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Reducing Tax Evasion from Cross-Border Fraud: The role of Digitalization

By Emmanouil Kitsios, Joao Jalles, Geneviève Verdier

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Abstract

Using data on intra-EU and world trade transactions, this paper presents evidence that (i) cross-border trade fraud is non-trivial and prevalent in many countries; (ii) such fraud can be alleviated by the use of digital technologies at the border; and (iii) potential revenue gains of digitalization from reducing trade fraud could be substantial.

JEL Classification Numbers: H3, H26, O3, C23

Keywords: panel data, fiscal policy, carousel fraud, e-government, technology, taxation

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I. INTRODUCTION

Examples of tax evasion at the border are not hard to come by. In late 2018, a Singapore citizen was found guilty of evading Chinese tariff payments of $75 million on 1.3 million tons of oil products imported to China.[2] A World Bank report estimates that well-connected firms in Tunisia evaded $1.2 billion in tariffs between 2002 and 2009 by undervaluing imports (Rijkers, Baghdadi and Raballand, 2015). Such tariff evasion could significantly erode revenue mobilization efforts, particularly in low-income countries. Even in more advanced economies, such evasion is costly. Cross-border trade fraud to evade custom duties, VAT, and excises has important public revenue implications both for developed and developing economies. For example, Missing Trader Intra Community (MTIC) fraud (also known as carousel fraud) exploits the zero-rating of export and deferral of tax on intra-European Union (EU) imports that allows trading across Member State borders to be VAT free (Keen and Smith, 2007). This type of fraud has been estimated to incur between EUR 45 billion to 60 billion tax losses to the EU annually.[3]

How can governments reduce the prevalence of cross-border fraud? In this paper, we argue that the use of digital technologies offers an opportunity to reduce fraud and increase revenue. Digitalization—the integration in everyday life of digital technologies that facilitate the availability and processing of more reliable, timely, and accurate information—presents an important opportunity for fiscal policy since both expenditure and tax policies depend crucially on information about economic actors. However, relevant and reliable information is not always available or easy to use, constraining the design, implementation, and evaluation of tax and spending policies. Digitalization can improve tax compliance by enhancing operational efficiency and the quality of information in trade transactions. Digital information facilitates the collection of authentic, accurate and complete information about traded goods, enhancing the ability of border agents to collect the appropriate level of trade taxes.

This paper presents evidence that (i) cross-border trade fraud is non-trivial—about 5 percent of GDP in low-income countries; (ii) such tax evasion can be alleviated by the use of

[2] https://www.straitstimes.com/asia/east-asia/singaporean-oil-trader-gets-12-years-in-chinese-prison-over-tariff-evasion

[3] See https://www.europol.europa.eu/crime-areas-and-trends/crime-areas/economic-crime/mtic-missing-trader-intra-community-fraud.

digital technologies; and (iii) potential revenue gains could be substantial. As in others in the literature (e.g. Kellenberg and Levinson, 2019), we exploit variations in bilateral trade transactions, using data on 28 intra-EU and 86 cross-country trade transactions over the period 2003–16. Tax evasion is measured using discrepancies in trade statistics between origin and destination countries. However, we first focus on intra-EU trade reporting gaps to stress that trade misreporting may occur even within customs unions, where misreporting incentives lie on incentives to evade VAT and excises rather than customs duties. The literature has paid less attention to the implications of trade fraud on VAT revenue even though the latter accounts for a large portion of the estimated VAT gaps in the EU (for an exception see Gradeva, 2014).[4] Also, previous studies typically relied on disaggregated industry-by-industry measures of trade misreporting.[5] Similar to Kellenberg and Levinson (2019), we examine trade misreporting at the country level to focus on policy-relevant measures other than tariffs that do not differ by sector of activity.

The remaining of the paper is organized as follows. Section II documents how digitalization has changed the conduct of government policy and more specifically how digital tools can improve the collection of information on traded goods at the border. Section III describes the empirical methodology and Section IV presents the results. Section V concludes.

II. GOVERNMENT DIGITALIZATION AND TAX COMPLIANCE

Digital technologies have spread rapidly in much of the world. The number of Internet users worldwide has more than tripled in a decade—reaching 3.2 billion at the end of 2015—and is expected to rise further (IMF, 2018). More households in developing countries now have access to mobile technology, than have access to schools, electricity, or clean water (World Bank, 2016). This digital transformation has meant that individuals, firms, and governments are now more connected, making information more available and accessible than ever before. Vast improvements have occurred in the collection, processing, tracking, and dissemination of

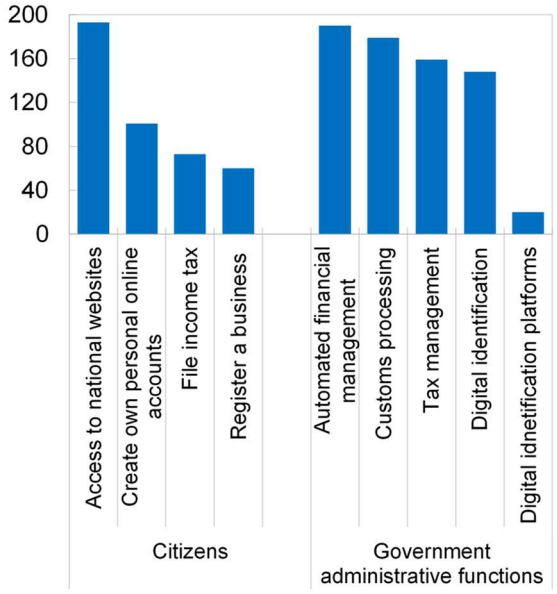
[4] The share of the MTIC fraud in the VAT gap has been estimated to average 24 percent, with the remainder of the VAT gap attributed to losses of revenue arising from other factors such as domestic fraud and evasion (see p.20 in European Commission, 2017).

[5] Contributions in this area include Fisman and Wei (2004), Javorcik and Narciso (2008), Mishra, Subramanian, and Topalova (2008) and Jean and Mitaritonna (2010).

(continued…)

information over the last two decades.[6] Governments are increasingly turning digital.7 Almost all country governments now have national websites and automated financial management systems (Figure 1). Digitalization allows tax authorities to offer electronic tax filing, pre-populate tax returns, and verify customs and business activity. These could improve tax compliance and enforcement by reconciling payment differences, monitoring real-time revenue collection, performing audits, and using big data to assess taxpayer risks. At the same time, digitalization can help link information across systems, for example, information from electronic transactions can be linked to value-added taxes (VAT).8 Governments in advanced economies have performed better on average in digital adoption, but many small developing countries have taken the lead regionally, including Estonia in Europe, Chile in Latin America, Singapore in Asia, and Rwanda and South Africa in sub-Saharan Africa (Figure 2).

Figure 1. Number of Countries with selected digital services



Source: UN, World Development Report 2016, World Bank.

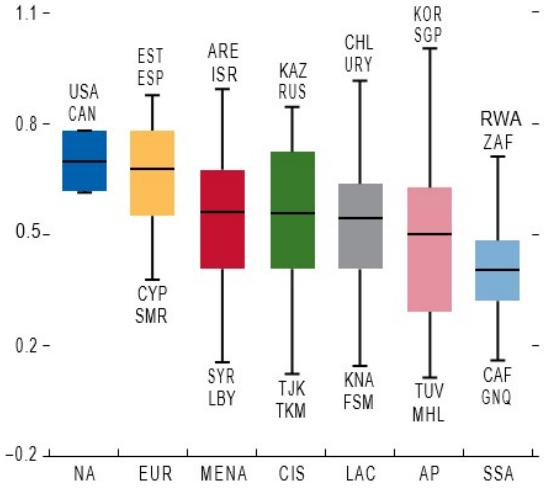
[6] At the turn of the century, only one-quarter of data were stored in digital form, and in less than a decade, the ratio rose to over 95 percent in 2010 and has continued to rise (Ross, 2016).

[7] Some countries have made substantial efforts to digitalize their tax administration. In South Africa, the use of electronic tax submissions, customs declarations, and payments has risen from below 20 percent to close to 100 percent over the past decade, following efforts to modernize and auto- mate administrative processes in tax administration. In Estonia, tax administrators have used big data to identify high-risk and anomalous behavior of taxpayers to improve compliance.

[8] Electronic filing and payments have on average reduced the time for taxpayers and tax authorities by 25 percent in the five years after the digital system was introduced (World Bank, 2016).

Figure 2. Digital adoption index for governments across regions

(latest available year)



Source: World Bank, 2016

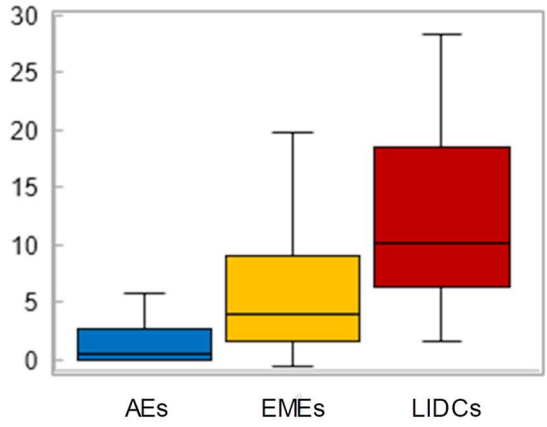
Note: data labels in the figure use International Organization for Standardization country codes. The World Bank´s Digital Adoption Index measures the global spread of digital technologies for 171 countries. It provides a global picture of technology diffusion across businesses, people and governments across countries. The government cluster is the average of three indices: core administrative systems, online public services and digital identification. The countries listed are the top and bottom-ranking countries in each region.

Digitalization can improve tax compliance by enhancing operational efficiency and the quality of information in trade transactions—particularly within custom unions where border control is lacking. Information is crucial for collecting taxes and duties at the border, in particular information about the product classification, volume and value of goods traded. This information is typically provided by importers and exporters who have an incentive to misreport transactions to evade duties or taxes. To verify information provided by importers and exporters, custom officers need access to third-party information. Direct access to accurate third-party information is facilitated by digitalization. Digital information is more resilient against manipulation than paper documents, facilitating the submission of *authentic* documents. Blockchain technology could also help secure the authenticity of submitted information, as all transactions are recorded, including the initial submission and all

subsequent modifications.[9] Digitalization can also help secure the *accuracy* of reporting at the border. The analysis of historical custom transactions data can enable tax administration to discriminate more effectively between high and low-risk declarations and to mobilize its resources to prevent evasion more efficiently. However, while digitalization can significantly reduce problems related to authenticity and accuracy, obstacles remain when it comes to *completeness* of information, particularly when the trade payment includes credit where the financial flows linked to the transaction do not sum up to the value of the goods. Nevertheless, the use of digitalization tools could help countries revenue mobilization efforts as trade taxes still represent a non-trivial share of revenues, particularly in developing economies where they constitute close to 10 percent of total revenues on average (Figure 2).

Figure 2. Taxes on International Trade, 2015

(Percent of total revenue)



Note: AEs = advanced economies; EMEs = emerging market economies; LIDCs = low-income developing countries.

III. Methodology and Data

We estimate the following trade gravity model, which builds on the work of Kellenberg and Levinson (2019):

[9] The use of blockchain in customs administration remains limited so far. Dubai Customs is exploring the use of blockchain for the import and re-export process of goods (Krishna et al., 2017).

$$\frac{V^{m}_{xmt}-V^{x}_{xmt}}{(V^{m}_{xmt}+V^{x}_{xmt})/2} = \beta_1 Z^{m}_{xmt} + \beta_2 Z^{x}_{xmt} + a_t + a_{xm} + \varepsilon_{xmt} \quad (1)$$

where V^{m}_{xmt} is the annual total trade shipped from exporting country x to importing country m as reported by the importer; V^{x}_{xmt} is the same value as reported by the exporter. The dependent variable is defined as the difference between these two values and proxies trade misreporting. This difference is subsequently normalized by the average reported trade flow to form the so-called "trade gap".[10] In general, the trade gap between two countries tends to increase with the distance between the two trading partners, since in practical terms, the value reported by exporters is free-on-board (FOB) while the value reported by importers includes cost, insurance and freight (CIF). Thus, the set of independent variables considered includes a matrix of bilateral proxies for CIF costs Z^{σ}_{xm} (e.g. distance, common borders and languages as in typical gravity-type models), as well as dummies to capture year specific (a_t) and country-pair specific fixed-effects (a_{xm}).

To assess which underlying factors—including the potential role played by digitalization—determine the size of the trade gap, a gravity model approach is employed. Recognizing that the trade gap could be driven by both importer and exporter characteristics, matrices of observable country characteristics (Z^{m}_{xmt} and Z^{x}_{xmt} for importers and exporters, respectively) such as VAT rates and weighted average tariff rates, are included that may be related to incentives to misreport trade flows. In addition, typical trade gravity models include variables such as GDP and GDP per capita to proxy for the size and development level respectively, of each partner, while inflation and exchange rates are also included here as they may affect the value of the transacted goods while in transit. Controlling for whether a country participates in regional trade agreements, or whether it is a GATT or WTO member, is useful in proxying for unobserved customs collaboration. Finally, country-pair specific time-invariant characteristics—such as distance between two countries—are absorbed by the country-pair fixed effects a_{xm}.

The main regressor of interest is digitalization as proxied by the UN's Online Service Index. This variable assesses the scope and quality of public sector online services, including

[10] The trade gap as defined can have a maximum value of 2 and a minimum value of –2. The estimation below is robust to the exclusion of such extreme values.

online services for tax submission and registration of businesses. The index is normalized between 0 and 1 and it is available since 2003. It is significantly correlated to other digitalization indices available and has broader sample coverage across countries and over time compared to WB's Digital Adoption Index and WEF's Government Success in ICT Promotion[11] (Table 1).

Table 1. Pairwise Correlations of Digitalization Indices

		Online Service Index	E-Government Index	Digital Adoption Index	Government Success in ICT Promotion
Online Service Index	Correlation	1			
	Observations	1488			
E-Government Index	Correlation	0.89***	1		
	Observations	1488	1488		
Digital Adoption Index	Correlation	0.85***	0.75***	1	
	Observations	186	1486	186	
Government Success in ICT Promotion	Correlation	0.46***	0.44***	0.49***	1
	Observations	282	282	144	566

Note: *** denote statistical significance at the 1 percent level. ICT denotes information and communication technology.

Bilateral trade data are obtained from IMF's Direction of Trade Statistics (DOTS) which reports the values of imports and exports in US dollars. The macro-variables were obtained from the World Economic Outlook, the World Development Indicators and IMF's Tax Database. CEPII's Gravity Dataset was used for trade agreement participation and distance. Governance indicators on the control of corruption, the implementation of the rule of law, and effective governance, were retrieved from the World Governance Indicators database. Controlling for such indices prevents confounding the estimate on digitalization with the effect of broader governance factors. Table A1 in the Appendix includes information on the variables and data sources used.

IV. Empirical Results

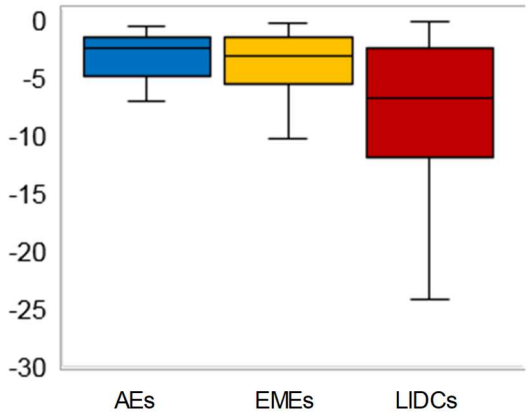
Trade fraud leading to tax evasion can be proxied using discrepancies in trade statistics at the origin and destination countries. Existing studies in this area typically follow the approach

[11] The index has been combined with human capital and telecommunication technology indicators to form alternative composite digitalization indices, such as the United Nation's e-government index and the World Bank's Digital Adoption Index.

suggested by Fisman and Wei (2004), identifying evasion based on a correlation between tax or tariff rates and reporting discrepancies between importers and exporters (see also Javorcik and Narciso 2008; Mishra, Subramanian, and Topalova 2008; Ferrantino, Liu, and Wang 2012; Kellenberg and Levinson 2019). In practice, the value reported by importers includes CIF and—in principle—should exceed the value reported by exporters that is FOB. This trade gap—the difference between these two reported values—provides a crude indication of trade fraud, when unexplained by other factors such as valuation changes. The median trade gap ratio across countries are significantly different from zero, ranging between -2.4 percent of GDP for advanced economies (AEs) and -6.6 percent of GDP for low-income developing countries (LIDCs) (Figure 3).

Figure 3. Trade Gap Ratios, 2016

(difference between importer and exporter reported values in percent of GDP)



Source: IMF, Direction of Trade Statistics, IMF-WEO, authors calculations

To the extent that digitalization reduces trade misreporting, it may help improve revenue collection. Table 1 shows the results of estimating the gravity equation (1). The first four columns refer to the sample of 28 European Union countries over the period 2003–2016. A distinct advantage of using the EU sub-sample is to stress that trade misreporting may occur even within custom unions, where misreporting incentives lie on incentives to evade VAT and

excises rather than custom duties.[12] Column 1 estimate the gravity equation (1) via OLS and point estimates suggest a strong positive association between improved digitalization indices and the trade reporting gap, suggesting a lower incidence of trade fraud when governments increase digitalization.[13] More specifically, destination countries with more digitalized governments tend to have a larger reported value of imports relative to the exports the countries of origin are reporting.[14] This relationship remains significant after controlling for other key determinants, including tariffs and tax rates, the level of development and governance.[15]

Columns 2 and 3 use two-stage least squares (TSLS) to address potential problems related to omitted variable bias and reverse causality. Such concerns could arise if, e.g., a higher incidence of import misreporting mobilized public authorities of the importing country to foster digitalization efforts so as to reduce tax evasion. This could bias downward the estimated effect of digitalization, given that the policy decision to improve digitalization is negatively correlated with the trade gap and positively correlated with the digitalization index. We instrument the digitalization index using (i) a measure of country's level of research and development (R&D) intensity (R&D expenditure in percent of GDP) and (ii) a measure of R&D efficiency—the ratio of patents to R&D intensity. The exclusion restriction relies on the assumption that the trade gap itself is not correlated with differences in the instruments once macro-variables are explicitly controlled for. Table 1 reports the first-stage Kleibergen-Paap F-statistics, which exceed the Stock and Yogo (2005) critical values for weak instrument diagnostics. The coefficient estimate for importer's digitalization is higher in magnitude (and equally statistically significant) than the OLS estimate. The negative coefficient on the importer's VAT rate is in line with the assumption that the incentive to underreport imports rises with the VAT rate.

Columns 4 to 6 broaden the sample to include all trading partners available in the DOTS database. The resulting estimates confirm the previous EU subsample conclusion that

[12] Missing trader fraud is not specific to the EU. However, the European Commission has recognized this problem to be an important one and has incorporated estimates of VAT fraud in its VAT gap analysis.
[13] The standard errors reported are robust to allow for different variance across country pairs. Results are robust to clustering standard errors at the country pair level to account for bilateral trade correlation across time.
[14] The underreporting of imports can occur both when the gap is positive and when the gap is negative. The main channel at work is that improved digitalization of the importing country is positively correlated with the recording of imports, and therefore with the revenue resulting from imported goods.
[15] Results are robust to the inclusion of alternative governance quality indicators, such as the rule of law or government effectiveness indices provided by the World Governance Indicators database.

importer's digitalization index is positively associated with the reporting of imports. The estimation includes an index to control for corruption that is found significant in the broader sample.

Table 1. Trade Gap Regressions Using Intra-EU and All Partners Trade Data

Specification	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Regressors/estimator/sample	**OLS (EU)**	**TSLS-1 (EU)**	**TSLS-2 (EU)**	**OLS (ALL)**	**TSLS-1 (All)**	**TSLS-2 (All)**
Im.Digitalization Index	0.186*	1.284**	0.841*	−0.069*	1.181**	1.733*
	(0.107)	(0.505)	(0.436)	(0.036)	(0.575)	(0.937)
Ex.Digitalization Index	0.383***	0.703	0.304	0.066*	0.054	−0.982
	(0.13)	(0.53)	(0.44)	(0.038)	(0.701)	(0.927)
log Im.GDP	0.385	1.570*	1.227*	−0.370***	−0.831***	−0.861***
	(0.61)	(0.827)	(0.721)	(0.114)	(0.191)	(0.221)
log Ex.GDP	−1.385**	−1.03	−1.599**	0.947***	1.475***	1.436***
	(0.647)	(0.829)	(0.788)	(0.107)	(0.194)	(0.225)
log Im.GDP pc	−0.597	−1.817**	−1.427**	0.334***	0.671***	0.643***
	(0.499)	(0.753)	(0.659)	(0.12)	(0.194)	(0.241)
log Ex.GDP pc	0.889*	0.537	1.094	−0.824***	−1.380***	−1.243***
	(0.534)	(0.756)	(0.712)	(0.111)	(0.203)	(0.25)
log Im.inflation rate	0.624	0.299	0.316	0.189*	−0.770**	−1.108**
	(0.562)	(0.629)	(0.565)	(0.112)	(0.313)	(0.56)
log Ex.inflation rate	1.177**	1.060*	1.242**	−0.157	−0.104	0.502
	(0.539)	(0.603)	(0.556)	(0.098)	(0.343)	(0.525)
log Im.exchange rate	−0.076	−0.04	−0.002	0.077**	0.184*	0.339*
	(0.113)	(0.142)	(0.121)	(0.035)	(0.094)	(0.177)
log Ex.exchange rate	0.201	0.215	0.113	−0.004	−0.052	−0.251
	(0.152)	(0.163)	(0.146)	(0.033)	(0.103)	(0.168)
Importer VAT rate	−0.004	−0.029**	−0.02	0.005	0.003	0.004
	(0.008)	(0.014)	(0.013)	(0.004)	(0.007)	(0.009)
Exporter VAT rate	−0.015	−0.022	−0.012	−0.011***	−0.001	−0.012
	(0.009)	(0.016)	(0.014)	(0.004)	(0.008)	(0.009)
Importer tariff rate				−0.005**	0.003	0.005
				(0.002)	(0.004)	(0.006)
Exporter tariff rate				−0.011***	−0.013***	−0.010*
				(0.002)	(0.004)	(0.005)
Importer corruption control				−0.063**	−0.103*	−0.141*
				(0.03)	(0.056)	(0.075)
Exporter corruption control				0.121***	0.155***	0.166**
				(0.029)	(0.059)	(0.071)
Im.Rule of Law				0.070*	0.162**	0.224**
				(0.036)	(0.077)	(0.114)
Ex.Rule of Law				−0.107***	−0.127	−0.249**
				(0.033)	(0.081)	(0.104)
Im.GATT/WTO Member				−0.158***	−0.419**	−0.548**
				(0.04)	(0.163)	(0.248)
Ex.GATT/WTO Member				−0.019	0.066	0.269
				(0.036)	(0.178)	(0.232)
Number of observations	716	716	670	36,626	13,318	10,944

R^2	0.060			0.013		
F-stat (first stage)		13.05	26.45		16.34	17.24

Note: Robust standard errors in parentheses, *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Controls include country FE, and year FE. 'Im.' refers to importer and 'Ex.' refers to exporter. TSLS-1 and TSLS-2 use as IVs R&D in percent of GDP and the logarithm of patents over R&D intensity, respectively.

A back-of-the-envelope calculation of the potential revenue gains from reducing trade fraud exploits specification (1) holding other factors constant and using column 6's estimated coefficient on the digitalization index. Denote $V^{m}_{Total} = \sum_{x}(V^{m}_{xm})$ and $V^{x}_{Total} = \sum_{x}(V^{x}_{xm})$. Assuming that the importer's digitalization advancements increase reported imports V^{m}_{Total} without affecting V^{x}_{Total}, one can proxy the potential revenue gain from the corresponding increase in reported imports relative to exports as follows:

$$\text{Revenue Gain}_{\tau} = \tau_{rate} \cdot \Delta(V^{m}_{Total}\text{-}V^{x}_{Total}) \quad (2)$$

where τ_{rate} refers to the tax rate of interest (i.e., VAT or tariff rate).

Equation (2) can be written in terms of the change in the digitalization index of the importer, Δz^{m}, and its estimated impact β^{m}_{digit}:

$$\text{Revenue Gain}_{\tau}=\tau_{rate} \cdot \frac{1}{2}(V^{m}_{Total}+V^{x}_{Total})\, \beta^{m}_{digit} \cdot \Delta z^{m} \quad (3)$$

Rearranging equation (2) to obtain equation (3) assumes that, except for the digitalization index, the remaining set of determinants and imports in the denominator of the trade gap are held constant. Holding constant imports in the denominator effectively biases our estimate downward, allowing for a conservative estimate of the gains from reaching the digitalization frontier.

Reducing the distance to the digitalization frontier for each importer by 50 percent implies increasing z^{m} by $\Delta z^{m} = 0.5 * (1 - z^{m})$, as the maximum value the digitalization index can attain is one. The revenue gains are found by applying the latest country-specific VAT and

weighted tariff rates, along with the average trade flow (V^{m}_{Total}-V^{x}_{Total}) reported in 2016 to equation (3) and assuming $\beta^{m}_{digit} = 1.181$ or 1.733.

Table 2. Median Revenue Gains per Country Group from closing half the distance to the Digitalization Frontier, 2016

(Percent of GDP)

Country group	**VAT Revenue Gains**	**Tariff Revenue Gains**
Advanced Economies	(0.7-1.0)	(0.04-0.06)
Emerging Market Economies	(0.7-1.0)	(0.2-0.3)
Low-Income Developing Countries	(1.2-1.7)	(0.4-0.5)
EU-28	(0.3-0.5)	

Note: Latest available VAT rates were used to compute the revenue gains. EU-28 = European Union group of 28 countries (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Sweden, Spain, United Kingdom); VAT = value-added tax.

Halving the distance to the digitalization frontier could raise the median VAT revenue by 1.7 percent of GDP for low-income developing countries, 1.0 percent of GDP for emerging market economies and advanced economies, and 0.5 percent for the EU. Similarly, median tariff revenue could increase by 0.5 percent of GDP for low-income developing countries, 0.3 percent of GDP for emerging market economies, and 0.06 percent of GDP for advanced economies. These results are only indicative of potential revenue gains because reducing the distance to the digitalization frontier is likely to require significant fiscal resources and the removal of institutional barriers.

V. CONCLUSION

Our paper is the first—to our knowledge—to document a lower incidence of trade fraud when governments enhance information collection and processing through digitalization. The results point to significant potential revenue gains of digitalization from reducing trade fraud.

Digitalization can bridge information gaps between governments and economic actors, improving the efficiency of policy and the lives of citizens. Greater information can enable governments to better enforce tax compliance, improve the delivery of public services, ensure participation in the social safety net, and design policies that are more consistent with individual circumstances and behavior.

Even if digitalization broadens options for governments to better design and implement policies, how viable these policies ultimately depend on political resolve. The challenge is to adopt digital tools to enhance government policies, while mitigating the risks associated with digitalization.

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APPENDIX

Table A1. Data Sources

Variable	Data Source
Bilateral exports	IMF: Direction of Trade Statistics
Bilateral imports	IMF: Direction of Trade Statistics
Common currency	CEPII: Gravity Dataset
Common official/primary language	CEPII: Gravity Dataset
Common religion	CEPII: Gravity Dataset
Contiguity	CEPII: Gravity Dataset
Control of corruption	WB: World Governance Indicators
Digital Adoption Index	WB: World Development Report 2016
E-Government Index	UN: E-Government Survey 2016
Exchange rate	WB: World Development Indicators
GDP	IMF: World Economic Outlook
GDP per capita	IMF: World Economic Outlook
Government effectiveness	WB: World Governance Indicators
Government success in ICT promotion	WEF: The Global Information Technology
Report 2016 Inflation rate	WB: World Development Indicators
Online Service Index	UN: E-Government Survey
2016 Origin is GATT/WTO member	CEPII: Gravity Dataset
Patents filed by residents	WB: World Development
Indicators Population-weighted distance	CEPII: Gravity Dataset
R&D expenditure (percent of GDP)	WB: World Development
Indicators Regional trade agreement	CEPII: Gravity Dataset
Rule of law	WB: World Governance Indicators
Tariff rate (weighted mean)	WB: World Development
Indicators VAT rate	IMF: Tax Rate Database

Note: CEPII = Centre d'Etades Prospectives et d'Informations Internationales; GATT/WTO = General Agreement in Tariffs and Trade/ World Trade Organization; ICT = information and communication technology; R&D = research and development; UN = United Nations; VAT = value-added tax; WB = World Bank; WEF = World Economic Forum.