provide detailed literature reviews and empirical findings.

[2] Government of New Zealand (2007), Gatti and Honoratti (2008), and OECD (2008) discuss benefits that could be generated from reducing tax compliance cost for small and medium size firms.

[3] Che Azmi, et. al., (2010); E-filing may also reduce tax-administrating costs for the public sector (see, e.g., IFC 2012) although, these are not discussed here.

[4] E.g. whether the policy was enforced or optional; whether the policy replaces the old paper filing or requires double filing.

[5] Nevertheless, this effect was only captured in the South African case due to limitations in data from other countries.

run although such reduction in TCC should not necessarily be expected in the short-term.

More specifically, we start the analysis with a critical discussion of the different policy experiences in South Africa, Nepal and Ukraine[6] and then provide some theoretical basis to illustrate how e-filing can be related to and is potentially expected to decrease TCC. In order to provide a more comprehensive understanding of the relation between e-filing and TCC, we focus on two questions in the descriptive analysis: "Who are e-filers?" and "How much does TCC differ between e-filers and non-e-filers?" To answer the first question, a detailed discussion on the correlation between firms' characteristics and e-filing decisions is provided. Then, our focus was on the differential in TCC incurred by e-filers versus non e-filers to answer the second question. Following the simple descriptive analysis, we undertake a more rigorous regression analysis to estimate the likelihood of e-filing usage by controlling for many firm characteristics that are found to be important for e-filing decisions in the descriptive analysis. Finally, we estimate the effect of e-filing usage on TCC in a regression setup.

Our results show that the answer to the question of the focus is: "it depends". In countries where e-filing replaces paper-based filing with no additional work required from firms, as was the case in South Africa, e-filing is associated with some savings in TCC. On average 22.4% reduction in overall TCC and 21.8% reduction in hours spent for complying with VAT are associated with e-filing usage in South Africa. Yet, this reduction does not always occur in overall TCC but in a few relevant components. It is therefore not clear whether one can always expect a statistically significant reduction in overall TCC or not.[7] In fact, the policy implementation of e-filing is very important for the effectiveness of the system in decreasing TCC and may actually fail to achieve its intended objective. For instance, we estimate about a 34% increase in TCC associated with e-filing usage in Nepal, where the policy was mandatory for all firms. Additionally, perception and trust of the electronic system

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[6] TCC surveys from these countries are used in the analysis, which provide sufficient information for the purpose of this research.

[7] One reason for this could be measurement error or underreporting.

is also important for the efficiency of the policy. E-filing was not mandatory in Ukraine, however our estimates from this country show that an increase in TCC is associated with e-filing usage up to 25%. This should not be too surprising as most SMEs performed double filing in the country, due to lack of trust on the online system, although paper filing was not required. We provide a detail analysis on all of these in the following sections.

Firm level cross sectional survey data sets with quite detailed information on firm characteristics were used in this analysis. Our identification strategy and related assumptions are discussed below. We were critical about many potential sources of endogeneity and especially careful about self-selection. Nevertheless, our results should be taken suggestive rather than strict causality.

In what follows, the differences in policy implementation across countries and data coverage in each survey are provided along with a discussion on theoretical background and empirical identification. In section 2, we present a descriptive analysis of each data set from all three countries separately. Section 3 sheds further light on the hypothesis from regression analysis and Section 4 concludes with research findings.

1.1 Policy Implementation and Survey Coverage

The analysis here is based on the experience of three countries: South Africa, Nepal, and Ukraine.[8] As each country has had different policy experiences, it is important to discuss these differences, including policy implementation and other details about the survey coverage, while doing the analysis.

In South Africa, e-filing was introduced in 2003, but initially only for value added (VAT) and employment taxes. E-filing for income taxes for companies and individuals followed in 2006. According to the policy implementation in the country, e-filing is voluntary and e-filers are not required to file paper returns once the process is completed electronically. An important consideration is that the TCC

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[8] TCC survey has been conducted for 12 developing countries although only three of these countries provide sufficient information for our analysis. See Coolidge (2012) fur further details on some of the data for excluded countries.

survey for SME taxpayers in South Africa was performed in 2007 with a focus on the previous fiscal year, 2006 (USAID, 2008). This may weaken the identification of benefits from the reform with respect to income taxes, although the benefits from e-filing should have been long realized by VAT and employment tax payers.

In Nepal, the implementation of the system was quite complex. Firms were reportedly required to complete a tedious amount of paper work for their electronic reports to be accepted by the revenue agency, which may increase TCC. The e-filing was legally required, but not comprehensively enforced, and many firms complained about poor IT connectivity. Additionally, e-filing was introduced in the 2009/2010 fiscal year, while the TCC survey was done in 2011, focusing on fiscal tax year, 2009/2010 (IFC, 2012). This can be problematic for the analysis of such data since it was the first year of policy practice, and businesses that used it were still in the process of learning-by-doing.

The Ukrainian government introduced a full e-filing system in 2006 on a voluntary basis, and e-filers were not legally required to submit hard copies of their tax returns. However, certain "background documents" had to be submitted in hard copy; although they could be sent by registered mail, most private sector taxpayers reportedly did not trust the system and the survey showed that the vast majority reported that they had brought their hard copies to the State Tax Committee physically. In addition, SMEs had only one year of e-filing experience prior to the survey (IFC, 2009), which might not have been a sufficient period for "learning by doing" to gain all the benefits. It is likely that a survey conducted shortly after the introduction of e-filing may not be able to provide a complete picture of the medium to long run effects of e-filing on TCC.

1.2 Theoretical Thinking and Empirical Identification

It is important to identify the mechanisms through which e-filing might affect TCC. To address this, we present a very simple theoretical illustration. This is by no means intended to represent a theory of tax compliance, but rather to focus on the basics to clarify the underlying thought process we have in mind. To begin, we think from the perspective of firms. Say the TCC can be written as TCC = f(**s,e,g**), where

TCC is assumed to be function of firm specific factors (**s**), group specific factors (**e**) and government policy implementation (**g**). Among firm specific factors, one may include turnover, employment, management quality, productivity (of employees and tax staff), firm's experience with taxes etc. With the exception of management quality, these are observable factors that are specific to each firm. The location of firms, the industry that they operate in and legal form are group specific factors, which affect all the firms in the same group similarly. E-filing policy implementations including corruption, informalities in conducting the policy or requiring double filing are examples for the government side of the story.

The equation (below) simply states that change in TCC (ΔTCC) is equal to changes in compliance costs associated with e-filing given all specific factors less the cost of adopting it (c(capital, labor)). The cost of adopting e-filing is written as (c(capital, labor)) and is modeled in two parts: the first part is the capital investment such as cost of registering, software, computers, maintenance etc., and the second part is training accounting staff to use the system. These costs include fixed and variable costs over time. Now, one can write the effect of e-filing on TCC as

ΔTCC = [f(s,e,g|efile=1) - f(s,e,g|efile=0)] + c(capital, labor).

The first term is the cost savings associated with e-filing and is presumably (a priori) negative (i.e. e-filers pay less TCC relative to non e-filers, holding everything else constant) and the second term, cost of adopting e-filing, is positive. The first term is simply a *necessary condition* of our theoretical framework but is not sufficient to claim that e-filing will indeed decrease TCC. *Sufficient condition* requires the negative effect to be bigger than the positive one in magnitude. Net change in TCC (ΔTCC) thereof depends on which effect dominates. Since we do not have detailed data on the cost of adopting e-filing, we are forced to assume that this is more or the less same across all firms. Nevertheless, this may not be always true. A more appealing setup would certainly be a dynamic one to understand the transitions in the short and long runs. Simply, adoption cost will diminish over time and also, as firms gain experience with the system, they benefit more from it. Put

differently, over time the benefits from e-filing (assuming perfect policy implementation) will increase while the costs diminish.

In a perfect world, one can estimate the average effect of e-filing (the first part of the equation) by conducting a controlled experimental design, where some firms (regardless of their characteristics) are randomly assigned to use e-filing while others (the control group) are assigned to not use it. In this way, one could simply go around the self-selection problem[9] by disentangling the decision of adopting e-filing and firm characteristics. Following the first step, one could then undertake a very simple regression analysis to estimate the average "causal effect" of using e-filing on TCC. In a world of empirical data lacking an experimental design, one needs to control for all firms' characteristics, especially the ones that are particularly important for the decision of e-filing usage, to overcome the selection problem. Following the first step, one can then estimate the average effect of e-filing on TCC in a more complex regression setup. This could best be done in a panel setup by using firm's fixed effects (including time invariant unobserved firm characteristics) and time trends in the regression model. The time frame is also important to understand the short-run versus medium to long-run impacts of using e-filing.

As we have, so far, only cross sectional firm level data sets, we are not in a position to apply the first two methods. However, using the data available to us, we can control for many firm characteristics such as turnover, employment, productivity, taxes paid by firms, bank accounts (formality in doing business) etc., and also, can control for industry, location and legal form of firms. As the analysis is done for each country separately, the government policy generally should have similar effects on all firms in the same country (although firms' perceptions or experience with informalities generated by government officials within a country may be different). Finally, there are some perception variables, which can be used as proxies for governance quality and the efficacy of policy implementation at the firm

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[9] See Heckman, J. James (1979, 1990) and also for a recent reference, see Jacobs, Hartog and Vijverberg (2009) for further details. There are different types of selection bias problems, the one that is particular concern to us here is the possibility of a group of firms with certain types of characteristics (that are not observable in the data) self-selecting themselves to e-file.

level. Such consideration will enable us to address the self-selection and other types of endogeneity problems. However, our results should be interpreted as identifying the "association" between the variables of interest rather than a strict "causation," which requires a deeper consideration with a richer data set (e.g. experimental design).[10] Further discussion on these issues is provided in the regression analysis section.

2. Descriptive Analysis

In this section, we seek answers to a series of questions such as "Who are e-filers?", "Is there a certain pattern behind such behavior?", "Does this behavior differ across countries?" Secondly, we perform several mean comparison tests to check if mean TCC paid by e-filers is statistically different than mean TCC for non-e-filers.

2.1 Who Are E-filers?

The descriptive analysis for South Africa, Nepal and Ukraine outlines several patterns that are important in firms' e-filing decisions: firms that are located in developed regions, relatively larger in size, under relatively more complex legal forms, paying higher taxes, operate in relatively more capital intensive industries (e.g. finance and consulting service) are more likely to sign up for e-filing relative to others.

Infrastructure development is quite important not only for firms' e-filing decisions but also for using the system effectively. The reliable availability of internet access and electricity, capability in computer usage, awareness of e-filing or being informed about the process are part of what we label "infrastructure". In fact, according to the information provided in the surveys, firms rank these issues at the top of the list of reasons for "why they do not sign up for e-filing."[11] Moreover, the descriptive analysis shows that firms operating in relatively more developed cities

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[10] There are also other methods available to address the self-selection problem, such as Heckman Correction and/or Propensity Score Matching methods. The former requires an exogenous identification criteria and the latter requires a large data set to obtain sufficient number of matches. Due to data limitations in size and coverage, both approaches are beyond the capability of this report.

[11] For instance, in Nepal, lack of information about the system among firms was the most frequently mentioned reason for not e-filing.

are more likely to use e-filing. This is not a country specific finding; rather is supported by the evidence from all countries considered in the analysis.

Firm size is important. Relatively larger firms, operating more professionally, tend to employ staff dedicated to accounting and tax, and are exposed to the usage of technology relatively more than smaller firms. These characteristics may allow large firms to adopt e-filing more conveniently or at least to use it more efficiently. On the other hand, firms that are larger in size are generally subject to more taxes such as corporate income taxes (CIT), value added taxes (VAT), payroll taxes (PAYE) and so on. In this respect, e-filing – if it indeed simplifies tax compliance in practice – may benefit larger firms more than smaller firms. As such, larger firms simply have more means to use e-filing and this claim is supported in the data. Firm size is measured by turnover as well as by the number of workers, and in both cases we find a positive correlation between firm size and e-filing decisions.

The legal structure of the firm and the number of taxes it pays are positively correlated with firm size. Legal form is therefore also positively correlated with e-filing decisions of firms. Put differently, micro firms usually operate as sole proprietorships, where they are either subject to a simplified tax regime (as in Ukraine's case), are under the VAT threshold or are not even legally required to pay certain taxes. Therefore e-filing may offer very little reduction in their TCC, while adoption of e-filing can be quite expensive and require computer skills that they may not have. In this respect, we find that firms operating under relatively more complex legal forms such as partnerships and corporations (LTD) are more likely to adopt e-filing.

Different industries may also require different skill sets. For instance financial industry, professional services and trade-oriented industries may already demand more technology usage from firms. Firms operating in these industries might already use computers, internet, and high skilled labor in their operations, which allow them to enjoy "economies of scope" in case of adopting e-filing. This simply means adopting e-filing may be easier or cheaper for these firms. In fact, this claim is supported by the analysis undertaken here: that is, firms operating in such

sectors are more likely to adopt e-filing relative to other firms operating in less technology oriented sectors such as agriculture.

Details of the descriptive analysis are extensively discussed below by relying on the experience of three different countries. As data availability allows, we provide empirical evidence for each of these claims. We start with South Africa and then proceed in the order of Nepal and Ukraine.

2.1.1 South Africa

As of the 2006 fiscal year, 32% of the firms had signed up for e-filing in South Africa. Over 60% of all e-filers, which constitute 20% of the firms in the total sample, are located in the heavily urbanized (or relatively more developed) provinces of the country: Gauteng and the Western Cape.[12] The remainder is located in the other seven provinces. As Figure S1 shows e-filing usage among firms in the more urbanized provinces is relatively more common relative to the other provinces.

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[12] According to the development report by the South African National Planning Commission in 2010, these are the two most developed provinces of the country.

Figure S1: Percentage of Firms Using E-filing by Province

Source: USAID 2008 [South Africa]
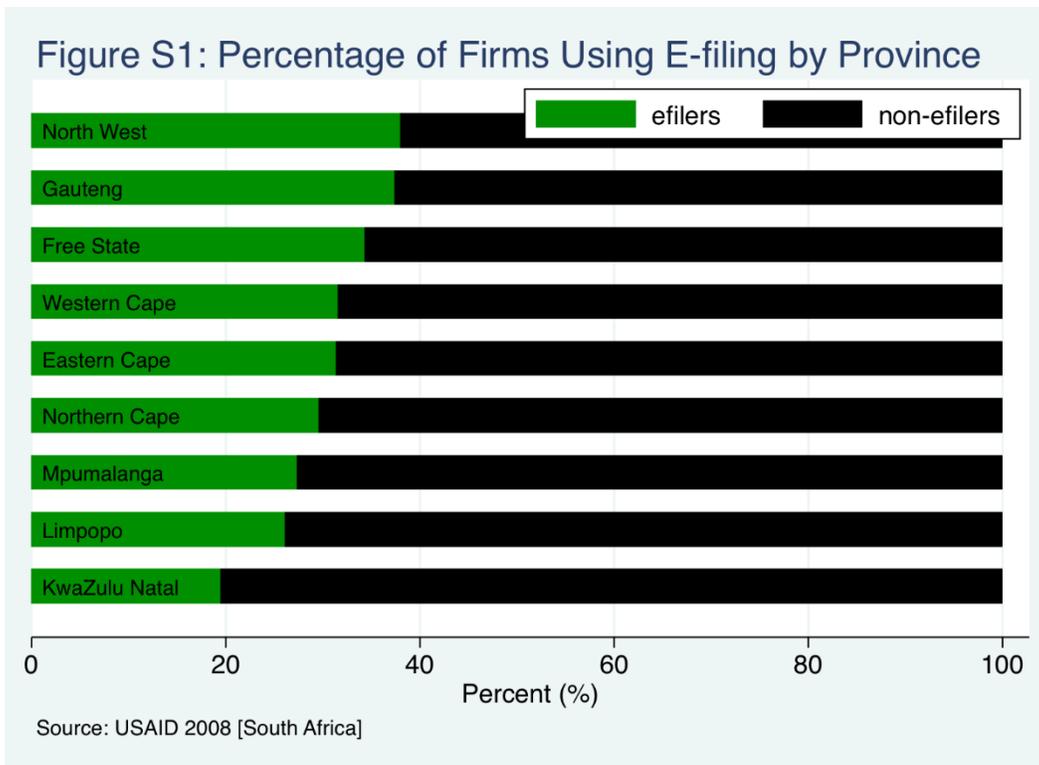
According to the survey, only 27 % of e-filers are in the lowest three turnover bands. In contrast, e-filers located in the highest three turnover bands constitute 66% of total e-filers in the country. Cross tabulations of this figure only for firms located in Gauteng or Western Cape present similar patterns. As expected, and as Figure S2 shows, firms generating relatively higher turnover tend to use e-filing more frequently compared to those in lower turnover bands. The total number of workers may also be used as a proxy for firm size. To consider this, the weighted average of the total number of workers hired by e-filers and non-e-filers are compared; which shows that on average firms with more workers are more likely to sign up for e-filing.[13]

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[13] The mean difference is statistically significant according to all conventional levels.

Figure S2: Percentage of Firms Using E-filing by Turnover

Source: USAID 2008 [South Africa]
* In thousands of Rands ('000)
*DN/Us/Re: Don't know, Unsure, Refused to answer
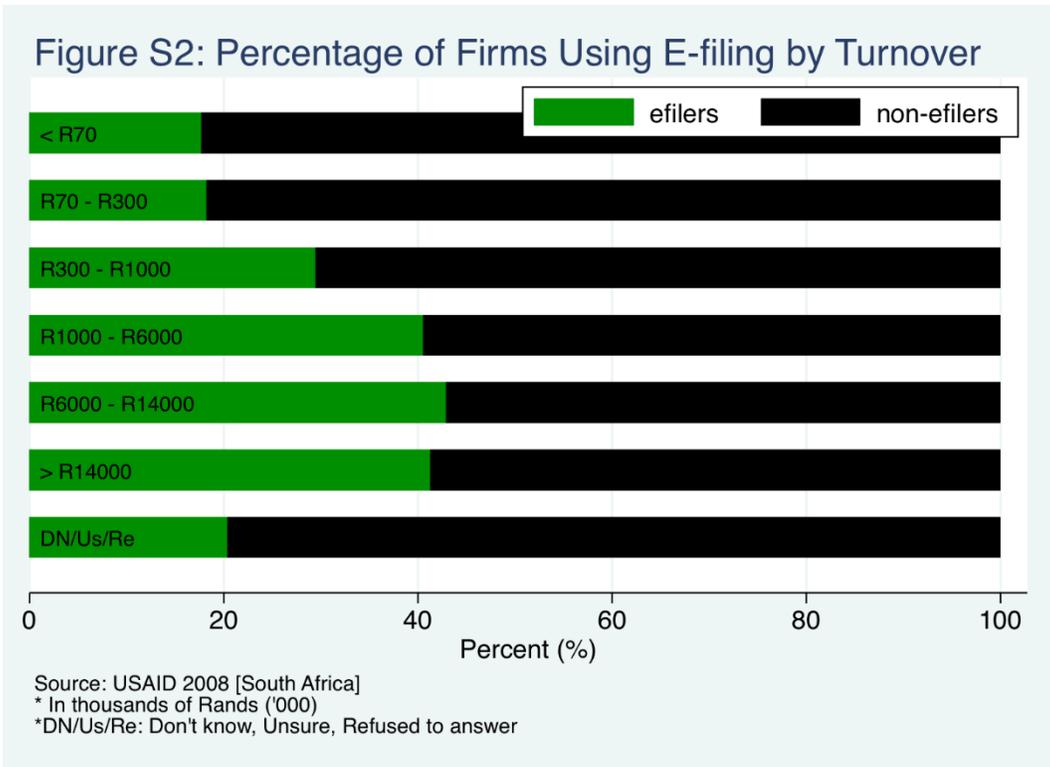
Firms' legal form and their e-filing decisions are presented in Figure S3. It shows that e-filing is more common among partnerships and companies (PTY LTD) compared to other legal forms.

Figure S3: Percentage of Firms Using E-filing by Legal Form

Source: USAID 2008 [South Africa]
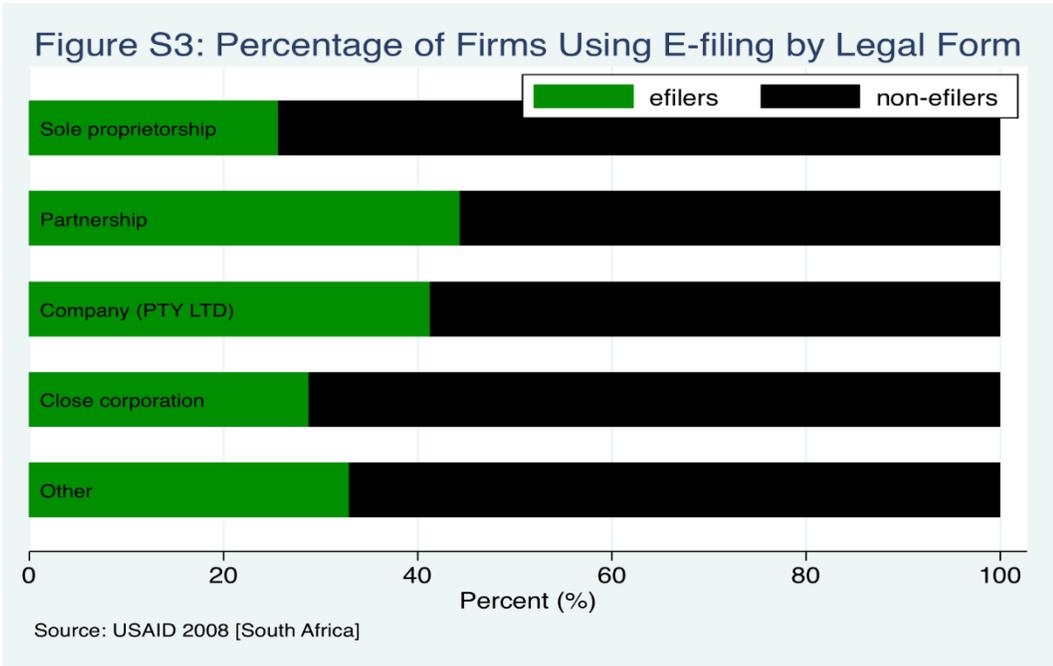
Similar to legal structure, different taxes may incentivize firms differently with respect to using e-filing. Given that the e-filing system was first introduced for VAT and employment taxes (PAYE, UIF and SDL) in 2003, and only later, in 2006, for income taxes (CIT and PIT), it is not surprising to see a slightly higher percentage of VAT and employment tax payers using e-filing (in Table 1) relative to other major taxes. Since most sole proprietorships pay PIT, PIT payers record the lowest percentage of e-filing usage.

TABLE 1: Taxes by E-filing Usage

E-FILING	CIT NO	CIT YES	PIT NO	PIT YES	VAT NO	VAT YES	PAYE NO	PAYE YES	UIF NO	UIF YES	SDL NO	SDL YES
Non-Efilers	68	606	522	152	84	590	110	564	83	591	266	408
	77%	67%	67%	70%	90%	65%	85%	65%	86%	66%	75%	63%
Efilers	20	304	259	65	9	315	19	305	13	311	87	237
	23%	33%	33%	30%	10%	35%	15%	35%	14%	34%	25%	37%
TOTAL	88	910	781	217	93	905	129	869	96	902	353	645

*Source: USAID, 2008

It should be noted that signing up for e-filing does not always imply the actual usage of the system in practice. In fact, usage of the system varies across different taxes. For instance, as shown in Figure S4, about 46 % of e-filers use the system for all four main taxes in Table 1.[14] Firms using the e-filing system for only three of these taxes constitute 32 % of e-filers. This implies that 78 % of e-filers (25% of the total sample) report at least 3 of 4 main taxes electronically. Among these taxes, VAT and PAYE are the most commonly reported electronically (88 % and 85 % of all e-filers respectively).

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[14] In the survey, CIT and PIT are grouped under "income taxes" and UIF and SDL are also considered as one group.

Figure S4: Percentage of Firms Using E-filing by the Number of Taxes Paid
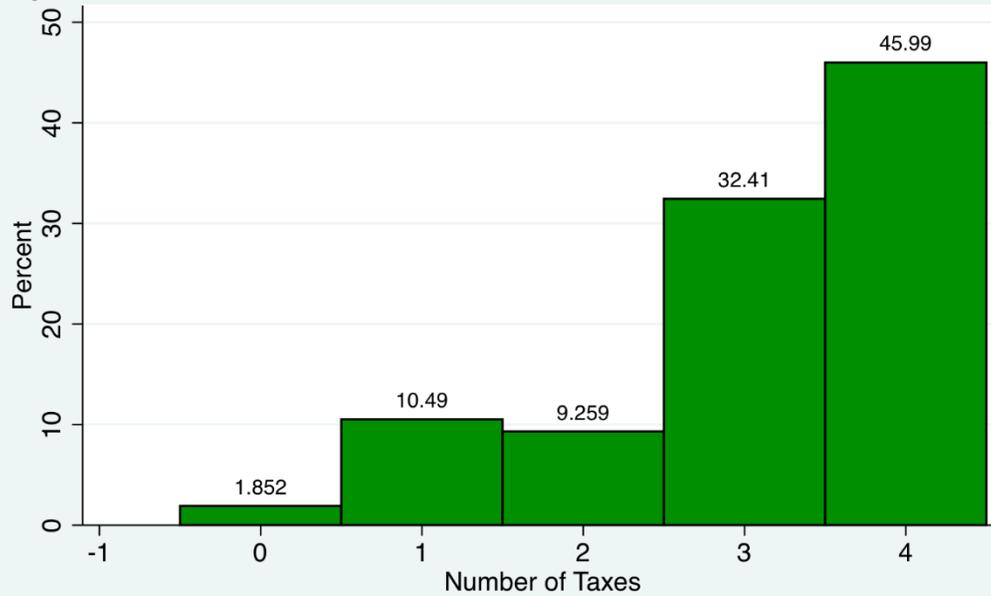
Source: USAID 2008 [South Africa]

Table 2 provides the distribution of e-filing usage over the four main industries, which accounts for 75% of total e-filers in South Africa. These four industries alone include 66% of all the firms in the country. A closer look at these industries (in Figure S5 below) shows that firms in finance, real estate and the business services industry are more likely to sign up for e-filing compared to firms in all other industries (47%). Between 29 % and 34 % of firms in manufacturing, professional services and wholesale industries use e-filing.

Table 2: E-filers by Industry

Industry	Number	%
Finance, real estate	117	36%
Manufacturing	39	12%
Wholesale and retail	45	14%
Professional services	43	13%
Sub Total	244	75%
Grand Total	324	100%

*Source: USAID, 2008

Figure S5: Percentage of Firms Using E-filing by Main Industries
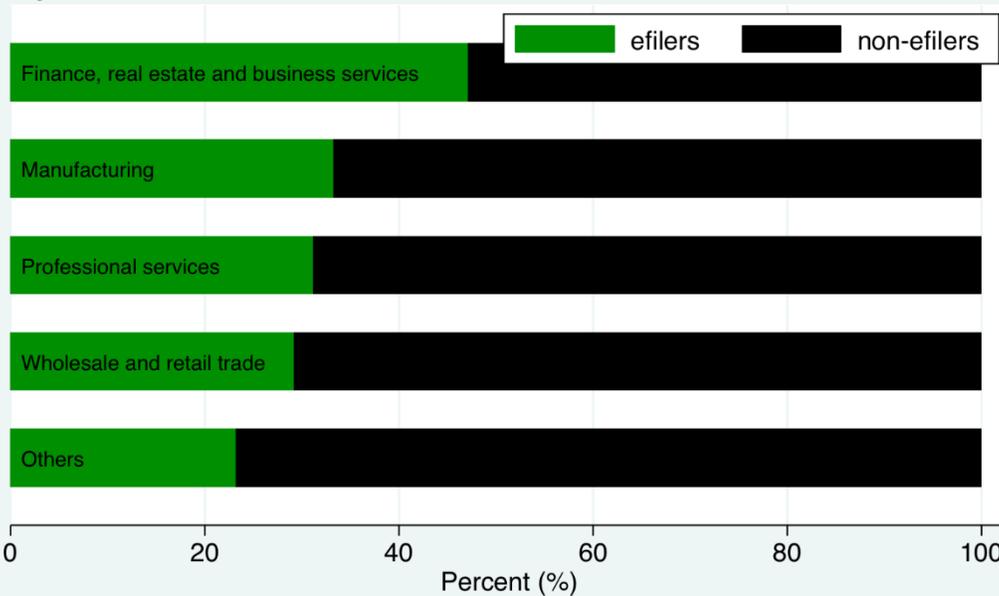
Source: USAID 2008 [South Africa]

2.1.2 Nepal

According to the TCC Survey done in 2011 focusing on 2009/2010 fiscal year in Nepal, only 16 % (159) of firms (out of 990 firms in the representative sample) had signed up for electronic filing.[15] Since it was the first year of the policy in the country, participation appears to be low, and it is likely that many firms that outsource their tax compliance may not even be aware of whether their professional accountants are using e-filing for their tax returns.[16] E-filers are mainly located in the Central Region (55% of all e-filers), particularly in the capital city Kathmandu (48% of all e-filers). Besides the importance of infrastructural development in the practice of e-filing, in Nepal, agglomeration associated with the presence of many e-filers in Kathmandu may be due the fact that it was the first year of the policy. A look at firm location and e-filing usage shows that 45.4 % of the firms located in Mahendranagan (which corresponds only to 4% of all the firms in the country) have signed up for e-filing. This number is 20 % in Kathmandu (Figure N1), while e-filers

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[15] After considering the sampling weights.

[16] In fact, e-filing was officially mandatory in 2011 but apparently not consistently enforced.

in Kathmandu constitute 16 % of the total population. The rate of e-filing participation for firms located in all other cities is only 7.5 %.

Figure N1: Percentage of Firms Using E-filing by City

Source: IFC 2012 [Nepal]
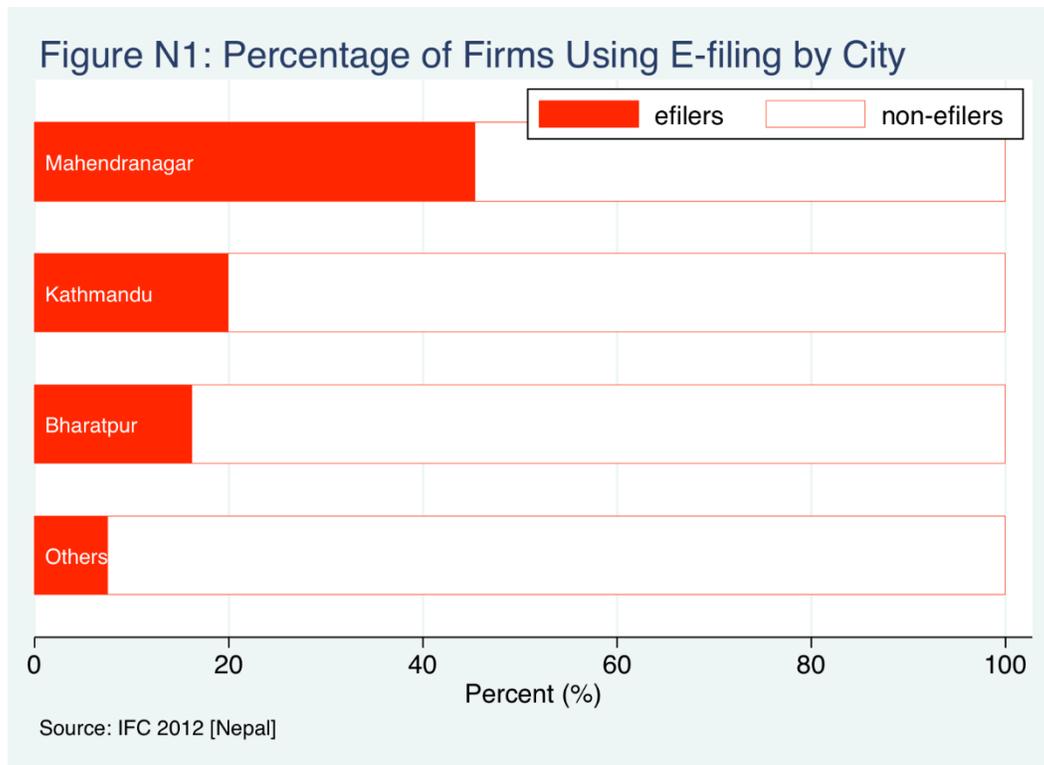
As discussed before, firm size is important in e-filing decisions, and this appears to be the case in Nepal as well, given that it is a very common practice among firms in the highest four turnover bands. For instance, while 65 % of firms in turnover band "Nrs 10,000,000 to Nrs 50,000,000" using e-filing, this figure reaches to 97 % in the highest turnover band. This shows that (in Figure N2) there is almost a monotonic increase in the number of e-filers when moving from very low turnover bands to higher bands; in particular, the lowest turnover band has no e-filing users. Moreover, above the VAT registration threshold (at or above NRs 2,000,000) there is a drastic jump in the usage of e-filing. As recorded by the IFC Survey Report for Nepal, (WBG(2012)) average estimated TCC for VAT is the highest among all major taxes in the country. This may imply that there is relatively high prospective cost savings in TCC for VAT payers from utilizing e-filing and this may explain the drastic jump in the usage of e-filing above the VAT threshold. It is also worth noting that a

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mean comparison test between the total number of workers hired by e-filers and non-e-filers –as another size measure– confirms the hypothesis: firms with a relatively higher number of workers are more likely to sign up for e-filing. This is statistically significant at all conventional levels.

Figure N2: Percentage of Firms Using E-filing by Turnover

Source: IFC 2012 [Nepal]
*In thousands of NRs ('000)
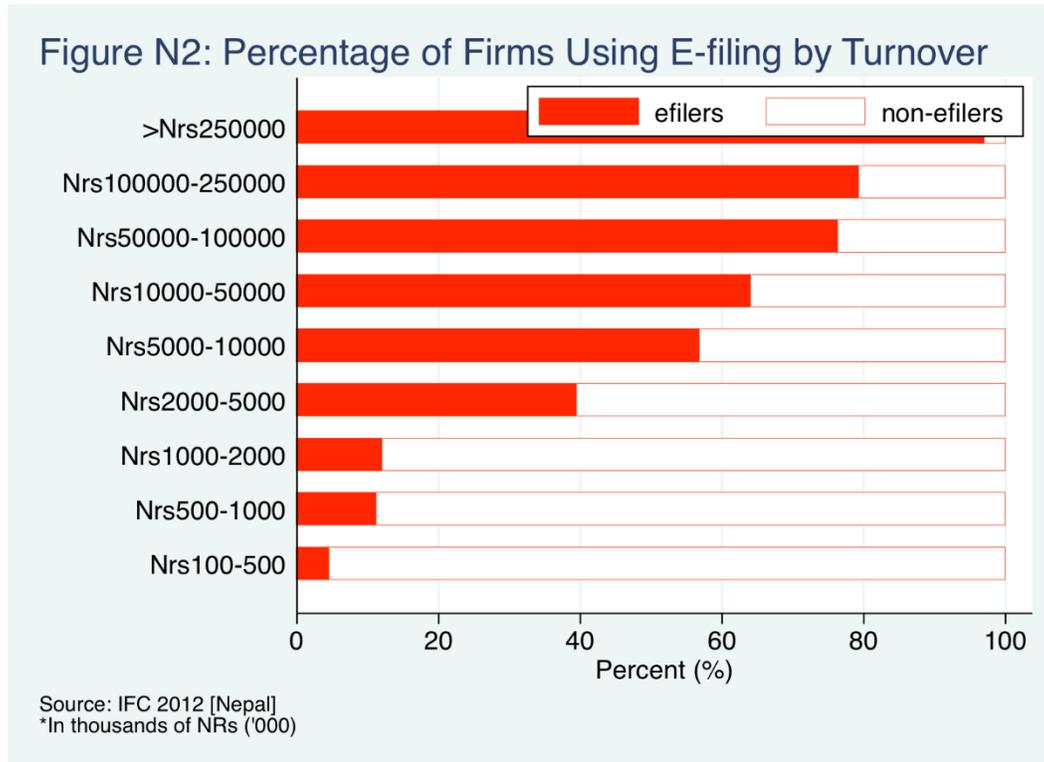
Out of 990 firms surveyed in Nepal, 875 of them are sole proprietorships, which corresponds to 88% of the population in Nepal. Looking at the e-filing rate among firms operating under various legal forms shows that only 12% of sole proprietorships use e-filing while this figure is 94% for public limited companies (Figure N3).

Figure N3: Percentage of Firms Using E-filing by Legal Form
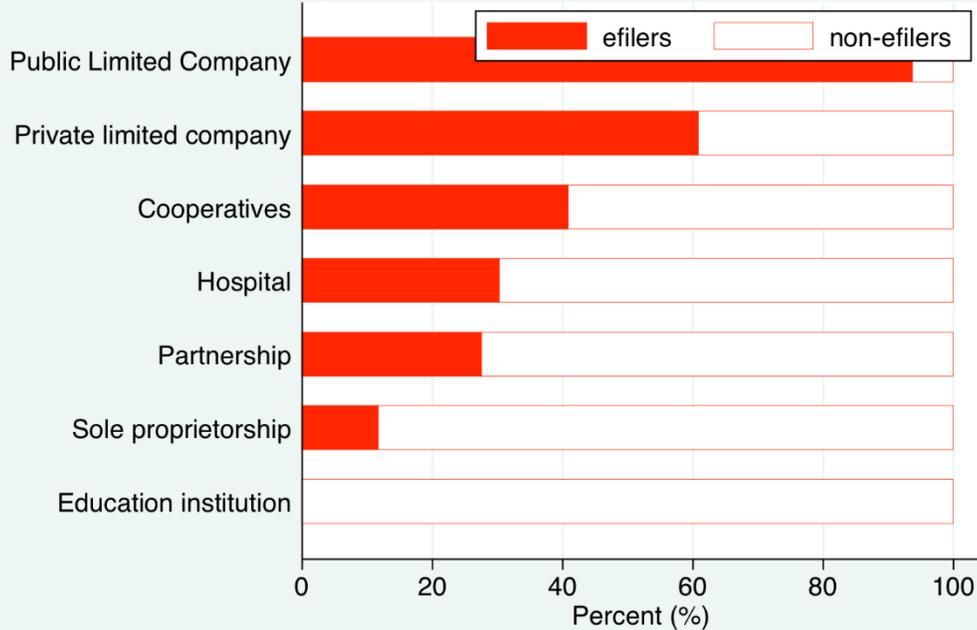
Source: IFC 2012 [Nepal]

Similarly, most of the private limited companies (about 61% of the group) also prefer electronic filing. This is in line with the earlier observation that firms with more complex legal structures are more likely to register for e-filing.

TABLE N1: Taxes by E-filing Usage

E-FILING	CIT		VAT		TDS/PIT	
	NO	YES	NO	YES	NO	YES
Non-Efilers	0	831	732	100	756	75
	0%	84%	93%	49%	90%	50%
Efilers	0	159	57	102	84	75
	0%	**16%**	7%	**51%**	10%	**50%**
TOTAL	0	990	788	202	840	150

*Source: IFC 2012 [Nepal]

In Table N1, different taxes paid by firms, and firms' e-filing status are presented. According to the data, all of the firms in the sample pay CIT. Yet, only 16% of them are registered for e-filing. Moreover, this number for VAT payers is 51% and for TDS/PIT (withholding taxes) payers is 50%, which suggests that VAT and TDS/PIT are mostly paid electronically, relative to other taxes. Moreover, Figure N4 depicts the quantity of (major) taxes paid by firms and firms' e-filing status. According to the figure, firms that are paying only one tax (only CIT) are the least likely to sign up for e-filing (5%) while firms paying all three major taxes are the most likely to sign up for e-filing (71%).

Figure N4: Percentage of Firms Using E-filing by the Number of Taxes Paid
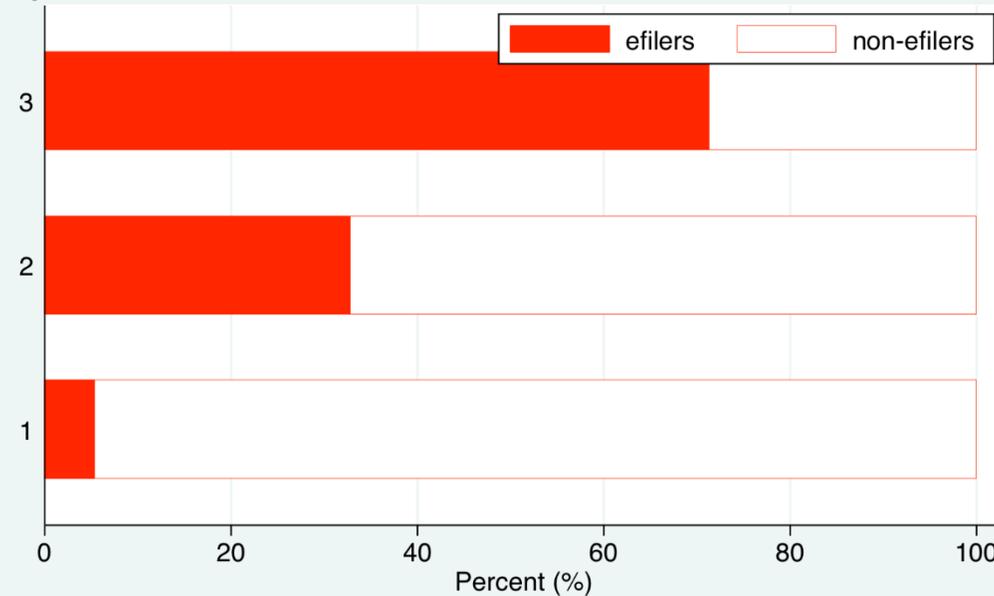
Source: IFC 2012 [Nepal]

There are three main sectors considered in the survey; manufacturing, trade and service sectors. Most of the firms in the country are in the trade industry (around 57% of all the firms). However, firms in all three sectors are similarly likely to sign up for e-filing, which is around 15% in trade and 18% in service sectors. Lack of detailed data on sectoral allocation of firms limits our ability to say more on this.

2.1.3 Ukraine

According to the TCC survey carried out in Ukraine as of 2007 fiscal year (excluding proprietorships, which were covered in a separate survey), 21% of companies had signed up for e-filing.[17] On the other hand, floppy disk usage in filing was 26%, which was slightly higher than electronic filing. One reason may be the policy practice of floppy disk filing (now including flash-drives) has a longer history than e-filing. Nevertheless, perhaps the most important reason for this – in the case of Ukraine – was the lack of trust in the system (as described above). This was suggested by the fact that many firms filed hard copies in addition to e-filing despite

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[17] Considering sampling weights does not change this number.

the fact that the state law does not require it. Most e-filers (65%) are located in four oblasts that are most urbanized: Odessskaya, Kievskaya, Khar'kovskaya and Donetskaya. Figure U1 presents further details on e-filing practice relative to the total number of firms located in these cities. This is in line with our earlier findings from other countries where e-filers are located in the most developed regions of the country.[18]

Figure U1: Percentage of Firms Using E-filing by Cities

Source: IFC 2009 [Ukraine]
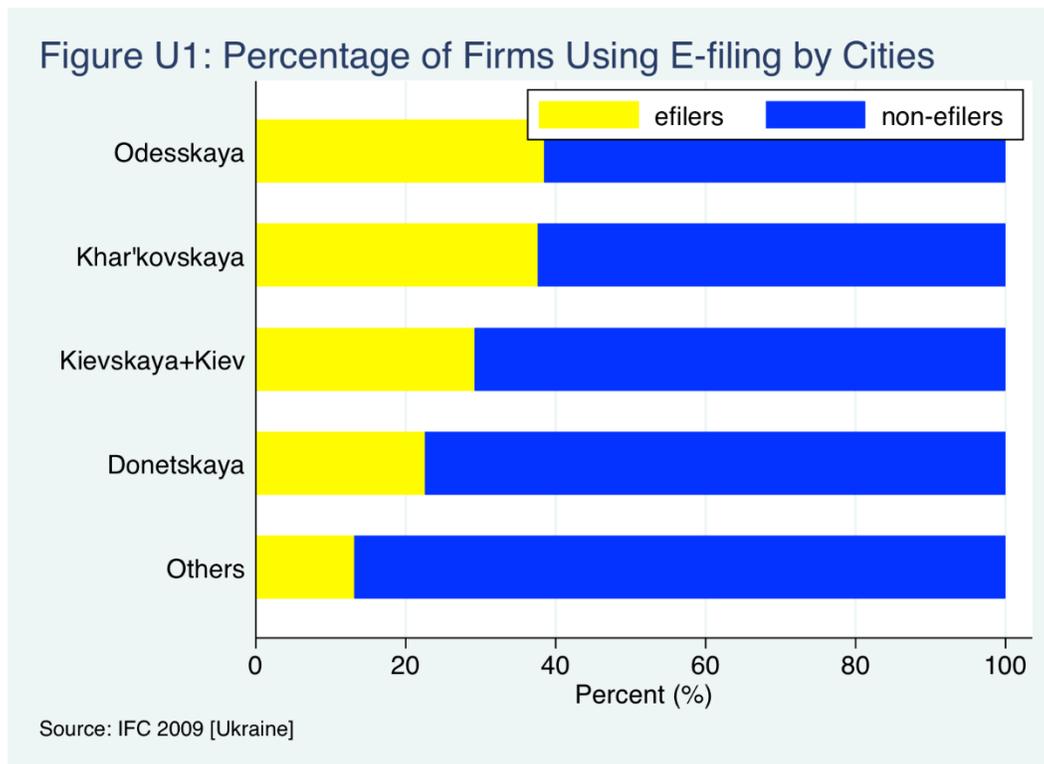
Ukraine displays an interesting case with respect to the relationship between firm turnover and e-filing decisions. As seen in the income bands (in Figure U2), it appears that firms in the lowest and the highest income bands are less likely to sign up for e-filing, while firms in the middle-turnover groups are more likely to sign up for e-filing compared to the country average. In the case of the highest income band, the fact that many of them are served by the Large Taxpayer Unit (and were

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[18] According to the Ukrainian National Statistics Department's regional gross domestic product numbers, these cities are amongst the most developed cities in Ukraine.
http://www.ukrstat.gov.ua/operativ/operativ2008/vvp/vrp/vrp2008_e.htm

probably in the habit of providing electronic files without using the internet) may explain the anomaly.

Figure U2: Percentage of Firms Using E-filing by Turnover

Source: IFC 2009 [Ukraine]
*M: Millions
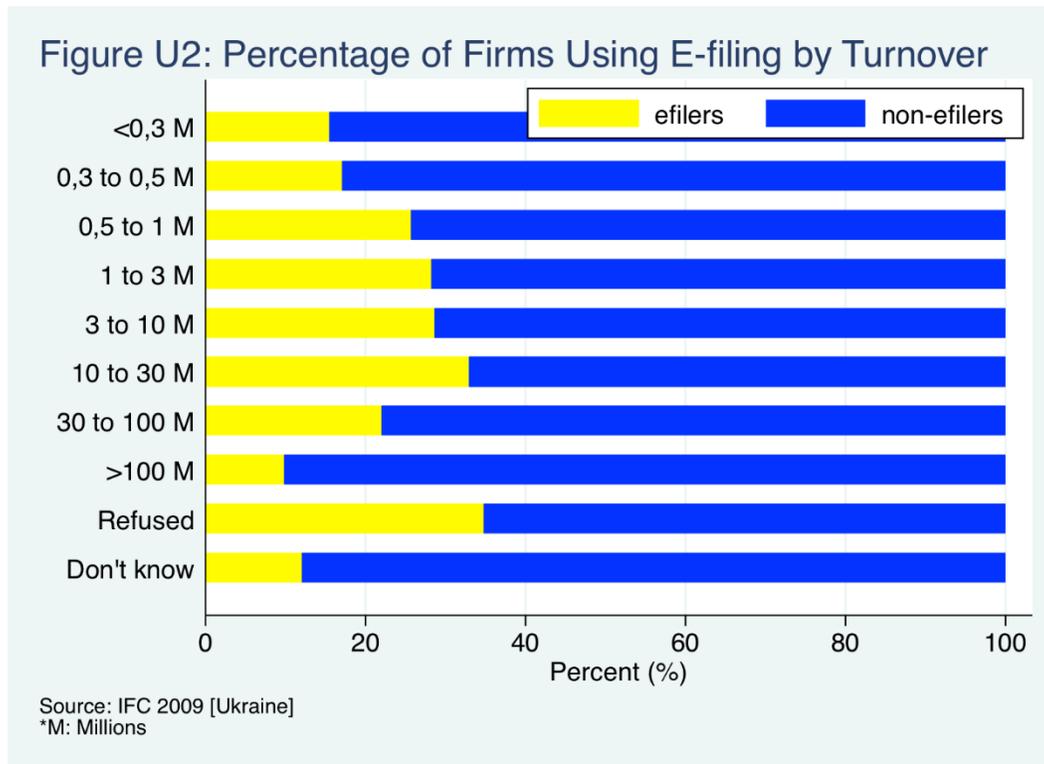
On the other hand, Ukrainian firms that refused to answer the related turnover question are the most frequent users of e-filing. This seems rather puzzling. As a robustness check, we looked at other information provided in the survey, where turnover bands were more broadly defined (less than .3M, .3 to 1M and more than 1M) and the question – on firm turnover – was answered by all the firms in the survey. Using this information, firms with turnover less than 1M constitute about 38% of e-filers. However, the use of e-filing among firms in the mid and upper turnover groups is more common (20 % and 29 %) as compared to sample average, which do match with our previous findings. As before the total number of workers is used as a secondary proxy for firm size; firms are compared based on their number of workers and e-filing preference. Comparing the sample means shows that firms who hire relatively more workers appear to be more likely to e-file, but the difference is not statistically significant.

Unfortunately, there is no information on firm legal structure provided in the Ukraine survey with the exception that a separate sample is collected for sole

proprietorships, which indicates that only 3 % of sole proprietors in the country uses electronic filing. This is also further confirmed by WBG (2009), which reinforces our claim that firms with relatively simple legal structures are less likely to use e-filing.

The industry distribution of e-filers is presented in Figure U3. E-filers are mostly clustered in the service and trade industries. The least number of e-filers operate in hotels and catering industry.

Figure U3: Percentage of E-filers by Industry
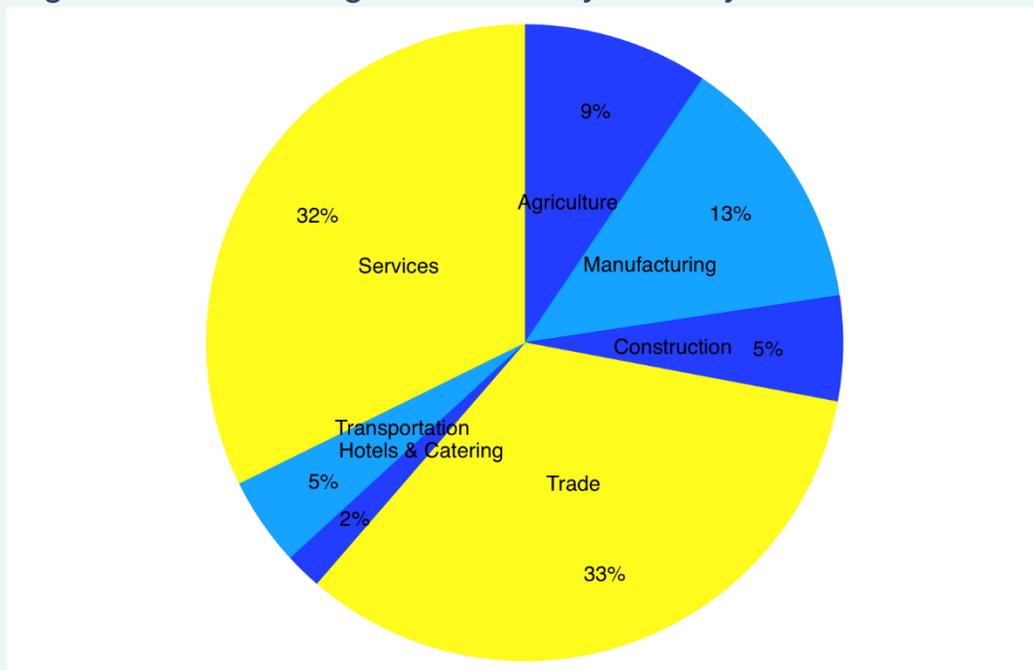
Source: IFC 2009 [Ukraine]

A more detailed picture of industries by e-filing practice is provided in Figure U4. According to the picture, e-filing registration rates in the service, transportation, trade and manufacturing industries are 26%, 22%, 23.5% and 22%, which are higher than other industries. In contrast, firms in the agriculture and construction industries are the least likely to sign up for e-filing.

Figure U4: Percentage of Firms Using E-filing by Industries

Soure: IFC 2009 [Ukraine]
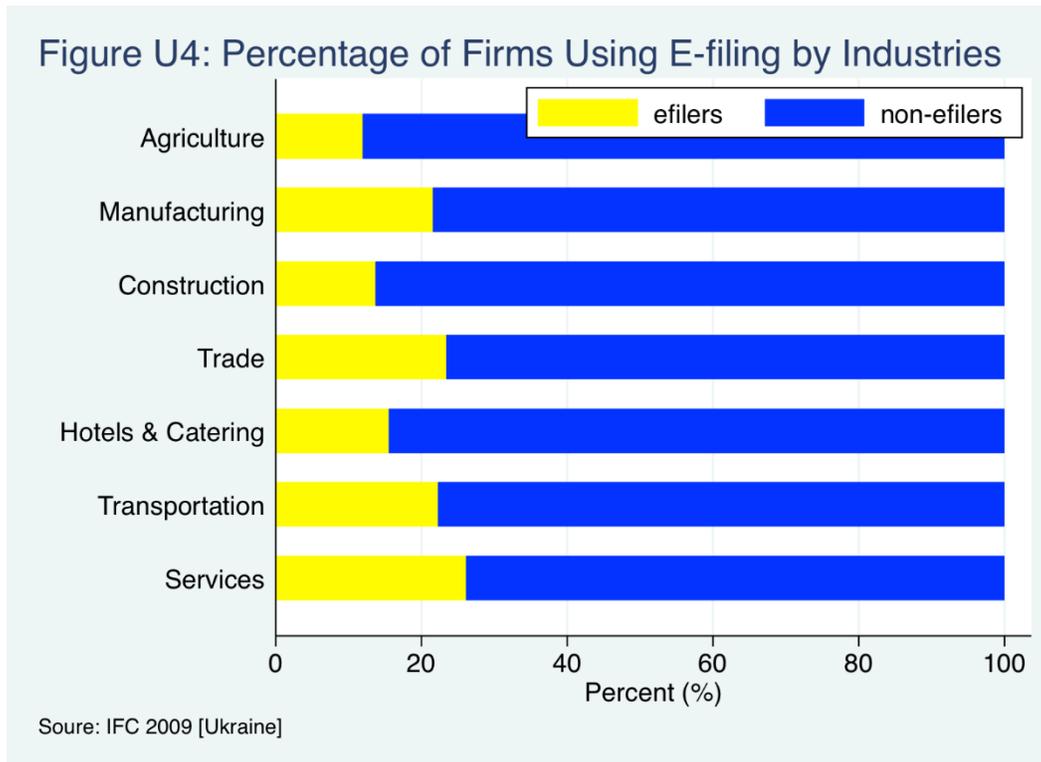
Among the major taxes, profit tax (PT) payers prefer e-filing relative to payers of other taxes (Table U1). It is important to note that unified tax (UT) payers do not use e-filing as often as others. This is a simplified tax regime for firms that meet certain criteria: only firms with turnover of "less than 5M UAH" and number of workers of "less than 50 workers" are eligible for the unified tax. Taxpayers in this category are smaller firms and thus, are less likely to use e-filing. Moreover, according to WBG (2009), firms on average spend less time for TC of the unified tax relative to the time spent individually for all other taxes.[19] The simplicity of the UT regime suggests that the gains from e-filing for UT payers may be lower than the cost. The report also claims that the average time spent on tax compliance is highest for VAT,

TABLE U1: Taxes by E-filing Usage

E-FILING	VAT		PT		PIT		UT		SFP		LT&D	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Non-Efilers	581	1063	866	779	422	1222	1039	606	170	1474	526	1119
	85%	76%	85%	73%	82%	78%	75%	86%	77%	79%	83%	77%
Efilers	103	335	147	290	92	345	337	100	52	385	107	331
	15%	24%	15%	27%	18%	22%	25%	14%	23%	21%	17%	23%
TOTAL	684	1398	1013	1069	515	1567	1376	706	222	1860	632	1450

*Source: IFC 2009 [Ukraine]

[19] See Table 6 in WBG(2009) for a more detailed discussion.

with PT coming in second. This reinforces the finding of the more frequent of e-filing by the payers of these taxes relative to others.

As the number of the "major" taxes[20] (listed in Table U1) paid by firms increases, the probability of signing up for e-filing also rises (Figure U5). The base point in the figure is "zero" – where firms don't pay any of the major taxes; these are mostly unified taxpayers. Again this is because, in principle the unified tax regime supposedly replaces the major taxes for qualified firms.[21]

Figure U5: Percentage of Firms Using E-filing by Number of Taxes Paid

Source: IFC 2009 [Ukraine]
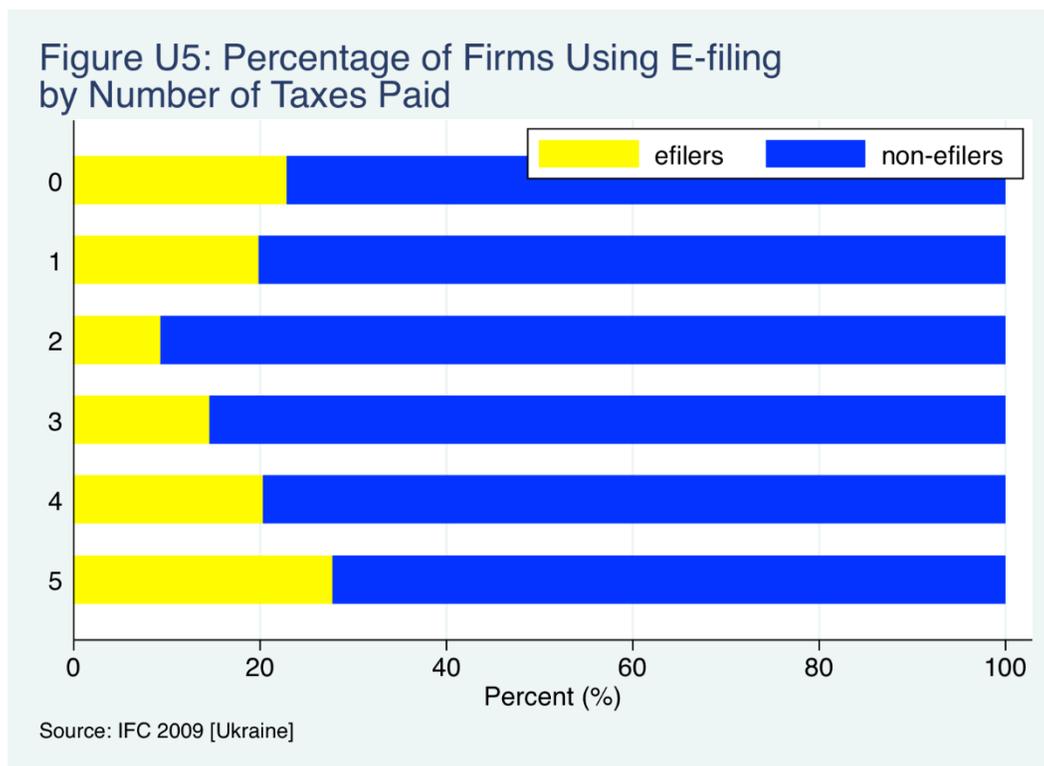
2.2 Do TCC Differ between E-filers and Non-E-filers?

As explained in the theoretical section above, e-filing can possibly have positive (benefits) and/or negative (costs) effects on TCC. These benefits and costs are likely to be fully observed by firms only if they are doing all TC work fully in-house. This is because professional accountants might not pass on the full reduction (or increase) in TCC due to e-filing in their prices (or service fees) charged to their

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[20] "Major" taxes are VAT, Enterprise Profit tax, PIT, Social Fund Payments, Local taxes and duties; therefore "zero" in the graph implies that the firm pays only the Unified Tax but none of the major taxes.

[21] In fact, 75 out of 85 firms are in the "zero" category pay only unified tax.

customers. They might face a stronger incentive to pass on any extra costs associated with electronic filing. We therefore focus primarily on firms that do all their TC work fully in-house.

In general, looking at the raw data only, we observe that e-filers on average pay higher TCC compared to non-e-filers. The difference appears to be big and economically important. However, as our descriptive analysis shows, e-filers are more likely to be large firms, operate in bigger cities and in relatively more complex (or capital intensive) industries and are thus subject to relatively more complex tax requirements, which all together might account for a substantial portion of the difference. It is therefore important to control for differences in size, location, taxes paid, productivity, management, policy implementation etc. to assess the effect of using e-filing.

In particular, the results of a straightforward mean comparison analysis (without conditioning on firm characteristics) would be misleading and potentially reflect self-selection in the decision to adopt e-filing. The fact that e-filing was not assigned randomly in the survey, but rather was a choice variable on the part of firms, complicates the research because of the self-selection problem. This suggests the need for more complex regression based approaches, which we do later in the paper. In what follows immediately, we undertake a simpler, more descriptive analysis in comparing the mean TCC of e-filers and non-e-filers.

2.2.1 South Africa

Computation of TCC faces a number of challenges and is in fact not the primary aim of this report. Nevertheless, there is a growing body of literature – especially by World Bank researchers – that is utilized in this report. In particular, Coolidge, Ilic and Kisunko (2009) provide a simple methodology for the computation of TCC for South Africa, which is closely followed here.[22]

Considering only the firms that perform all TC work in-house, e-filers on average face higher TCC than non-e-filers (R30,302 versus R20,036). A mean

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[22] For details, see the appendix.

comparison test indicates that the difference is statistically significant at all conventional levels. We can also split the definition of TCC in to sub-categories to focus on the most relevant tasks that can be directly affected by e-filing usage. According to the survey, general bookkeeping and tax compliance tasks are divided into four categories as follows:

1. Keeping all physical receipts in an organised manner (such as sales slips, invoices, receipts, and so on)
2. Physical book-keeping to record income and expenses in an organised manner
3. Recording income and expenses in an organised manner using a computer and specialised software
4. Filling out and submitting tax forms

Of these four categories, e-filing should mostly affect the fourth task and therefore, is expected to decrease tax compliance work related to this category, if it simplifies tax reporting at all. A simple mean comparison test of TCC for the fourth task between e-filers and non-e-filers shows that the difference is statistically different than zero and e-filers on average still pay higher TCC with respect to this task.[23]

We also compare time spent on TC activities by e-filers versus non-e-filers. In particular, the average total time spent on reporting VAT per cycle is computed to be about 2 hours less for e-filers than it is for non-e-filers. Yet, the difference is not statistically significant.

2.2.2 Nepal

Considering all firms, the weighted average of TCC (also including general bookkeeping) is estimated to be NRs 35,509 in Nepal for SME. The figure for e-filers only is about NRs 97,507 while it is NRs 25,725 for non-e-filers. The difference is statistically significant. Moreover, 74% of weighted average TCC comes from bookkeeping costs and the rest from the tax accounting costs that are more relevant for our analysis. In particular, tax accounting tasks in Nepal include calculating,

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[23] We also performed this test for the same group but now, firms with only one tax staff as well as another case where firms can have at most two tax staff. Mean difference becomes statistically insignificant.

filling and submitting tax reports, paying taxes, finding and analyzing relevant legislations etc.

A simple comparison of the weighted average of tax accounting cost for e-filers to non-e-filers shows that the difference is huge; e-filers pay NRs 32,995, that is, almost 6 times higher than the cost for non-e-filers, NRs 5,593, and the difference is statistically significant. Comparing the time spent for all tax accounting activities shows that e-filers on average spend 24 days more than non-e-filers.

Fortunately, the survey provides information on the breakdown of TCC across the three main taxes: CIT, VAT and withholding taxes. Among these, VAT (NRs 14,756) has the highest TCC, withholding taxes (NRs 7,176) come in second, followed by CIT (NRs 5,232). It is worth noting that e-filers on average pay twice as much TCC for VAT as non-e-filers and this is also statistically significant.

2.2.3 Ukraine

E-filers on average also pay higher TCC relative to non-e-filers in Ukraine. The difference in terms of total annual TCC is about UAH 7,456 and this number is statistically significant. Since TCC includes all different types of compliance costs – which may or may not be affected by e-filing usage– this difference cannot entirely be attributed to the e-filing usage.

Further decomposition of TCC is provided by the data and outlined in the survey report for Ukraine (WBG (2009)). Total tax accounting costs (TAC) is a sub-component of TCC, which includes preparation of primary documents, bookkeeping, finding and analyzing tax legislation, fulfillment of tax returns and payment process. It is simply the total labor cost of TC. Total TAC is significantly higher for e-filers compared to non-e-filers and similarly, total TCC for only filling out tax forms and submitting (paying) taxes is also very large for e-filers. The difference between e-filers and non-e-filers in terms of TCC with respect to only VAT is also positive and statistically significant, yet it is relatively small.

We can also compare the time spent for TCC activities across e-filers and non-e-filers. E-filers on average spend 518 working hours (or 65 working days) more in a year than non-e-filers for TAC activities. This difference incorporates only

35 hours for filling out and submitting tax forms and also is 155 hours for TCC activities to report VAT. All these results are statistically significant and economically important.

3. Regression Analysis

As discussed above, there are substantial problems with simple comparison of TCC across different types of firms (e-filers vs. non-e-filers) without controlling for other differences that we know are important determinants of TCC. This requires the use of regression analysis. As will be discussed later, there are several econometric issues that arise in this regard, which we address as data allows.

This section begins with a brief discussion of summary statistics of the data sets and relevant measurement issues. We then present regression models and underlying identification issues. Finally, we conclude with research findings.

3.1 Data

In this section, we provide the main details of the data sets considered in the regression analysis. In general, TCC has many components, which may or may not be affected by e-filing. To account for this, we consider sub-components of TCC that are presumably closely related to or can be influenced by e-filing. Particularly, tax accounting that includes filling out and submitting forms is the most important component of TCC that can be affected by e-file usage. Secondly, experience from different countries shows that VAT payers are more likely to use e-filing, which suggests that it might merit closer attention. This is also investigated separately whenever the data suffices.

The analysis focuses on the firms that do all their tax compliance work fully in-house. This is again crucial to capture the full benefits or losses created by e-filing policy in the country. For instance, firms that partially outsource may prefer to outsource activities that otherwise would be done in-house, including possible e-filing. In this case, even though outsourcing generates some cost savings in TCC,

these may or may not be reflected on the service fees charged by professional accountants depending upon the market conditions.[24]

Finally, we account for several firm characteristics such as size (turnover and employment), location (region or city), industry, main taxes paid as well as some perception variables when possible. All details about these variables and other data issues are provided in the summary statistics tables for each country.

The main data sets used in this analysis are surveys conducted by the World Bank from three countries: South Africa (USAID, (2008)), Nepal (IFC (2012a)), and Ukraine (IFC (2009)).

3.1.1 South Africa

We take three different approaches to identify the relevant TCC for e-filing analysis in South Africa. The TCC Survey allows us to identify not only the sub-components of TCC but also total time spent on each tax. After making use of all the detailed data, we are able to measure TCC as:

1- Total tax compliance cost of firms (in Rands) that do all TC tasks in-house,

2- Sub-group of TCC under the task: "filling and submitting tax forms",

3- Total time spent for TCC of VAT.

Estimating the salaries of tax staff is another issue in the TCC Surveys, especially when it comes to estimating owners' imputed wage rates. All salary estimates are taken from Coolidge, Ilic and Kisunko (2009). These estimates depend on firm turnover and associated average salaries (regardless of skill level) and do not consider other sources of variation that may prevail such as the province, sector, or occupation of the tax staff at the work place etc. This approach may result in an underestimate of TCC. To mitigate this issue, we estimate the model for three different groups of firms according to their TCC: firms with only one tax staff, firms with one or at most two tax staff and finally, firms with any number of tax staff. Lastly, the information provided in the survey on the total time (hours) spent on

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[24] If the market is fairly competitive, one may expect to see professional accountants reflecting all the cost savings in the service fees. Yet, this is not necessarily the case in especially developing countries with relatively thin markets.

each different tax per filing cycle is used to compute the (1) time spent on VAT per submission and (2) total time spent on VAT per year.[25] All other details, regarding to other controls are presented in summary statistics, Table R.SA1.

Table R.SA1: Summary Statistics

Variable	Obs	Mean	Std. Dev.
Turnover	872	9,148,226	46300000
Employment	872	33.37	89.57
Productivity	872	379425.5	690708.5
E-filing Experience	236	14.41	14.39
E-filing Experience^2	236	413.69	722.37
Province	872	3.26	2.56
Industry	872	5.63	3.53
Legal Form	872	3.10	1.11
CIT	872	0.91	0.28
PIT	872	0.21	0.41
VAT	872	0.91	0.28
PAYE	872	0.88	0.32
UIF	872	0.91	0.28
SDL	872	0.66	0.47
TCC all in Rands	844	21,336	35346.88
TCC (2) in Rands	758	15,034	14247.67
TCC (1) in Rands	542	11,810	11117.78
F&S TCC All in Rands	448	5,247	8053.46
F&S TCC (2) in Rands	386	3,707	4663.07
F&S TCC (1) in Rands	262	2,695	3949.92
Tot. Time for VAT	596	58.41	117.14
Time per Cycle	596	9.39	19.31

Province (1-9), Inductry (1-12) and Legal Form (1-5) are categorical variables.TCC variables only includes firms which do all TC in-house.

3.1.2 Nepal

As was the case in South Africa, we try to consider the most relevant part of TCC that may be affected by e-filing. However, due to differences in the surveys performed for the different countries, the same sub-divisions of TCC are not always available. We consider total TCC in terms of money and time as well as total TCC with respect to tax accounting[26] in money and time.[27] Moreover, as the VAT

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[25] For further details, see the appendix.

[26] Tax accounting activities are defined in the survey as calculating, filling out and submitting tax reports, paying taxes, finding and analysis if relevant legislation and so on. See TCC Survey Nepal (2011), page 8.

[27] We refer reader to the IFC (2011) report for the details on computing TCC.

threshold is an important criterion for a firm's e-filing decision, we further split the data into two groups – i.e. firms below and above the threshold.

On the other hand, it is important to note that the wage rate issue that was present in South African case is mostly dealt in Nepal's. In this case, we have reported accounting staff salaries and also who does the TC work (i.e. owner, manager or accounting staff). This feature avoids the potential measurement problems in this regard.

Moreover, the TCC survey for Nepal has a rich set of perception variables such as difficulties in access to finance, skilled workers, electricity access, computer usage in tax accounting, internet availability, corruption, political instability and whether a firm has a bank account or not. All of these variables may be factors for e-filing decisions and may thus be considered in the regression analysis. Table R.N1 presents the summary statistics of all variables used in the regression analysis.

Table R.N1: Summary Statistics

Variable	Obs	Mean	Std. Dev.
E-file	910	0.4296703	0.4953012
Turnover	910	208,000	1650000
Employment	909	33.19692	108.2876
Productivity	909	3846705	2.00E+07
VAT	910	0.5120879	0.5001287
TDS	910	0.4736264	0.4995785
VAT Threshold	910	0.6967033	0.4599351
Computer Usage in TC	910	0.4043956	0.4910446
Acces to Internet	910	0.8428571	0.3641355
Industry	910	2.056044	0.7447224
Region	910	4.378022	3.018455
Legal Form	910	1.83956	1.183205
Bank Acct	910	0.7626374	0.4257003
Acces to Finance	909	3.391639	1.200485
Corruption	823	3.232078	1.480068
Acces to Electricity	909	4.234323	1.100205
Availability of Skill Workers	907	2.888644	1.324649
Political Stability	908	4.547357	0.8166971
Acces to Road Infrastructure	910	2.505495	1.270583
TCC in Nrs. (money)	363	56,703	107374.9
TAC in Nrs. (money)	363	12,239	29673.66
TCC in days	363	115	140.9535
TAC in days	363	22	38.7493

Region (1-8), Inductry (1-3) and Legal Form (1-9) are categorical variables.TCC variables only includes firms which do all TC in-house. Turnover is in thousands (1000).

3.1.3 Ukraine

Following the same strategy in Ukraine, we start the analysis with the broad definition of TCC, which is total annual TCC. It is then decomposed into parts that are more relevant for this analysis. The most relevant part of TCC is tax accounting costs (TAC), which as explained above includes preparation of primary documents, bookkeeping, finding and analyzing tax legislation, fulfillment of tax returns and payment process. TAC is then further decomposed into the cost of filling out and submitting tax forms. Moreover, as VAT among other taxes constitutes the biggest portion of TCC, we also estimate the models with VAT TCC only. In order to make sure that our results are not driven by salary estimates, we replace all above tax definitions (which are defined in UAH) with time variables and re-estimate the models. All of these different tax definitions are listed in Table R.Uk1.

Table R.Uk1: Summary Statistics

Variable	Obs	Mean	Std. Dev.
E-filing	1790	0.20	0.40
Turnover	1790	2562.81	10868.73
Employment	1623	35.02	143.96
Productivity	1623	157.51	935.95
City	1790	0.99	1.28
Industry	1790	3.99	2.16
VAT	1790	0.66	0.47
PT	1790	0.50	0.50
PIT	1790	0.75	0.43
UT	1790	0.35	0.48
SFP	1790	0.90	0.30
LTD	1790	0.68	0.46
Quantity of Taxes	1790	0.42	0.49
Tax Accounting Procedures	1790	0.34	0.47
Periodicity of submitting	1790	0.35	0.48
TCC (UAH)	1314	16015.83	24476.64
TAC (UAH)	1790	16118.89	23333.07
TCC of F&S (UAH)	1790	2787.29	3791.17
TCC of VAT (UAH)	1327	9272.35	13609.34
TAC (Hrs)	1790	1391.57	1345.21
TCC of F&S (Hrs)	1790	252.57	263.38
TCC of VAT (Hrs)	1327	798.38	812.08

Values are computed with sampling weights. City (1-5) and industry (1-7) are categorical variables. Turnover is in thousands (1000). TCC is total tax compliance cost, TAC is total tax accounting costs, F&S is filling and submitting tax forms and VAT is value added tax. UAH is the national currency and Hrs is time in hours.

Since most firms do not outsource in Ukraine, we do not lose many observations by focusing only on firms that do all TC in-house. Outsourcers are only about 4 % and are dropped from the analysis. We also utilize the perception variables provided in the survey; these are responses to questions such as: "how problematic are the quantity of taxes, tax accounting procedures and periodicity of submitting tax forms for your firm?" All the variables considered in the analysis are reported in Table R.Uk1.

3.2 Estimation Methodology

This section focuses on two main tasks: providing further evidence to supplement the earlier descriptive analysis, and secondly, to estimate the effect of e-filing on TCC, while controlling for other important factors. For the former, we undertake several probabilistic models; in particular linear, probit and logit estimation methods. For the latter task, we provide several cross-sectional estimates.

In the descriptive analysis our purpose was to understand which firms e-file and which firms don't, and which factors affect TCC. In the descriptive analysis, we are able to control for only one or two main differences between strata at a time. Yet, in regression analyses we can simultaneously control for many of these factors in comparing e-filers versus non-e-filers. Furthermore, we employ a linear estimation of the probability of signing up for e-filing to show which firms are more likely to sign up for e-filing or simply what drives such behavior. For this, we estimate the following reduced form equation, Equation 1:

$$Efile_i = a_0 + a_1 L(turnover_i) + a_2 L(employment_i) + a_3(perception_i) + \sum_k \delta_k(location_i)$$
$$+ \sum_l \sigma_l(industry_i) + \sum_m \beta_m(legalForm_i) + \sum_n \theta_n(taxes_i) + e_i$$

In the equation, the dependent variable is e-filing dummy (1 for e-filing and 0 for otherwise) and the standard controls of the log of annual turnover and total employment as proxies for firm size (and productivity instead of turnover and employment[28]). All other firm characteristics that are controlled in the equation are the location, industry, legal form, types of taxes paid by firms and finally, firm perceptions of certain (country specific) problems regarding the tax system. To check the robustness of our results, probit and logistic models are also estimated for each country. In order to avoid limitations that may arise from certain distributional assumptions[29] for the models, we report only linear probability estimates along with a brief discussion of the results from other methodologies.

In the next step, we estimate the effect of e-filing on TCC. For this, a simple reduced form regression equation, mainly motivated by Coolidge, Ilic and Kisunko (2009), is employed to identify the impact of e-filing on TCC, Equation 2:

$$L(TCC_i) = a_0 + \gamma Efile_i + a_1 L(turnover_i) + a_2 L(employment_i) + a_3(perception_i)$$
$$+ \sum_k \delta_k(location_i) + \sum_l \sigma_l(industry_i) + \sum_m \beta_m(legalForm_i) + \sum_n \theta_n(taxes_i) + e_i$$

Although the definitions used for TCC are in general similar across countries, they do differ in some aspects, since they come from different surveys. Moreover, in addition to the list of regressors discussed in the former model, we control for e-filing experience and its square in the second model, whenever the information is available.

We employ sampling weights in all regressions and also run the models without the weights as a robustness check. Additionally, all the standard error estimates (when not using weights) are corrected for heteroskedasticity. Experience with tax compliance (number of years since registry) and its square term are employed as a robustness check in the model. The remainder of this section

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[28] A standard way of approximating productivity is sales/worker or sales per worker. See Lileeva and Trefler (2007) and Hulten, Dean and Harper (2001) for further discussion.

[29] Probit methodology requires normal distribution and Logit requires logistic distribution assumptions: for further discussion, see Wooldridge (2002, Chapter 13).

presents the results. We present and discuss the results for each country separately. It should also be noted that different countries have different taxation systems and sometimes such differences may create different incentives for e-filing usage. We account for these differences as the data allows us to do so.

3.2.1 South Africa

3.2.1.1 Probability Estimates for E-filing

Probability estimates for South Africa are displayed in Table R.SA2. All of the standard controls are employed except the perception variables since the response rate to these questions is quite low. Moreover, in the first two columns, firms that perform all TC in-house or partially outsource are included, since fully outsourcing firms are not relevant for this analysis. In the next two columns, we present the estimates with only firms doing all TC in-house and for partial outsourcers. In order to save space, only statistically significant results are reported.

Table R.SA2: Linear Probability Estimates, *Dependent variable: E-filing*

	All		In-house	Partial Out.
Turnover	0.023*		0.018	0.034*
	(0.013)		(0.019)	(0.019)
Employment	0.024		0.037	0.006
	(0.017)		(0.025)	(0.023)
Productivity		0.011		
		(0.013)		
Gauteng	0.141***	0.137**	0.027	0.178***
	(0.054)	(0.053)	(0.098)	(0.065)
Western Cape	0.109*	0.103*	-0.026	0.176**
	(0.058)	(0.057)	(0.097)	(0.076)
North West	0.168**	0.172**	0.115	0.154
	(0.083)	(0.082)	(0.133)	(0.104)
Mpumalanga	0.055	0.057	-0.265**	0.327***
	(0.076)	(0.077)	(0.110)	(0.108)
North Cape	0.139*	0.143*	0.050	0.160
	(0.079)	(0.081)	(0.128)	(0.097)
Service (Finance & Business)	0.238***	0.213***	0.224***	0.174*
	(0.059)	(0.060)	(0.085)	(0.096)
Personal Services	-0.007	-0.032	-0.236**	0.152
	(0.100)	(0.099)	(0.101)	(0.155)
Hotels and Restaurants	0.074	0.050	0.423**	-0.194**
	(0.103)	(0.101)	(0.165)	(0.078)
Catering	0.466**	0.492**		0.435*
	(0.236)	(0.242)		(0.256)
VAT	0.169***	0.190***	0.229***	0.087
	(0.048)	(0.048)	(0.076)	(0.068)
Constant	-0.491**	-0.302	-0.331	-0.698**
	(0.204)	(0.192)	(0.297)	(0.279)
Observations	872	872	419	453
R-squared	0.107	0.096	0.171	0.110

Sampling weights are used in all regressions. "All" includes all firms either partially outsource or do all the TC in-house. "In-house" includes firms which do all TC in house and "partial out" covers partially outsourcing firms. Turnover, total employment and productivity (turnover/employment) are in logs. Also, out of all industry, legal form, province and major tax dummies, only the statistically significant ones are reported. *** p<0.01, ** p<0.05, * p<0.1

Turnover is in general positively associated with e-filing decisions, although its effect disappears in the case of firms that do all TC in-house. Firms that are located in North West, Gauteng and Western Cape provinces are more likely to file their returns electronically relative to the firms located in Kwazulu Natal. This is in line with our earlier descriptive analysis. Service firms, regardless of their outsourcing strategy, are always more likely to use e-filing (17% to 24%) relative to firms in the agricultural sector. Among the major taxes, VAT payers face the biggest incentive to file electronically and so they are more likely to e-file. Contrasting with our early findings, we did not find any significant effect of legal forms on firm's e-filing decisions.

These results are generally robust to the choice of probabilistic model and are also in line with our earlier findings. This is important for the identification of the e-filing coefficient in the next section.

3.2.1.2 Estimating the Effect of E-filing on TCC

As briefly mentioned above, TCC_i is measured in three different ways. The first is the total TCC in Rands; the second is the sub-component of TCC (4th task: filling and submitting forms) in Rands and finally, the last two are total and average time spent on reporting VAT per annum and filing cycle. Firm e-filing experience is measured in hours.

The estimates are presented in tables R.SA3 and R.SA4. Table R.SA3 displays estimates with total TCC and TCC of only filling out and submitting forms in money (Rands) and Table R.SA4 does the same for TCC of VAT in time (hours). Moreover, in Table R.SA3, the first columns for both TCC definitions present the estimates for firms with only one tax staff (or the owner); the second columns do the same but now for firms with at most two tax staff and finally, in the last columns, all the firms which do all TC work in-house are considered (regardless of the number of tax staff). On the other hand, in Table R.SA4, OLS estimates using the total number of hours per annum are reported in the first two columns. The last two columns show the estimates of the effect of e-filing experience – instead of the dummy – on TCC of VAT in hours per cycle.[30] However, the former model (where the dependent variable was total annual TCC of VAT) was also estimated with e-filers' experience as well, and the latter model was estimated with e-filing dummy instead of experience though the results are not reported because most of the variables of interest were not statistically significant.

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[30] We have also tried regressions of total hours spent on VAT per annum on e-filing experience and hours per cycle on e-filing experience. Yet none of these estimates for the interest of variables were statistically significant and were thus excluded from the tables.

Table R.SA3: OLS Estimates, *Dependent variables: TCC in Rands*

	TCC			TCC of only Filling & Submiting		
	Only 1	At most 2	All	Only 1	At most 2	All
E-file	-0.224*	-0.0694	0.0759	-0.106	0.0515	0.114
	(0.122)	(0.105)	(0.104)	(0.146)	(0.122)	(0.116)
Turnover	0.164***	0.124***	0.131***	0.138***	0.130***	0.138***
	(0.0386)	(0.0371)	(0.0378)	(0.0485)	(0.0440)	(0.0430)
Employment	0.0336	0.0416	0.118**	0.0957	0.0488	0.116**
	(0.0534)	(0.0462)	(0.0485)	(0.0682)	(0.0568)	(0.0551)
CIT	-0.214	-0.0372	-0.0930	-0.329	-0.0886	-0.209
	(0.221)	(0.211)	(0.228)	(0.270)	(0.251)	(0.252)
PIT	-0.236	-0.00516	-0.246	-0.380	0.00433	-0.0932
	(0.315)	(0.392)	(0.406)	(0.464)	(0.482)	(0.433)
VAT	0.0180	-0.0507	-0.0212	-0.171	-0.250	-0.251
	(0.236)	(0.234)	(0.229)	(0.255)	(0.245)	(0.242)
PAYE	0.388*	0.473**	0.499**	0.707**	0.747**	0.857***
	(0.203)	(0.216)	(0.215)	(0.319)	(0.302)	(0.299)
UIF	0.260	0.182	0.0852	-0.555*	-0.471	-0.544*
	(0.237)	(0.245)	(0.248)	(0.321)	(0.302)	(0.291)
SDL	-0.298**	-0.189	-0.149	0.0512	0.165	0.132
	(0.143)	(0.129)	(0.129)	(0.195)	(0.186)	(0.177)
Industry	YES	YES	YES	YES	YES	YES
Province	YES	YES	YES	YES	YES	YES
Legal Form	YES	YES	YES	YES	YES	YES
Constant	6.226***	6.504***	6.682***	5.349***	5.088***	5.229***
	(0.583)	(0.641)	(0.655)	(0.786)	(0.772)	(0.700)
Observations	248	361	419	262	386	448
R-squared	0.281	0.222	0.280	0.236	0.192	0.247

Samping weights are used in all regressions. Regional, industry and legal form dummies are controlled but not reported. "Only 1" includes firms with only one tax staff, "At most" includes firms with at most two tax staff and finally, "all" includes all firms, doing all TC in-house. Dependent variables, turnover and employment are in logs.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table R.SA4: OLS Estimates, _Dependent variable: TCC of only VAT in hours_

	Total Hours		Hours per Cycle	
E-file	-0.218*	-0.184		
	(0.128)	(0.129)		
E-file Experience			-0.039**	-0.041**
			(0.019)	(0.020)
E-file Experience^2			0.001*	0.001*
			(0.000)	(0.000)
Turnover	-0.013		-0.043	
	(0.043)		(0.072)	
Employment	0.175***		0.145	
	(0.060)		(0.109)	
Productivity		-0.043		-0.065
		(0.042)		(0.074)
Industry	YES	YES	YES	YES
Province	YES	YES	YES	YES
Legal Form	YES	YES	YES	YES
Constant	2.496***	3.265***	0.906	1.485
	(0.668)	(0.610)	(1.071)	(1.042)
Observations	596	596	236	236
R-squared	0.092	0.077	0.155	0.150

Sampling weights are used in all regressions. Regional, industry and legal form dummies are controlled in all regressions but not reported. Dependent variables, turnover, employment and productivity (turnover/employment) are in logs. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Our first set of estimates (in Table R.SA3) shows that the e-filing may reduce TCC but in general, estimates are statistically insignificant. Only in the first case (e.g. only one tax staff), is the coefficient estimate for e-filing the expected sign and is marginally statistically significant. It suggests that e-filing gives rise to about a 22% decrease in TCC for firms that use only one tax staff and perform all TC tasks in-house. These cost savings appear to decline as firms employ more tax staff. This suggests that the cost savings generated by e-filing may be very small or even may disappear as the amount of TC work increases. Alternatively, the salary estimates we take from Coolidge, Ilic and Kisunko (2009) might be under- or overestimated and thus, mitigate or exacerbate TCC as the number of tax staff increase.

Another way to think about e-filing is as a tool which can improve tax staff's productivity. This is evident in Table R.SA4, where using e-filing is associated with about a 22% decrease in total time spent for TC of VAT. Yet, the evidence is quite weak and not robust to controlling for productivity. In addition to this, having more practical experience with e-filing pays back according to our second set of results, as

each month of extra experience[31] in using the system is associated with an average of 4% decrease in the TCC of VAT per cycle. However, the square of experience is also significant and positive; this suggests that the decrease due to experience occurs at a decreasing rate and diminishes over time, as expected.

Other coefficient estimates are generally as expected and in line with the estimates of Coolidge, Ilic and Kisunko (2009). It is important to note that PAYE is an important driver of TCC in South Africa. One would expect to see a similar result for VAT, yet our estimate of this coefficient is not significantly different than zero. These results are robust to controlling for all type of industry, province and legal form. It is important to note that experience with tax compliance (not necessarily e-filing) is never statistically significant and thus dropped from the main regression equation. This may suggest that it is the experience with e-filing, not with tax compliance relevant type of experience associated with a reduction in TCC.

3.2.2 Nepal

3.2.2.1 Probability Estimates for E-filing

Coefficient estimates from Equation 1 with Nepali data are presented in Table R.N2. Besides the variables present in the main model, we also control for several other perception variables: difficulties in access to finance, road infrastructure, skilled worker and electricity, computer usage in tax accounting, internet availability, corruption, political instability and whether a firm has bank account or not. This is to see if these variables are indeed important in e-filing decisions.

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[31] This is computed from responses to the questions: "How long ago (in months) did you started e-filing" for each four major taxes (income tax, VAT, PAYE and UIF/SDF). We simply took the average of e-filing experience in months with all these four major taxes

Table R.N2: Linear Probability Estimates, *Dependent variable: E-filing*

	All	All & Th=0	All & Th=1	Inhouse	Partial Outsourcers
Turnover	0.0155	0.0209	0.0165	0.0273*	0.00936
	(0.0125)	(0.0169)	(0.0189)	(0.0156)	(0.0218)
Employment	0.0478*	0.0502	0.0246	0.00186	0.0736*
	(0.0256)	(0.0368)	(0.0263)	(0.0249)	(0.0402)
Hetauda	-0.212***	-0.167**	-0.365***	-0.133	-0.464***
	(0.0634)	(0.0823)	(0.0838)	(0.0814)	(0.0921)
Mahendranagar	0.264***	0.294***	0.238***	0.242**	0.304***
	(0.0896)	(0.109)	(0.0646)	(0.119)	(0.100)
Public LTD	0.186*		0.296***	0.114	0.217*
	(0.109)		(0.0981)	(0.225)	(0.120)
VAT	0.301***	0.299***	0.324***	0.271***	0.335***
	(0.0673)	(0.0964)	(0.0550)	(0.102)	(0.0886)
VAT threshold	0.0409			-0.0169	0.103
	(0.0660)			(0.0687)	(0.0973)
Computer Usage in TC	0.180**	0.110	0.170***	0.280	0.0427
	(0.0787)	(0.145)	(0.0593)	(0.174)	(0.0700)
Bank Account	0.00163	-0.000996	0.157**	0.00837	0.135*
	(0.0271)	(0.0296)	(0.0680)	(0.0304)	(0.0703)
Corruption	-0.0130	-0.0175	-0.00436	-0.0275**	0.0297*
	(0.0106)	(0.0128)	(0.0146)	(0.0127)	(0.0172)
Political Instability	0.0266	0.0254	0.0383	0.0416*	-0.0433
	(0.0182)	(0.0208)	(0.0280)	(0.0233)	(0.0347)
Access to Electricity	-0.0288*	-0.0241	-0.0248	-0.0187	-0.0517*
	(0.0170)	(0.0204)	(0.0221)	(0.0203)	(0.0284)
Constant	-0.112	-0.203	-0.327	-0.424*	0.274
	(0.211)	(0.266)	(0.326)	(0.243)	(0.350)
Observations	818	240	578	324	494
R-squared	0.493	0.390	0.426	0.427	0.552

Sampling weights are used in all regresions. Mianly statisticaly significant variables (in at least one of the models) are reported, and thereof others; TDS, industry dummies, all city dummies except the ones reported, all legal forms except the ones reported, access to internet, access to skill workers, access to road infrastructure and finance, are excluded. "All" includes only partial outsurcers and in-house and when "Th" is "0", only firms below VAT treshold are included; otherwise, when "Th" is "1", firms above VAT threshold. Turnover and employment are in logs. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

The first three columns present the results with all firms that are either partial outsourcers or doing all TC work in-house. Firms in the second and third columns are grouped as above and below the VAT threshold, to see if there are major differences between the groups. The last two columns display the results separately for firms that do all TC in-house or partially outsource.

For the most part, the estimates are in line with the descriptive analysis. In particular, firm size (turnover and employment) is positively associated with e-filing. Yet, the estimates are only marginally significant which is somewhat

unexpected. This could be due to the fact that most of the firms in the database (and generally in the country) are small (sole proprietorships). Firms located in Mahendranagan are more likely to e-file, and firms located in all other cities are less likely to sign up for e-filing relative to Kathmandu. Public LTD companies are more likely to use e-filing than sole proprietorships. In terms of taxes, firms that pay VAT – perhaps because TCC for VAT is the highest among types of taxes – are 27% to 35% more likely to prefer reporting their taxes electronically. Computer usage for TC purpose increases the probability of using e-filing and finally, there is also weak evidence suggesting that using a bank account (as a proxy for formality) is positively associated with e-filing, while difficulties in accessing to electricity are negatively associated with e-filing.

Another interesting set of results from the estimates is that as firms (or at least those that do all TC in-house) perceive severe corruption, they become less likely to sign up for e-filing. In fact, one might expect that e-filing usage could reduce corruption (by avoiding the informal interaction between state's tax staff and tax payers or computerizing the tax system) and thus, firms perceiving severe corruption should be more likely to use e-filing. Although it is only marginally significant, there is some weak evidence of this from the firms above the threshold. Additionally, as the perception of political stability increases, the probability of using e-filing rises. All other perception variables are generally not statistically significant in most regressions and are therefore excluded from the table.

In contrast to our earlier descriptive analysis, our results show that legal form and industry are not among the main determinants of e-filing decisions. For the former, it may be due to the skewness in the distribution of firms toward sole proprietorship and for the latter, the definition of industries is too broad (only three). We also check the robustness of our results with respect to other estimation methodologies such as Probit and Logit. The results remain statistically significant and their signs don't change. We also consider other regressors such as log of productivity (i.e. turnover/employment) instead of turnover. Our results are similar, which reinforces the findings of the descriptive analysis as well as providing some insights for the identification of the e-filing coefficient in the next section.

3.2.2.2 Estimating the Effect of E-filing on TCC

Following the reduced form equation (Equation 2) explained above, we estimate the effect of e-filing on TCC in Nepal. Aside from the main variables, we also control for computer usage in tax accounting, internet availability and whether the firm has a bank account or not. As discussed in the previous section, perception variables are weakly associated with e-filing decisions and thus are dropped. Nevertheless, controlling for these variables does not change our results and they are mostly statistically insignificant. To save space, only statistically significant results are reported in Table R.N3.

The first set of estimates under "All" includes only the firms that do all TC in-house, while the second set groups them according to whether they are above or below the VAT threshold. As was done in the previous section, we provide estimates for TCC and the narrower TAC (tax accounting cost) in money (Nrs) and in time (working days). Firstly, e-filing appears to be a statistically significant determinant of only tax accounting cost (TAC), not total TCC. TCC includes all types of cost associated with tax compliance; cost of audits, penalties, book keeping, travel and all other possible maintenance costs etc., while TAC mainly includes the labor side of tax compliance. In this respect, firms that are experiencing an increase in their TAC as a result of e-filing may also be saving from other parts of TCC (e.g. travel cost to the local revenue agency office) that may reduce the positive effect of e-filing. This may explain why while TAC increases with e-filing but not total TCC. Moreover, this effect is more prominent for firms below the VAT threshold, as shown in the last two columns. Estimating exactly the same models for firms above the threshold shows that this effect disappears. Thus, very small (or micro) firms suffer from an increase in their TCC due to e-filing the most. These results are robust to controlling for productivity (defined as turnover/employment).

The estimates are economically important; in general all firms suffer an increase of 33% in TAC from use of e-filing and this number reaches to 35% for firms below the threshold. TAC on average is 34% of total TCC. A revision of our estimates with the consideration of this fact results in an increase in total TCC of

between 11% and 13%. This effect disappears at higher levels of turnover, which may be due to productivity increase (as productivity is negatively associated with TCC). It is important to mention that a cross tabulation of the position of most knowledgeable person[32] with turnover bands shows that there is a very big jump in the position of the most knowledgeable person from owner to accountant staff (e.g. chief accountant and accountant) right after the VAT threshold. This suggests that the productivity increase in TC as firms grow in size may be large enough to outweigh the negative effect of e-filing on TCC.

Moreover, only 15% of the firms (doing all TC in-house) make turnover higher than 10 million Nrs. In other words, for the most part it is small firms that do all TC in-house; this needs to be accounted for. To address the issue, we re-estimated the main models with a dummy for firms below and above the 10 million Nrs threshold. Our results do not change under these considerations.

In terms of our controls, VAT – as suggested by the descriptive statistics analysis – increases TCC. All other estimates for the controls are generally in line with our earlier estimates and Coolidge, Ilic and Kisunko (2009) and thus, are not repeated here. As before, experience with tax compliance (not necessarily e-filing) does not appear to be statistically significant and thus was dropped from the main regression equation. These results show that micro firms in Nepal – perhaps due to the cumbersome implementation of the e-filing policy – experienced a significant increase in TCC in conjunction with the introduction of e-filing. The good news appears to be that this effect diminishes as firms grow. Additionally, in the long-run potential benefits from learning by doing may be observed by firms, while the cost of implementing e-filing (e.g. license, computer and its usage, etc.) might be decreasing.

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[32] It is the first question in the survey: Who is the most knowledge person in the company about tax compliance?

Table R.N3: OLS Estimates, *Dependent variable: TCC*

	All Firms				Below VAT Threshold	
	Money		Days		Money	Days
	TCC	TAC	TCC	TAC	TAC	TAC
E-file	0.193	0.332**	0.195	0.334**	0.347**	0.347**
	(0.204)	(0.153)	(0.199)	(0.149)	(0.169)	(0.165)
Turnover	0.129*	-0.0171	0.117*	-0.0304	-0.0316	-0.0372
	(0.0698)	(0.0803)	(0.0688)	(0.0795)	(0.0865)	(0.0856)
Employment	0.218**	0.311***	0.209**	0.300***	0.313***	0.304***
	(0.0879)	(0.104)	(0.0869)	(0.104)	(0.116)	(0.115)
VAT	0.464***	1.256***	0.454***	1.250***	1.319***	1.310***
	(0.166)	(0.183)	(0.160)	(0.180)	(0.216)	(0.213)
TDS	0.320	0.612***	0.284	0.578***	0.635***	0.602***
	(0.203)	(0.155)	(0.194)	(0.147)	(0.168)	(0.159)
VAT Threshold	0.409**	0.700***	-0.0577	0.230		
	(0.168)	(0.178)	(0.167)	(0.177)		
Industry	YES	YES	YES	YES	YES	YES
Region	YES	YES	YES	YES	YES	YES
Legal Form	YES	YES	YES	YES	YES	YES
Acces to Internet	YES	YES	YES	YES	YES	YES
Comp. Usage in Tax Acc.	YES	YES	YES	YES	YES	YES
Bank Account	YES	YES	YES	YES	YES	YES
Constant	7.278***	7.209***	1.788**	1.733*	7.366***	1.787
	(0.897)	(1.036)	(0.884)	(1.024)	(1.119)	(1.108)
Observations	362	362	362	362	234	234
R-squared	0.339	0.490	0.289	0.460	0.432	0.430

Sampling weigths are used in all regressions. TCC is total tax compliance cost, TAC is total tax accounting costs. All continous variables (including dependend variable) are in logs. In "All" columns, firms firms that do all TC in-house are employed. In "below Threshold" columns, only the firms that are below VAT threshold are included. Industry, city, legal form, computer usage, acess to internet and bank account dummies are also controlled but excluded from the table. *** p<0.01, ** p<0.05, * p<0.1

3.2.3 Ukraine

3.2.3.1 Probability Estimates for E-filing

In this section, we discuss the estimates from Equation 1 for the Ukraine that are presented in Table Uk.2. We are able to control for firm size (turnover and employment), location of firms (four main regions of the country: Donetskaya, Kievskaya, Odesskaya and Kharkovskaya), industry, taxes paid and some perception variables (e.g. how problematic are the number of taxes, tax accounting procedure and periodicity of submitting forms for your firm?). However, we cannot control for firms' legal form since it is not available in the survey. Nevertheless, as mentioned

previously, in the Ukraine case the database includes mostly firms in legal forms other than sole proprietorships, which apparently find hiring fulltime accountants more cost-effective for them in tax compliance than using outside help. In this regard, firms that outsource all or some of TC constitute only 4% of the sample, which are excluded from the data.

Table R.Uk2: Linear Probability Estimates, *Dependent variable: E-filing*

		All	UT=0	UT=1	VAT=0	VAT=1
	Turnover	-0.004	-0.012	0.012*	0.002	-0.006
		(0.008)	(0.012)	(0.007)	(0.012)	(0.011)
	Tot. Employment	0.058***	0.068***	0.035	0.036	0.057***
		(0.014)	(0.016)	(0.027)	(0.030)	(0.016)
R	Donetskaya	0.077*	0.175***	-0.023	-0.094***	0.187***
E		(0.039)	(0.060)	(0.040)	(0.036)	(0.060)
G	Kievskaya	0.091**	0.026	0.165**	0.163*	0.068
I		(0.046)	(0.057)	(0.072)	(0.088)	(0.054)
O	Odesskaya	0.152**	0.217**	0.082	0.145*	0.106
N		(0.063)	(0.085)	(0.082)	(0.083)	(0.096)
	Kharkoskaya	0.199***	0.262***	0.054	-0.005	0.274***
		(0.058)	(0.073)	(0.058)	(0.053)	(0.073)
	Manufacturing	0.061	0.070	0.054	-0.007	0.098**
		(0.048)	(0.056)	(0.077)	(0.096)	(0.048)
	Construction	0.010	0.065	-0.025	0.001	0.049
I		(0.045)	(0.054)	(0.066)	(0.082)	(0.047)
N	Trade	0.116**	0.190***	0.067	0.096	0.166***
D		(0.047)	(0.054)	(0.072)	(0.087)	(0.047)
U	Hotels and Catering	0.131***	0.198***	0.034	0.045	0.202***
S		(0.045)	(0.065)	(0.064)	(0.078)	(0.059)
T	Transportation	0.082*	0.123**	0.060	0.069	0.100**
R		(0.046)	(0.057)	(0.071)	(0.089)	(0.050)
Y	Services	0.167***	0.286***	0.032	0.051	0.254***
		(0.049)	(0.066)	(0.065)	(0.080)	(0.060)
	VAT	0.051	0.062	0.011		
		(0.041)	(0.056)	(0.057)		
	PT	0.021	0.003		-0.066	0.013
		(0.049)	(0.052)		(0.117)	(0.050)
	PIT	0.050	0.090*	0.048	-0.029	0.109**
		(0.034)	(0.050)	(0.046)	(0.037)	(0.050)
	UT	-0.083			-0.096	-0.094
T		(0.056)			(0.100)	(0.061)
A	SFP	-0.131**	-0.061	-0.161**	-0.079	-0.163
X		(0.065)	(0.107)	(0.068)	(0.062)	(0.129)
E	LTD	-0.045	-0.159***	0.031	0.008	-0.115**
S		(0.036)	(0.061)	(0.038)	(0.038)	(0.057)
	Quantity of Taxes	0.033	0.022	0.068	0.124**	0.007
		(0.032)	(0.038)	(0.052)	(0.056)	(0.037)
	Constant	-0.005	-0.026	-0.048	0.076	0.069
		(0.081)	(0.125)	(0.084)	(0.105)	(0.134)
	Observations	1,623	1,043	580	538	1,085
	R-squared	0.128	0.142	0.171	0.169	0.141

Sampling weights are used in all regressions. "All" includes all firms which do not outsorce any of the tax related tasks. "UT=0" refers to firms that are not signed up for unified tax and otherwise, "UT=1". "VAT=1" VAT payers and otherwise, "VAT=0" not payers. Turnover, total employment and productivity are in logs. Also, statistically insignificant perception variables are excluded fro the table: tax accounting procedure and periodicity of submitting forms. *** p<0.01, ** p<0.05, * p<0.1

In the first column, all firms are included regardless of their VAT or UT status. The second and third columns compare the results for UT payers (UT=1) versus non-payers (UT=0). Finally, in the last two columns, we report the same for VAT payers and non-payers. These splits are important. Firstly because firms are provided the option of choosing unified tax (UT) – if eligible – and secondly, the compliance cost of VAT is the highest among all other major taxes.[33]

Firm size is positively associated with the probability of e-filing. In particular, firms with relatively more workers are more likely to sign up for e-filing in all regressions, except for UT payers and firms not paying VAT. Turnover appears to play a relatively less significant role in this; exclusion of sole proprietorships might have reduced the variation in turnover between firms. As pointed out in the descriptive analysis, firms located in Odesskaya and Kharkovskaya are more likely to sign up for e-filing relative to others (e.g. others include the regions which are not controlled in the regressions). In all regressions, the effects of sectoral differences on TCC are estimated relative to agriculture industry. Among other industries, the service industry (i.e. mainly business and finance services) has the higher probability of e-filing relative to agriculture industry.

Among the taxes, social funds payments (SFP) and local taxes and duties (LTD) payers are less likely to use e-filing relative other taxes. In contrast to our prior expectations, neither VAT nor UT appear to affect the probability of e-filing usage. And finally, none of the perception variables appear to be important for firms' e-filing decisions except the quantity of taxes, which is perceived as a serious problem only for non-VAT payers. More importantly, many of the significant effects disappear in the case of UT and VAT payers. E-filing decisions on the part of UT payers appear almost random.

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[33] The unified tax (UT) is a turnover tax that simplifies tax compliance (and its associated cost) for eligible small and medium entities. UT payers generally do not (are not required) to register for many taxes including VAT, enterprise and personal income taxes and fee, although UT payers are allowed to register for VAT (in which case they pay a lower UT rate)

3.2.3.2 Estimating the Effect of E-filing on TCC

Table Uk.3 provides estimates from Equation 2 for Ukrainian firms. The first two columns report the results for the effect of the controls on total tax compliance cost in UAH. In the next four columns, annual "tax accounting cost (TAC)" is employed as it is the most relevant component of TCC to e-filing. In the last two columns we employ TCC for only filling out and submitting tax forms and TCC for only VAT with a sample of only VAT payers. Although we tried all dependent variable definitions with different model specifications (as in TAC), we report the statistically significant and economically relevant results only.

Table R.Uk3: OLS Estimates, *Dependent variables in UAH*

	Total TCC		Tax Accounting Cost				Filling & Paying Cost	TCC for VAT
	All	**All**	**All**	**UT=1**	**UT=0**	**VAT=1**	**All**	**VAT=1**
E-filing	0.116	0.247***	0.201**	0.249	0.180**	0.204**	0.168*	0.253***
	(0.086)	(0.091)	(0.079)	(0.181)	(0.090)	(0.088)	(0.086)	(0.090)
Turnover	0.032*		0.048***	0.067***	0.047**	0.050***	0.016	0.064***
	(0.017)		(0.015)	(0.026)	(0.019)	(0.017)	(0.018)	(0.018)
Employment	0.299***		0.263***	0.280***	0.258***	0.256***	0.251***	0.248***
	(0.027)		(0.025)	(0.061)	(0.028)	(0.028)	(0.030)	(0.031)
Productivity		-0.009						
		(0.016)						
VAT	0.542***	0.586***	0.340***	0.609***	0.060		-0.144	
	(0.101)	(0.110)	(0.089)	(0.130)	(0.130)		(0.097)	
PT	-0.016	-0.147	-0.093		-0.107	-0.010	0.016	-0.008
	(0.137)	(0.158)	(0.109)		(0.110)	(0.117)	(0.158)	(0.124)
PIT	-0.074	-0.057	-0.156*	-0.297**	0.012	0.140	-0.315***	0.257**
	(0.091)	(0.096)	(0.081)	(0.127)	(0.104)	(0.098)	(0.095)	(0.116)
UT	-0.245*	-0.599***	-0.406***			-0.131	-0.230	0.108
	(0.147)	(0.168)	(0.124)			(0.147)	(0.159)	(0.178)
SFP	-0.336**	-0.413***	-0.115	-0.099	0.029	-0.200	-0.246	-0.105
	(0.150)	(0.156)	(0.146)	(0.191)	(0.219)	(0.222)	(0.162)	(0.262)
LTD	0.232***	0.291***	0.317***	0.320***	0.166	0.186**	0.238**	0.261**
	(0.075)		(0.075)	(0.120)	(0.102)	(0.094)	(0.092)	(0.113)
Region	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
Perception	YES	YES	YES	YES	YES	YES	YES	YES
Constant	7.702***	8.834***	7.824***	7.492***	7.866***	8.014***	6.708***	4.318***
	(0.207)	(0.193)	(0.207)	(0.343)	(0.240)	(0.256)	(0.227)	(0.313)
Observations	1,195	1,195	1,623	580	1,043	1,085	1,623	1,080
R-squared	0.532	0.411	0.416	0.332	0.307	0.321	0.209	0.286

Sampling weights are used in all regressions. "All" includes all firms, which do not outsorce any of the tax related tasks. "UT=1" refers to unified tax payers and otherwise, "UT=0". "VAT=1" refers VAT payers and otherwise, "VAT=0". Turnover, total employment and productivity (tot.Turnover/tot.Employment) are in logs. Regional and industry dummies are controlled but not reported and also, perception variables are excluded: Quantity of taxes paid, tax accounting procedure and periodicity of submitting forms. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

E-filing is statistically significant and economically important in most of the regressions, except in the non-VAT payers and UT payers cases (i.e., mostly the smallest firms). The estimates show that about a 18% to 20% increase in annual TAC or a 25% increase are associated with e-filing. Put differently, after controlling for firm characteristics and their perception of the taxation system, e-filers pay more in tax compliance than non-e-filers. And this effect appears to be large for relatively small firms (for UT payers and non-VAT payers). The individual effect of e-filing on the cost of filling out and submitting forms is estimated to be slightly lower, at 17%. We also split the sample into the same groups as reported in the TAC columns and re-estimated the models. Our results show no statistically significant estimates for e-filing. This suggests that there is no statistical difference between UT payers and non-payers nor between VAT payers and non-payers in terms of the effect of e-filing on TCC of filling and submitting forms. Finally, TCC of VAT is higher for e-filers, as estimated to be around 25%. As shown in the first three columns, VAT payers incur higher TAC than payers of other taxes, while UT payers enjoy a major reduction in TAC. This reduction is more severe for UT payers that do not pay VAT. In contrast, UT payers lose these benefits if they cross the threshold during the fiscal year and thus, have to pay VAT.

In Table R.Uk4, we present equivalent estimates but now in hours. The results are very similar to the earlier ones. Compared to our earlier estimates none of the coefficients change sign and in fact, statistical significance has improved. Magnitudes of the estimates declined slightly. A 15% to 22% increase in time spent for TAC is associated with using electronic filing. The effect of e-filing on TCC of filling and submitting forms reduces to 12% but it is not significant anymore and finally, TCC of VAT in terms of working hours increases for about 22% if firms file tax returns electronically.

Table R.Uk4: OLS Estimates, *dependent variable in time (hours)*

	Tax Accounting Cost				Filling & Paying Cost	TCC for VAT
	All	**UT=1**	**UT=0**	**VAT=1**	**All**	**VAT=1**
E-filing	**0.152****	**0.222**	**0.154****	**0.170****	0.119	0.220***
	(0.065)	**(0.157)**	**(0.071)**	**(0.069)**	(0.077)	(0.081)
Turnover	0.031*	0.041	0.035	0.025	0.000	0.039**
	(0.017)	(0.026)	(0.022)	(0.019)	(0.020)	(0.019)
Tot. Employment	0.225***	0.244***	0.217***	0.223***	0.214***	0.217***
	(0.024)	(0.050)	(0.028)	(0.026)	(0.031)	(0.029)
VAT	0.312***	0.558***	0.050		-0.171*	
	(0.079)	(0.116)	(0.114)		(0.094)	
PT	-0.195**		-0.183*	-0.090	-0.086	-0.087
	(0.093)		(0.098)	(0.104)	(0.144)	(0.117)
PIT	-0.196***	-0.299***	-0.102	-0.056	-0.355***	0.065
	(0.065)	(0.094)	(0.091)	(0.086)	(0.083)	(0.108)
UT	-0.465***			-0.209	-0.289**	0.025
	(0.100)			(0.129)	(0.142)	(0.163)
SFP	0.165	0.223	0.040	0.003	0.035	0.098
	(0.127)	(0.164)	(0.174)	(0.164)	(0.142)	(0.226)
LTD	0.266***	0.268***	0.213**	0.208**	0.187**	0.287***
	(0.065)	(0.100)	(0.087)	(0.084)	(0.085)	(0.103)
Region	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES
Perception	YES	YES	YES	YES	YES	YES
Constant	5.872***	5.510***	6.121***	6.200***	4.756***	4.980***
	(0.191)	(0.301)	(0.203)	(0.203)	(0.216)	(0.267)
Observations	1,623	580	1,043	1,085	1,623	1,080
R-squared	0.409	0.281	0.256	0.262	0.183	0.211

Robust standard errors in parentheses. Sample weights are used in all regressions. "All" includes all firms, which do not outsorce any of the tax related tasks. "UT=1" refers to unified tax payers and otherwise, "UT=0". "VAT=1" refers to VAT payers and otherwise, "VAT=0". Turnover and total employment are in logs. Regional and industry dummies are controlled but not reported and also, perception variables are excluded: Quantity of taxes paid, tax accounting procedure and periodicity of submitting forms. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

4. Summary of Research Findings

Our regression analysis provides many insights firstly on determinants of firms' e-filing decisions and secondly, how TCC is associated with e-filing. Regarding the former, our regression analysis mainly supports results of the descriptive analysis and for the latter, the answer is not simple. They demonstrate that firms that are relatively larger in size, operating in more capital or technology oriented

industries, located in developed cities, paying more taxes (especially VAT) are more likely to file their taxes electronically. Some perception variables are also found to be important for e-filing decisions. Firms reporting high levels of corruption and severe political instability are generally more likely to e-file, while firms experiencing difficulties in access to electricity are less likely to e-file.

Understanding e-filing behavior is important for the identification of our estimates in the second part since the possibility of self-selection bias regarding e-filing decisions is quite likely. For instance, when one compares e-filers with non-e-filers in terms of only mean TCC, e-filers face significantly higher amounts. Part of this is simply because of the fact that e-filers are usually large firms, paying more taxes, are located in more develop cities etc., and therefore face higher total TCC regardless of their e-filing status. In order to address this issue, we provide a detailed descriptive analysis as well as a regression analysis to understand the determinants of e-filing decisions. Furthermore, in the second set of estimates (addressing the association between e-filing and TCC), we control for all these main determinants across firms, which are important for e-filing decisions and for TCC, to minimize self-selection problem. There is still the possibility of omitted variables bias in that firms with better management are more likely to be large in size and face more complexity in tax compliance and also to choose e-filing than firms with lower quality management.

Our answer regarding the effect of e-filing on TCC is "it depends". First of all, it is clear from our results that policy implementation plays a major role in the effectiveness of e-filing in reducing TCC. Among the three countries considered in this analysis, only South Africa managed the policy effectively and only our results from this country provide evidence that e-filing may be associated with a statistically significant decrease in TCC. In contrast, e-filers in the other two countries suffer from an increase in total TCC, due to double reporting (e.g. paper filing and e-filing) or complicated filing process.

On the other hand, our results suggest that total TCC may not be significantly affected (decreased or increased) by e-filing or at least the evidence for a direct effect is weak. Our findings show that certain sub-components of TCC may be

affected by e-filing the most; for instance, tax accounting costs, filling out and submitting returns and also TC for VAT. This is important for the implementation of the policy: A policy to establish an effective e-filing system should avoid a requirement for firms to file paper returns or associated documentation, and should take the opportunity to mitigate any other source of complexity; otherwise it may lead to an increase in TCC for SMEs.

It also important to note that reduction in total TCC may not even occur in the short-run. The empirical evidence suggests there is a "learning by doing" process, and therefore the more firms have a chance to experience the system, the bigger the reduction in TCC they will enjoy. Secondly, the upfront investment (capital investment, learning or educating tax staff for the system) is sunk in the long-run and thus may be assumed to be irrelevant for e-filing decisions after they have been incurred.

Additionally, in a broad sense, e-filing also has a potential for costs savings on the public sector side of the tax system, reducing tax administration costs. In particular, computerization of all tax records may reduce errors and decrease the effort of tax authorities in sorting and analyzing the tax files, and administrating the system, besides the potential reduction in corruption and the informal interactions between tax payers and tax officials. Our results do support the claim that firms who report facing corrupt tax officials are more likely to sign-up for e-filing. One may interpret this result as firms that prefer to avoid corrupt officials can achieve this by electronic filing. In brief, e-filing can potentially help countries in other important ways (than directly helping firms reduce TCC) and some of these benefits can only be realized in the medium to long-run.

Moreover, data limitations certainly limit our ability to go deeper in the analysis. Firstly, taxpayers perhaps need up to 3-4 years to learn and effectively use the e-filing system (as was the case in South Africa's experience). However, some of the surveys were performed in the first or second year of the policy and this may underestimate the benefits from e-filing, while focusing excessively on its cost. Nevertheless, this also helped us to observe possible short-run consequences of the policy (e.g. Nepal and Ukraine) versus long-run (e.g. South Africa). Yet, due to

variation in the policy implementation, we cannot disentangle timing effects from the effect of policy implementation. Secondly, improvements in measuring TCC may also improve our research capabilities. One way to think about this is to split the cost into fixed and variable costs and focus on each group separately. The importance of dynamic analysis was mentioned above but needs further elaboration. We could take only a static approach in this analysis due to limitations of the data; however longitudinal data has a great potential to enhance our understanding of phenomena analyzed here. Mainly, this will allow us to control for all time invariant firm characteristics, which is quite important to deal with potential endogeneity problems. In the current version, we tried to control for all direct and indirect firm characteristics and their perception of tax systems and government services, which we hope will mitigate the endogeneity problem.

Another shortcoming of our analysis is the sample size. Due to various reasons explained above, the focus of the analysis was on the firms that do all TC in-house and this approach resulted in a loss of a fair part of the data. If the effect of e-filing on TCC is indeed relatively small and one estimates the effect with less information, then large standard errors (loss of precision of our estimates) are inevitable. Under such a scenario, estimates simply would become statistically unreliable although they may not necessarily be wrong estimates of the corresponding real population parameters.

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6. Appendixes

6.1 South Africa

<u>Computation of TCC</u>

1- Aggregate TCC in Dollars

We computed TCC per worker by exactly following Coolidge, Ilic and Kisunko (2009). Then, we create three groups of firms according to the total number of tax staff (q17a): firms with only one tax staff, with one or two and finally, firms with any number of tax staff. Then, we multiply TCC per worker with the total number of tax staff for these three groups and use these three different TCC proxies separately as dependent variables in our regressions.

2- Aggregate TCC in Dollars (Under 4th task)

Question q17c (in the survey) lists share of effort devoted to the four different tasks (listed above). We use this information to compute the component of TCC (computed in the previous section) spent for the relevant tasks.[34] As before, three different groups of firms – depending on their total number of tax staff – are created and used separately as dependent variables in our regressions.

3- Time Spent for VAT Compliance

The survey data provides total time spent in hours for major taxes including VAT (q19_3nu) for each cycle. This number is computed from Q19 by considering 8 hours work a day, 5 working days a week and 20 working days a month. Utilizing this information and Q18_3, we calculate (1) the total time (in hours) spent on VAT related tax compliance over a fiscal year. Secondly, using Q19_3, (2) one can also recover time (hour) spent for each submission (or cycle).

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[34] 17c_4 is specifically the percentage of time (of q17b) spent on filling out and submitting tax forms.