Tax evasion from cross-border fraud: does digitalization make a difference?

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ABSTRACT

How can governments reduce the prevalence of cross-border tax fraud? This paper argues that the use of digital technologies offers an opportunity to reduce fraud and increase government revenue. Using data on intra-EU and world trade transactions, we present evidence that (i) cross-border trade tax 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 from reducing trade fraud could be substantial. Halving the distance to the digitalization frontier could raise revenues by over 1.5% of GDP in low-income developing countries.

KEYWORDS

Panel data; fiscal policy; carousel fraud; e-government; technology; taxation; digitalization; tax evasion

JEL CLASSIFICATION

H30; H26; O30; C23

I. Introduction

Examples of tax evasion at the border are not hard to come by. 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. Specifically, cross-border trade fraud to evade customs duties, VAT, and excises have 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 – fraudsters exploit the EU VAT exemption for goods and services to avoid paying VAT on final sales to the relevant tax authority – has been estimated by a VAT Gap study commissioned by the European Commission to incur between EUR 45 billion to 60 billion tax losses to the EU annually.¹

How can governments reduce the prevalence of cross-border tax fraud? We argue that the use of digital technologies offers an opportunity to reduce fraud and increase revenue. Digitalization presents an important opportunity for fiscal policy as it depends 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. To our knowledge, our paper is the first to offer empirical support to the claim that digitalization can help reduce trade fraud.

Exploiting variations in bilateral trade transactions by using data on 28 intra-EU and 85 cross-country trade transactions over the period 2003–16, we show that: (i) cross-border trade fraud is non-trivial; (ii) such tax evasion can be alleviated by the use of digital technologies; and (iii) potential revenue gains could be substantial. Building upon Kellenberg and Levinson (2019), we proxy trade-related tax evasion using the difference between imports reported in the source country and those reported in the destination country. We examine

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¹https://www.europol.europa.eu/crime-areas-and-trends/crime-areas/economic-crime/mtic-missing-trader-intra-community-fraud

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trade misreporting at the country level using reported discrepancies in aggregate trade statistics between origin and destination countries since our main policy variable of interest – the country’s digitalization index – does not differ by sector of activity.²

**Government digitalization and tax compliance**

Digitalization – the integration of electronic data and payment systems that facilitate the availability and processing of more reliable, timely, and accurate information – presents important opportunities and challenges for fiscal policy. Digital technologies have transformed government operations over the recent years. Vast improvements in the collection, processing, tracking, and dissemination of information have helped enhance public service delivery. Governments in advanced economies have performed better on average in digital adoption, but many small or developing countries have taken the lead regionally, including Chile in Latin America, Singapore in Asia, and Rwanda in sub-Saharan Africa (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 and they also reduce the time burden associated with administration (World Bank 2016). 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. 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. The use of digitalization tools could help the revenue mobilization efforts as trade taxes still represent a non-trivial share of revenues, particularly in developing economies where they constitute close to 10% of total revenues.

![Digital adoption index for governments across regions](image-url)

*Figure 1. 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 (ISO) country codes. The World Bank’s Digital Adoption Index measures the global spread of digital technologies for 171 countries. The government cluster is the average of three indices: core administrative systems, online public services and digital identification. The list refers to the top- and bottom-ranking countries in each region. AP = Asia and Pacific; CIS = Commonwealth of Independent States; EUR = Europe; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; NA = North America; SSA = Sub-Saharan Africa.*

²Studies examining the impact of sector specific tariff rates on trade fraud relied on disaggregated industry-by-industry measures of trade misreporting (see e.g. Javorcik and Narciso 2008; Mishra, Subramanian, and Topalova 2008; Jean and Mitaritonna 2010).
II. Methodology

The following trade gravity model – building on Kellenberg and Levinson (2019), – is estimated:

\[
\frac{V^m_{xmt} - V^x_{xmt}}{(V^m_{xmt} + V^x_{xmt})/2} = \beta_1 Z^m_{xmt} + \beta_2 Z^x_{xmt} + \beta_3 Z_{xmt} + a_t + a_{xm} + \varepsilon_{xmt}
\]

(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 or ‘trade gap’ proxies the degree of trade misreporting and is defined as the difference between \(V^m_{xmt}\) and \(V^x_{xmt}\) normalized by the average reported trade flow.\(^3\) The trade gap between two countries tends to increase with the distance between the two trading partners, since the value reported by exporters is free-on-board (FOB) while the value reported by importers includes cost, insurance and freight (CIF). The set of independent variables considered includes a matrix of bilateral proxies for CIF costs \(Z^m_{xmt}\) (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 determine the size of the trade gap, a gravity model approach is employed. 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. Following typical trade gravity models, we also 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. We also control for whether a country participates in regional trade agreements.

The main regressor is digitalization proxied by the UN’s Online Service Index. This variable assesses the scope and quality of public sector online services. The index is normalized between 0 and 1 and it is available since 2003.\(^4\)

Bilateral trade data are obtained from IMF’s Direction of Trade Statistics (DOTS). 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 (WGI) database. Information on the variables and data sources are available upon request.

III. Results

Trade fraud leading to tax evasion can be proxied using discrepancies in trade statistics at the origin and destination countries. Existing studies typically follow the approach 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 Mishra, Subramanian, and Topalova 2008; Kellenberg and Levinson 2019). In practice, the value reported by importers includes CIF and should exceed the value reported by exporters that is FOB. When negative, this trade gap 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% of GDP for advanced economies (AEs) and −6.6% of GDP for low-income countries (LIDCs) (Figure 2).

To the extent that digitalization reduces trade misreporting, it may help improve revenue collection. Tables 1 and 2 show the results of estimating the gravity Equation (1). Table 1 refers to the sample of 28 European Union countries over the period 2003–16. 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. Column 1 estimates the gravity Equation (1) via OLS, and point estimates suggest a positive, yet statistically insignificant, association.

\(^3\)The trade gap as defined can have a maximum value of 2 and a minimum value of – 2. Estimations are robust to the exclusion of such extreme values.

\(^4\)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.
between improved digitalization indices and the trade reporting gap, suggesting a lower incidence of trade fraud when governments make progress in digitalization.

Columns 2, 3, and 4 report the results from implementing 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 a measure of R&D efficiency – the ratio of patents to R&D intensity. The coefficient estimate for importer’s digitalization is higher in magnitude than the OLS estimate, pointing to downward bias of the later due to endogeneity. The negative coefficient on the importer’s VAT rate is in line with the assumption that the incentive to under-report imports rises with the VAT rate.

Column 5 shows the second-stage results after censoring the dependent variable symmetrically at the 1st and 99th percentiles to address the concern that outliers could be driving the results. Results in columns 4 and 5 indicate that 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. This relationship remains significant after controlling for other key determinants.

Table 2 broadens the sample to include all trading partners available in the DOTS database. The resulting estimates confirm the previous EU sub-sample conclusion that 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.

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 5’s estimated coefficient on the digitalization index. Denote $V^m_{total} = \sum (V^m_{xm})$ 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:

$$\text{Revenue Gain} = \tau_{rate}\Delta (V^m_{total} - V^x_{total})$$

(2)

where $\tau_{rate}$ 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, $\Delta z^m$, and its estimated impact $\beta^m_{digit}$:

$$\text{Revenue Gain} = \tau_{rate} 1/2 (V^m_{total} + V^x_{total}) \beta^m_{digit} \Delta z^m$$

(3)

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3This instrumental variable is positively and strongly correlated to the endogenous digitalization index both for importers and exporters (columns 2 and 3). 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.
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% implies increasing \( z^m \) by \( \Delta z^m = 0.5 \ast (1 - z^m) \), 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 \( (V_{\text{Total}}^m - V_{\text{Total}}^x) \) reported in 2016 to Equation (3) and assuming \( \beta_{\text{digit}} = 1.158 \).

Halving the distance to the digitalization frontier could raise the median VAT revenue by 1.1% of GDP for low-income countries, 0.7% of GDP for emerging markets and advanced economies, and 0.4% for the EU (Table 3). Median tariff revenue could increase by 0.4% of GDP for low-income countries, 0.2% of GDP for emerging markets, and 0.04% 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.
Table 2. Trade gap regressions using all partners trade data.

| Specification | (1)            | (2)            | (3)            | (4)            | (5)            |
|---------------|----------------|----------------|----------------|----------------|----------------|
| Regressors/estimator | OLS            | TLS-1a         | TLS-1b         | TLS-2          | TLS-2          |
| Im.Digitalization index | −0.051         | (0.036)        | 1.158***       | 1.163*         |                 |
| Ex.Digitalization index | 0.111***       | (0.034)        | −1.463**       | −1.442**       |                 |
| Im.R&D efficiency   | 0.000          | 0.015***       | (0.002)        | (0.002)        |                 |
| Ex.R&D efficiency   | 0.000          | 0.016***       | (0.002)        | (0.002)        |                 |
| log Im.GDP         | −0.509***      | (0.031)        | −0.031         | −0.742***      | −0.738***       |
| log Ex.GDP         | 0.808***       | (0.031)        | 0.113***       | 1.054***       | 1.051***        |
| log Im.GDP pc      | 0.171          | (0.031)        | −0.096***      | 0.027          | 0.339***        |
| log Ex.GDP pc      | −0.679***      | (0.031)        | −0.026         | 0.393***       | 0.336**         |
| Im.Inflation rate  | 0.001          | (0.001)        | −0.003         | −0.003         | −0.003          |
| Ex.Inflation rate  | 0.002          | (0.001)        | 0.000          | 0.020          | 0.000           |
| log Im.Exchange rate | 0.055          | (0.037)        | 0.100***       | 0.000          | 0.005           |
| log Ex.Exchange rate | −0.037         | (0.031)        | 0.097***       | 0.027          | 0.120           |
| Im.VAT rate        | −0.007         | (0.005)        | 0.001          | 0.000          | 0.001           |
| Ex.VAT rate        | 0.002          | (0.001)        | −0.001         | −0.001         | −0.002           |
| Im.Tariff rate     | 0.001          | (0.001)        | −0.000         | −0.000         | 0.000           |
| Ex.Tariff rate     | −0.006*        | (0.001)        | 0.000          | 0.001          | 0.000           |
| Im.Corruption control | 0.011          | (0.030)        | 0.055***       | 0.001          | −0.053          |
| Ex.Corruption control | 0.049*         | (0.004)        | 0.000          | 0.001          | 0.001           |
| Im.Rule of law     | 0.077*         | (0.044)        | −0.076***      | 0.005          | 0.178**         |
| Ex.Rule of law     | −0.175***      | (0.037)        | 0.005          | −0.085***      | −0.315***       |
| Im.GATT/WTO member | −0.104*        | (0.057)        | 0.239***       | −0.001         | −0.397**        |
| Ex.GATT/WTO member | 0.014          | (0.036)        | −0.000         | 0.237***       | 0.393***        |
| Number of observations | 20,874         | 20,874         | 20,874         | 20,874         | 20,874          |
| $R^2$             | 0.020          |                |                |                |                |
| $F$-stat (first stage) | 33.52          |                |                |                |                |

Note: Robust standard errors in parentheses, *, **, *** denote statistical significance at the 10, 5 and 1% levels, respectively. Controls include country fixed effects, and year fixed effects. ‘Im’. refers to importer and ‘Ex’. refers to exporter. Columns TSLS-1a and TSLS-1b report the first-stage results from using as IVs the exporters’ and importers’ logarithm of patents over R&D, respectively. Columns 4 and 5 report the second-stage (TSLS-2) results before and after censoring the dependent variable at 1% and 99% percentiles.

IV. Conclusion

Our paper is the first to document a lower incidence of trade fraud when governments enhance information collection and processing through digitalization. Results point to significant potential revenue gains of digitalization from reducing trade fraud. Future work should focus on further analysing the transmission mechanism – how improvements in digitalization translate into better enforcement at the border. While the estimates of this paper provide

| Country group | VAT Revenue Gains | Tariff Revenue Gains |
|---------------|------------------|----------------------|
| Advanced Economies | 0.7             | 0.04                |
| Emerging Market Economies | 0.7             | 0.2                 |
| Low-Income Developing Countries | 1.1             | 0.4                 |
| EU-28 | 0.4 |

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, Spain, Sweden, United Kingdom); VAT = value-added tax.
a broad range for the revenue potential from digitalization, they do not provide a granular analysis of what specific digital tools are the most useful for reducing evasion.

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