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# Determinants of Cross-Border Informal Trade
## The Case of Benin

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## Abstract

This paper utilizes a survey on informal cross-border trade in Benin (ECENE), conducted by the National Institute of Statistics in 2011, to study the determinants of informal versus formal trade, concentrating on Benin's exports and re-exports to neighboring countries. We first show that goods traded formally and informally are very different and that the overlap between the two types of trade is very thin, suggesting the existence of two separate channels of trade. For example, agricultural products are mainly traded informally. Second, we illustrate how including informal cross-border trade gives to regional trade a higher role compared to that measured using formal trade only, which is particularly low by global standards. Finally, we study trade policy variables, and the time sensitiveness of products, as potential determinants of informality. We find that trade policy variables (tariffs and import bans) significantly explain informality of trade. We also find that, for re-exports, time sensitive products are more likely to be traded through the informal channel. This suggests a potential role for trade facilitation measures in reducing informality.

## Résumé

Cet article utilise les données de l'enquête sur le commerce transfrontalier informel au Bénin (ECENE), menée par l'Institut national de la statistique en 2011, pour étudier les déterminants du commerce informel par rapport au commerce formel, en se concentrant sur les exportations et ré-exportations du Bénin vers les pays frontaliers. Nous montrons d'abord que les biens échangés formellement et informellement sont très différents et que le chevauchement entre les deux types de commerce est très mince, ce qui suggère l'existence de deux canaux distincts de commerce. Par exemple, les produits agricoles sont principalement échangés de manière informelle. Deuxièmement, nous montrons que la prise en compte des échanges informels conduit à réévaluer la part du commerce régional de manière importante, alors que cette part apparaît comme très faible lorsqu'elle est mesurée pour le commerce formel uniquement. Enfin, nous étudions le rôle des variables de politique commerciale, ainsi que de la sensibilité des produits au temps, en tant que déterminants potentiels de l'informalité. Nous constatons que les variables de la politique commerciale (droits de douane et interdictions d'importation) expliquent de manière significative l'informalité du commerce. Nous constatons aussi que, pour les réexportations, les produits sensibles au temps sont plus susceptibles d'être échangés par la voie informelle. Ceci suggère un rôle potentiel des mesures de facilitation du commerce dans la réduction de l'informalité.

## 1. Introduction

Informal trade is pervasive in Africa and has important implications for the functioning of African economies. The evasion of customs duties is a serious concern for many governments in the region, for which tariffs account for a sizeable share of public receipts (Jean and Mitaritonna, 2010). Moreover, understanding informal cross-border trade is also crucial to understanding why the level of intra-African trade is low by global standards. While the share of intra-regional trade reached 40 percent in North America and 63 percent in Western Europe since the mid-2000s, it was estimated at only 10-12 percent in Africa (UNECA, 2015).

Empirically, informal trade is inherently difficult to measure. Following the initial idea of Bhagwati (Bhagwati, 1964; 1967), several recent papers have analyzed smuggling using mirror data; that is, matching importer- and exporter-reported bilateral trade flows. If the source country's reported exports exceed the destination country's reported imports, smuggling can be inferred (Fisman and Wei, 2004; Javorcik and Narciso, 2008; Mishra et al., 2008; Jean and Mitaritonna, 2010; Bouet and Roy, 2012).

Intra-African smuggling, however, cannot be fully apprehended with mirror data because official trade statistics from both the exporting and the importing country fail to record cross-border trade.

Macroeconomic research to determine countries' level of informal trade and its determinants (Ayadi et al., 2013; Golub and Mbaye, 2009; Golub, 2012) identify the goods smuggled, gather data regarding their prices across borders, and check whether the price difference observed come from tariffs, taxes, or bans applied in the countries trading informally.

In this study, we utilize a rich survey on informal cross-border trade in Benin (ECENE), conducted by the National Institute of Statistics in 2011, to study the determinants of informal trade compared to formal trade. We concentrate on Benin's exports and re-exports to neighboring countries, specifically Nigeria. For data regarding formal trade, we use the COMTRADE database to consider the trade declarations of Benin versus the same destinations in 2011.[1]

We first show that the two forms of trade are very different and that the overlap between goods appearing in each of the databases is very thin, suggesting the existence of two separated channels of trade. Agricultural products appear to be mainly traded informally. Second, we show that, as expected, higher tariffs and the existence of an import ban explain the choice to trade informally. Finally, we find that trade policies are not the only determinant of informality. Using an indicator of a product's time sensitivity, we

[1] It has to be noticed that the UN COMTRADE database is not deprived of problems. The quality of the data depends on the reliability of the reports made by custom agencies. In addition, values reported can be subject to under invoicing and the nature of the products to mis-classification

find that this variable also helps explain the probability of informal trade in the case of industrial products, suggesting a potential role for trade facilitation measures in reducing informality.

The remainder of the paper is organized as follows. In section 2, we review the context in which the informal trade relations have grown in Benin. Section 3 describes Benin's informal and formal bilateral trade patterns. In section 4, we present the empirical strategy used to look at the main determinants of informal trade flows, as well as the results. Section 5 concludes.

## 2. Entrepot Trade in Benin: Context

Benin is a French-speaking West African country of 10 million people. Lacking natural resources and an industrial basis, but benefiting from good access to the Atlantic Ocean through the port of Cotonou, since the end of the 1960s the country positioned itself as a hub for trade flows to its landlocked neighbors, Burkina Faso and Niger, as well as to Nigeria, its larger neighbor of 170 million, becoming an Entrepot economy (Igue and Soule, 1992).

In the case of Nigeria, factors other than access to the ocean have contributed to making trade with Benin attractive. Among these are the political turmoil associated with the Biafra War between 1967 and 1970, the increase in Nigeria's oil revenues after 1974, and, importantly, the country's protectionist trade policy adopted since its independence to develop the national industries. A number of import bans remain in place to this day in Nigeria, despite the country's adoption of a structural adjustment program in 1986 (which, in theory, implied a more open trade policy), its participation in the World Trade Organization from the organization's founding in 1995, its participation in the Economic Community of West African States (ECOWAS), and the adoption of ECOWAS common external tariffs in 2005 (Volker, 2010).

By contrast, Benin adopted an open trade policy after 1989. Therefore, trade protection levels in the two countries differ widely, and numerous consumption goods, such as edible oils or poultry meat, that are banned for import in Nigeria face no or low tariffs in Benin.

This situation has led to the development of large-scale trade between Benin and Nigeria. In addition to products originating in Benin, this trade also involves imports from third countries, which are imported into Benin at the port of Cotonou and then cross over land to Nigeria. A large part of this trade is informal, i.e. illegal and unrecorded (Raballand and Mjekiqi, 2010).

As the map in Figure 1 shows, the port of Cotonou is close to Lagos and to the south-western region of Nigeria, where a large part of the country's economic activity is concentrated. Qualitative accounts show how goods are transported through various routes, crossing the Benin-Nigeria border at several points. An important part of this cross-border trade also transits through Niger to reach the large market of Kano in north-west Nigeria (Walther, 2015).

Sending goods through the port of Cotonou may involve only a small increase in distance, and this may be compensated for by gains in cost and time associated with this route. Similarly, exporting goods from Benin to Nigeria may involve a choice between a formal, or legal, route and an informal one, and different levels of trade protection clearly create incentives for smuggling. In addition, case studies on Benin (Bako-Arifari, 2001) suggest that weak enforcement at government agency levels, as well as slow customs procedures, may also play a role in encouraging informal trade. In the following sections, we study some of these determinants of the choice to trade informally, using data for both formal and informal trade flows.

## 3. Data and Descriptive Statistics

### *3.1 Data*

In order to study the determinants of informal trade compared to formal trade in Benin, we use different sources of data. For informal (not recorded) trade, we use the ECENE survey, which was conducted by the National Institute of Statistics of Benin in 2011. The survey's objective is to quantify informal trade at Benin's borders by identifying and surveying 171 border crossing passages that were actively used by smugglers over a one-month period (September 2011). Questionnaires addressed to informal traders gathered information on the nature, quantity, and value of smuggled goods.

*Figure 1: Map of Benin and its neighbors*


The ECENE survey contains information at a very detailed product level (HS10) for goods crossing Benin's borders in different ways: exports, re-exports, imports, and transit. A total of 8,883 border crossings were recorded and 10,415 flows of goods identified (INSAE, 2011). We concentrate on exports and re-exports from Benin to Togo, Niger, and Nigeria, the three destinations with the largest frequency

of informal trade exchange. We are aware that the largest part of Benin's trade is through by transit (see Table 1); however, at the moment, we do not have any information regarding the transit activity registered by customs in Benin in 2011.

*Table 1: Benin: Formal trade outflows in value (USD K)*

| Regimes | 2004* | 2006* | 2011 |
|---|---|---|---|
| Export | 292,178 | 217,848 | 255,021.9 |
| Re-export | 12,587 | 25,958 | 133,570.3 |
| Transit | 1,148,248 | 1,284,587 | n.a. |

* Figures are those in Table 6.5 by (Raballand and Mjekiqi, 2010). Figures for 2011 come from Comtrade.

Formal trade (or registered trade) is recorded in the COMTRADE UN trade database. Data is available in both databases for the year 2011. However, COMTRADE contains flows only at the country level using the HS6 Rev3 nomenclature. For the sake of comparison, the full ECENE database has been aggregated accordingly.

For trade policy measures, we use the MFN tariffs as well as the preferential tariffs by HS6 product applied by Benin's neighboring countries for the year 2011. Tariffs have been provided by the customs agency of each country.

Using documents published by Nigeria's minister of Finance and reports published by the WTO, we have also reconstructed a complete database of Nigerian import bans at the product level for the year 2011. At the end of the 1990s, the government of Nigeria planned to phase out import bans. Twenty-three products faced import bans in 1998, and a number of these bans were replaced by high tariffs between 1999 and 2001. However, the trend reversed in 2002 (WTO, 2005), and 218 products (HS4) faced an import ban at the end of 2004. This prohibition list remained essentially unchanged until the end of 2008, when a number of products were removed, in part as a result of Nigeria's membership of ECOWAS, which required it to align with the group's common external tariff. However, numerous products remained on the prohibition list after 2008, when the implementation of the ECOWAS common tariff was still subject to negotiations between Nigeria and other members and was repeatedly delayed.

Finally, the information regarding time-sensitiveness at the HS4 level has been provided by Hummels and Schaur (2013).

### *3.2 Descriptive Statistics: Comparing Informal and Formal Trade*

Looking at descriptive statistics, several points are worth highlighting. First, the main countries with which Benin trades informally are Nigeria, Togo, and Niger. This paper focuses on these three destinations.

In Tables 2 and 3, we can see that the ratio of informal to formal trade is relevant, particularly in the case of Nigeria and Togo.

Accounting for estimates of informal trade modifies the picture of Benin's regional trade. For instance, Benin's regional exports over total exports pass from 19% up to 45%, depending on the method used to measure the annual value of informal trade (see Table 4). Indeed, estimates of annual informal trade are

obtained from ECENE data using two alternative extrapolation methods. In method one ("m1"), we use the number of transactions declared by traders for each month of the year, multiplied by the value of the recorded transactions, in September 2011. This allows to account for seasonality effects, but with a risk of recall error. On the other hand, "m2" is obtained by simply scaling up recorded transactions to a yearly period, ignoring seasonal variations.

Looking at the composition of trade, other important aspects emerge. Table 5 provides some statistics by product recorded in the ECENE database for both export and re-export from Benin to its neighboring countries. From column 1 and column 4, we can notice that the distribution of products is balanced between agricultural and non-agricultural goods, in particular in the case of exports. If we look at the number of products by the different aggregation level (HS6, HS4, or HS2), we can say that products are quite widespread across sectors.

Finally, comparing informal to formal trade by destination and products (see Table 6), we can notice the following:

- the number of informal products is quite important, often more so than the number of formally traded products. In particular, agricultural products are more frequent in the ECENE database.
- the two types of trade seem to be complementary. Indeed, very few of the HS6 products are recorded in both databases, providing evidence of two separate channels of trade. For re-exports, there is only one product at the HS6 level that is re-exported both informally and formally to Togo (oil, code 271019) and only one at the HS4 level (oil, code 2710); in the case of exports, we find five HS6 products exported through both channels to Nigeria and 11 to Togo, mainly industrial items.

*Table 2: Comtrade versus ECENE – annual exports (1,000 USD in 2011)*

| | **Formal** | **Informal (m1)** | **Informal (m2)** | **Ratio Informal/formal** | |
|---|---|---|---|---|---|
| **Destination** | | | | **m1** | **m2** |
| Nigeria | 30000.0 | 114364.4 | 69069.1 | 3.8 | 2.3 |
| Niger | 8279.1 | 341.7 | 365.7 | 0.0 | 0.0 |
| Togo | 3602.5 | 3468.9 | 3920.6 | 0.9 | 1.1 |
| Burkina | 7074.3 | 22.0 | 38.8 | 0.0 | 0.0 |
| Ghana | 0.0 | 0.0 | 0.0 | | |
| Total 5 | 48955.9 | 118197 | 73394.2 | 2.41 | 1.5 |
| World | 255021.9 | | | | |

Formal trade: Comtrade, Informal trade: ECENE. m1 and m2: method 1 and 2 for estimation of annual flows.

*Table 3: Comtrade versus ECENE - annual re-exports (1,000 USD in 2011)*

| Formal | | | | Informal (m1) Informal (m2) | | |
|---|---|---|---|---|---|---|
| | | | | | Ratio Informal/formal m1 | m2 |
| Nigeria | 16100.0 | 245213.9 | | 83813.6 | 15.2 | 5.2 |
| Niger | 1920.9 | 464.3 | | 588.8 | 0.2 | 0.3 |
| Togo | 5218.5 | 18921.7 | | 8554.5 | 3.6 | 1.6 |
| Burkina | 0 | 147.2 | | 84.5 | | |
| Ghana | 0 | 0.1 | | 1.1 | | |
| Total 5 World 133570.3 | 23239.4 | 264747.2 | | 93043.4 | 11.4 | 4.0 |

Formal trade: Comtrade, Informal trade: ECENE. m1 and m2: method 1 and 2 for estimation of annual flows.

*Table 4: Regional trade shares (%)*

| | | | Share destination over Total | | | |
|---|---|---|---|---|---|---|
| | | Exports | Re-exports | | | |
| Formal | | Formal | Formal | Formal Formal Formal | | |
| | | + Informal (m1) | +Informal (m2) | +Informal (m1)+ Informal (m2) | | |
| Nigeria | 11,8 | 38,6 | 30,2 | 12,1 | 65,6 | 44,1 |
| Niger | 3,2 | 2,3 | 2,6 | 1,4 | 0,6 | 1,1 |
| Togo | 1,4 | 1,9 | 2,3 | 3,9 | 6,1 | 6,1 |
| Burkina | 2,8 | 1,9 | 2,2 | 0,0 | 0,0 | 0,0 |
| Ghana | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| Total 5 | 19,2 | 44,7 | 37,3 | 17,4 | 72,3 | 51,3 |

Formal trade is measured by Comtrade, while Informal trade by ECENE.

*Table 5: ECENE Database - re-export and export by product (2011)*

| | re-export: Nbr of products | | | export: Nbr of products | | |
|---|---|---|---|---|---|---|
| Aggregation level | HS6 | HS4 | HS2 | HS6 | HS4 | HS2 |
| Destination | | | | | | |
| Ghana | 3 (0) | 2 | 2 | 0 (0) | 0 | 0 |
| Niger | 7 (1) | 7 | 6 | 10 (9) | 10 | 6 |
| Nigeria | 73 (26) | 55 | 33 | 112 (59) | 86 | 38 |
| Togo | 26 (4) | 22 | 19 | 110 (48) | 88 | 43 |
| Burkina | 1 (0) | 1 | 1 | 2 (1) | 2 | 2 |
| Total | 110 (31) | 87 | 61 | 234 (117) | 186 | 89 |

In parentheses the number of agricultural products, as defined by the WTO, excl. processed food.

*Table 6: ECENE and COMTRADE by product (2011)*

| | re-export | | | export | | |
|---|---|---|---|---|---|---|
| | Nb HS6 | Nb HS6 | HS6 | Nb HS6 | Nb HS6 | HS6 |
| Destination | ECENE | COMTRADE | Common pdts | ECENE | COMTRADE | Common pdts |
| Niger | 7 (1) | 5 (0) | 0 | 10 (9) | 41 (3) | 0 |
| Nigeria | 73 (26) | 15 (0) | 0 | 112 (59) | 47 (5) | 5(2) |
| Togo | 26 (4) | 19 (1) | 1 (0) | 110 (48) | 89 (7) | 11 (2) |

In parentheses the number of agricultural products, as defined by the WTO, excl. processed food.

## 4. Regression Results: Main Determinants of Informal Trade

This section looks at the determinants of informal cross-border trade compared to formal trade. Since the overlap between the two types of trade is minimal, we classify all products traded either as a formal or informal, dropping double observations for any given destination. We then estimate a choice model of trading mode:

$$P[Informal_{id}] = f(\beta_1 X_i + \beta_2 Z_{id} + \gamma_d) \quad (1)$$

where the $f$ function is linear or probit; $Z_{id}$ is trade policy variables (tariffs, bans) varying across product and destination, $X_i$ is product characteristics (agricultural dummy, time-sensitiveness), and $\gamma_d$ is destination fixed effects.

The dependent variable takes the value of 1 if the HS6 product is recorded for a given destination as informal and 0 otherwise.

We first perform a linear probability model and then a probit model as robustness check to test the impact of tariffs and bans for goods that appear in informal rather than formal trade. In the first two following subsections, we measure the importance of trade policy measures as main determinants of informality, treating separately the case of re-exports and export.

For tariffs, we use the MFN in the case of re-exports and the preferential tariff in the case of exports.

Note that we define the Ban2011 variable as an indicator, being 1 for HS6 products for which a ban was implemented in Nigeria in 2011 on at least to one product within the HS6 category. We apply the variable Ban2011 to flows to Nigeria and Niger, as there is evidence that products under a ban in Nigeria are smuggled through Niger. Finally, in subsection 4.3, we introduce time-sensitiveness as a determinant.

### *4.1 Results for Re-export: Trade Policies as Main Determinants*

In Table 7, we use a linear probability model to test the impact of import bans and tariffs on the probability of a good appearing in informal rather than formal trade for re-export.

It is important to note that in each regression, we control for destination fixed effects and we introduce a dummy for agricultural products. The inclusion of such a dummy is dictated primarily by the fact that agricultural products for re-export are exclusively registered in the ECENE database. From column 1, we can see that the effect of tariffs are positive and significant in explaining informality; the same can be seen in column 2 for Ban2011 alone. In column 3, the effect of Ban2011 disappears because of a collinearity problem. A product facing a ban is often subject to a low tariff; however, when a ban is applied, this ban forms a prohibitive barrier and the tariff is no longer important as a determinant of informal trade. We

introduce an interaction in column 4 that confirms this;[2] the variable Ban2011 is again positive and statistically significant in this column. In columns 5 to 7, we show results at the country level. We can notice that tariffs play a crucial role in the case of Togo, while in the case of Nigeria, the ban is the main determinant of informal trade; this latter finding holds when considering Niger and Nigeria.

*Table 7: Determinants of informal and formal trade: re-export. Linear Model*

| | **Dep. Variable : 1 if Ecene, 0 if Comtrade** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5- Tgo)** | **(6-Nga)** | **(7- Ner and Nga)** |
| MFN2011 | 2.227*** | | 2.093*** | 2.766*** | 5.039*** | 1.767** | 1.833** |
| | (0.530) | | (0.559) | (0.648) | (0.791) | (0.806) | (0.775) |
| MFN (Ner-Nga) | -0.907 | | -0.828 | -1.758 | | | -1.829 |
| | (1.859) | | (1.891) | (1.716) | | | (1.757) |
| Ban2011 | | 0.203** | 0.102 | 0.736*** | | 0.648*** | 0.606*** |
| | | (0.085) | (0.096) | (0.178) | | (0.190) | (0.190) |
| Ban2011*MFN2011 | | | | -3.633*** | | -2.763*** | -2.701*** |
| | | | | (0.860) | | (0.991) | (0.959) |
| Ban2011* MFN (Ner-Nga) | | | | 8.662 | | | 8.723 |
| | | | | (3.533) | | | (3.613) |
| Agr Dummy | 0.265*** | 0.304*** | 0.269*** | 0.340*** | 0.326** | 0.339*** | 0.341*** |
| | (0.062) | (0.063) | (0.065) | (0.061) | (0.137) | (0.064) | (0.062) |
| Destination F.E. | Yes | Yes | Yes | Yes | | | Yes |
| N | 153 | 153 | 153 | 153 | 46 | 92 | 107 |
| R2 | 0.243 | 0.153 | 0.245 | 0.301 | 0.395 | 0.212 | 0.261 |

Standard errors in parentheses. All regressions are clustered at the HS6 level. For re-exports to Niger, the first variable is Nigeria's MFN and the second is the difference between Niger's and Nigeria's MFN rates. * p<0.1, ** p<0.05, *** p<0.001

When we perform a probit model, the results from the linear model still hold (see Table 8).

*Table 8: Determinants of informal and formal trade: re-export. Probit Model*

| | **Dep. Variable : 1 if Ecene, 0 if Comtrade** | | | |
|---|---|---|---|---|
| | **(1)** | **(2- Tgo)** | **(3–Nga)** | **(4-Ner and Nga)** |
| MFN2011 | 11639*** | 16.570*** | 5.511* | 5.685* |
| | (2.543) | (3.816) | (2.819) | (2.677) |
| MFN (Ner-Nga) | -6.577 | | | -6.356 |
| | (5.724) | | | (5.707) |
| Agr Dummy | 1.774*** | 1.318* | | |
| | (0.459) | (0.599) | | |
| Ban2011 | 2.061* | | 1.705* | 1.729* |
| | (0.904) | | (0.922) | (0.909) |
| Ban2011*MFN2011 | -7.908 | | -4.895 | -5.069 |

[2] The difference between the coefficient for tariff plus standard error and the coefficient of interaction minus standard error overlap

| | | | | |
|---|---|---|---|---|
| | (5.165) | | (5.316) | (5.241) |
| Destination F.E. | Yes | | | Yes |
| N | 151 | 46 | 66 | 78 |
| PseudoR2 | 0.374 | 0.376 | 0.235 | 0.250 |

Standard errors in parentheses. All regressions are clustered at the HS6 level. For re-exports to Niger, the first variable is Nigeria's MFN and the second is the difference between Niger's and Nigeria's MFN rates. * p<0.1, ** p<0.05, *** p<0.001

### *4.2 Results for export: Trade policies as main determinants*

Table 9 displays results of the same linear model as for re-export applied to exports. Bilateral tariffs are now used when different from MFN; this is the case for Togo only. Results confirm the role of trade policy barriers in the choice of informality: both bans and tariffs are associated with a higher probability of informality in trade.

*Table 9: Determinants of informal and formal trade: export. Linear model.*

| | **Dep. Variable : 1 if Ecene, 0 if Comtrade** | | | |
|---|---|---|---|---|
| | **(1)** | **(2- Tgo)** | **(3- Nga)** | **(4-Ner and Nga)** |
| Bil Tariff | 1.099** | 1.787** | 1.200** | 0.605 |
| | (0.438) | (0.749) | (0.551) | (0.456) |
| MFN - Bil Tariff | 2.174*** | 2.606*** | | |
| | (0.470) | (0.556) | | |
| Ban2011 *Bil Tariff | -2.151*** | | -2.353** | -1.750** |
| | (0.732) | | (1.120) | (0.737) |
| Ban2011 | 0.254** | | 0.308* | 0.216* |
| | (0.124) | | (0.214) | (0.124) |
| Agr Dummy | 0.358*** | 0.354*** | 0.274*** | 0.374*** |
| | (0.050) | (0.082) | (0.058) | (0.058) |
| Destination F.E. | Yes | | | Yes |
| N | 338 | 161 | 132 | 177 |
| R2 | 0.337 | 0.246 | 0.127 | 0.428 |

Standard errors in parentheses. All regressions are clustered at the HS6 level. MFN-bilateral: difference between MFN and applied tariff; non-zero for
Togo only. The import ban variable is defined for Nigeria and Niger only. * p<0.1, ** p<0.05, *** p<0.001

*Table 10: Determinants of informal and formal trade: export. Probit model.*

| | **Dep. Variable : 1 if Ecene, 0 if Comtrade** | | | |
|---|---|---|---|---|
| | **(1)** | **(2- Tgo)** | **(3- Nga)** | **(4-Ner and Nga)** |
| Bil Tariff | 5.202*** | 6.067*** | 5.601** | 4.008* |
| | (1.653) | (2.149) | (2.538) | (2.157) |
| MFN- Bil Tariff | 8.234*** | 9.269*** | | |
| | (1.976) | (2.112) | | |
| Ban2011*Bil Tariff | -10.818*** | | -13.377** | -11.011*** |
| | (2.936) | | (5.460) | (3.333) |
| Ban2011 | 1.208** | | 1.728* | 1.287** |
| | (0.474) | | (1.040) | (0.520) |

| | | | | |
|---|---|---|---|---|
| Agr Dummy | 1.644*** | 1.347*** | 1.573*** | 1.964*** |
| | (0.255) | (0.341) | (0.341) | (0.364) |
| Destination F.E. | Yes | | | Yes |
| N | 338 | 161 | 132 | 177 |
| PseudoR2 | 0.280 | 0.210 | 0.211 | 0.362 |

Standard errors in parentheses. All regressions are clustered at the HS6 level. MFN-bilateral: difference between MFN and applied tariff; non-zero for
Togo only. The import ban variable is defined for Nigeria and Niger only. * p<0.1, ** p<0.05, *** p<0.001

### *4.3 Looking for other determinants: Time-sensitiveness*

In this section, we test whether informal trade facilitation through the payment of acceleration fees might also be important in determining informal trade levels. As a measure of time-sensitiveness, we use the estimation provided by Hummels and Schaur. In their paper (Hummels and Schaur, 2013), these authors estimate a model of exporters' choice between fast, expensive air cargo and slow, cheap ocean cargo; this model depends on the price elasticity of demand and the value that consumers attach to fast delivery. Using import data for the US, they provide rich variation in the premium paid for air shipping and in time lags for ocean transit to extract consumers' valuation of time. They estimate that each day in transit is equivalent to an ad-valorem tariff of 0.6 to 2.1 percent. The authors find a different effect for the two categories of goods: fresh (perishable agricultural goods) and part and components for industrial products. For perishable goods, they find that a higher "fresh" share increases the use of air shipment but does not significantly interact with transit days, suggesting that products such as "fresh fish" are so time sensitive that any delay longer than a few days ruins the product. This effect shows up in the higher use of air shipment for all exporters, regardless of ocean transit time to the US. For parts and components instead there is a sharp increase in the time sensitivity of that trade. Comparing a product with zero component share to one that is 100 percent components raises time sensitivity by 60 percent.

Hummels and Schaur provided us with unpublished estimations of time-sensitiveness at the HS4 level. Unfortunately, this type of information is not always available for all the products in our database. Particularly in the case of re-exports, we can only test this determinant for industrial products. Moreover, the distribution of the indicator is very noisy, with some negative values. This is likely due to two reasons, as suggested by the authors. First, there is an issue of sampling; second, there are some products that have very low observation counts with very imprecise estimating values. As we do not have information on the number of observations by product or the standard deviation of the index of time sensitiveness estimated, to deal with negative values we normalize the distribution of the index, subtracting from each observation the minimum value and dividing by the standard deviation. Moreover, we drop the most extreme values.

In Table 11, we show linear estimations for re-export (columns 1-3) and export (columns 4-6), including this measure of time-sensitiveness. As we can see in column 1 and column 4, estimations for trade policy

variables do not change significantly when using only the sample of goods for which we have information on time-sensitiveness.

The measure of time-sensitiveness seems to be an important determinant of informal trade when considering industrial products and re-export. This suggest a potential role for trade facilitation measures in reducing informality.

*Table 11: Adding time-sensitiveness. Linear model*

| | **Dep. variable:1 if ECENE, 0 if COMTRADE** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Re-export** | | | **Export** | | | |
| | 1 Time sensitiveness sample | 2 Time sensitiveness sample | 3 Industrial pdcts | | 4 Time sensitiveness sample | 5 Time sensitiveness sample | 6 Industrial pdcts |
| | | | | | | | |
| MFN tariff | 2.579*** | 2.841*** | 3.404*** | Bil Tariff | 1.389*** | 1.381*** | 2.091*** |
| | (0.750) | (0.658) | (0.673) | | (0.504) | (0.506) | (0.602) |
| MFN (Ner-Nga) | -1.376 | -0.409 | 0.748 | MFN-Bil Tariff | 2.252*** | 2.292*** | 2.989*** |
| | (2.162) | (1.890) | (1.791) | | (0.585) | (0.578) | (0.798) |
| Ban2011 | 0.662*** | 0.672*** | 0.698*** | Ban2011 | 0.313** | 0.326** | 0.228* |
| | (0.202) | (0.201) | (0.205) | | (0.153) | (0.154) | (0.150) |
| Ban2011*MFN | -3.093*** | -3.403*** | -3.262*** | Ban2011*Bil Tariff | -2.713*** | -2.737*** | -1.663 |
| | (1.119) | (1.063) | (1.061) | | (0.927) | (0.901) | (1.017) |
| Ban2011*MFN (Ner-Nga) | 8.600 | 7.882 | 7.209 | | | | |
| | (3.324) | (2.919) | (3.270) | | | | |
| Agr Dummy | 0.388*** | 0.381*** | | Agr Dummy | 0.399*** | 0.402*** | |
| | (0.068) | (0.079) | | | (0.059) | (0.059) | |
| Destination F.E. | Yes | Yes | Yes | Destination F.E. | Yes | Yes | Yes |
| Time sens | | 0.827 | 1.740** | Time sens | | 0.079 | -0.003 |
| | | (0.643) | (0.783) | | | (0.119) | (0.141) |
| N | 125 | 125 | 109 | N | 260 | 260 | 195 |
| R2 | 0.224 | 0.235 | 0.233 | R2 | 0.323 | 0.322 | 0.241 |

Standard errors in parentheses. All regressions are clustered at the HS6 level. Each specification includes a constant term.
* p<0.1, ** p<0.05, *** p<0.001

## 5. Conclusion

Informal trade is inherently difficult to measure. The ECENE survey is an original survey providing a direct insight into the size and composition of informal trade in Benin. We combine this data with official

trade data from COMTRADE. We focus on exports and re-exports flows between Benin and its neighbors, in 2011. We study trade policy variables, and the time sensitiveness of products, as potential determinants of informality.

Estimated annual trade flows show the important magnitude of informal trade. Accounting for it leads to reassessing the regional share of trade substantially. Product overlap between the two trading modes is very thin, suggesting two distinct channels of trade. We find that trade policy variables (tariffs and import bans) significantly explain informality of trade. We also find that, for re-exports, time sensitive products are more likely to be traded through the informal channel. This suggests a potential role for trade facilitation measures in reducing informality.

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