Cash-in-advance payments and transaction size: Cash-constrained importers

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Abstracts:
A high-productivity exporter can be in a stronger position when facing an importer in determining how and when payment is made. With a lower risk associated with exporters, cash-in-advance (CIA) payment is preferred by exporters. However, a baseline probit regression for the Turkish export dataset at the transaction level could not find a positive relationship between exporters' productivity and CIA. This puzzling finding is reconciled when we consider the financial conditions of importers, which may not allow their payment in advance, especially for a large-cash transaction. We find that the transaction size discourages the use of CIA payments. We also find that the productivity of exporters is associated non-linearly, i.e., in an inverted-U shape, with the use of CIA payments.

Keywords: Cash constraint; Cash-in-advance; Payment method; Productivity.
JEL Classification Codes: F14 (Empirical Studies of Trade); L14 (Transactional Relationships).

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1. Introduction

The finance-trade nexus resurged as a vital issue in international trade literature, especially when we observed a diminished supply of trade credits during the global financial crisis. For example, Minetti and Zhu (2011) find that Italian exporters participate less in exporting or export less if exporters are credit-constrained. This study investigates the behavior of exporting firms in a developing country, especially focusing on the financial side of trade contracts. More specifically, we examine the relationship between the cash-in-advance (CIA) payment method and the productivity of Turkish exporters[1].

Panel B of Figure 1 shows how the timing of payments differs across alternative payment contracts; CIA, letter of credit, cash-against-document, and open account (OA). Evaluating financial risk for an exporter associated with different payment methods is not a simple task; however, ordering payment methods in terms of risk is relatively straightforward. First, the most significant realized loss for exporters is not collecting payments after shipments of their products overseas, as shown in Panel A. The CIA payment method requires importers to make payments before exporters ship their products. With a CIA payment method, exporters bear no risk of payment[2]. Second, invoicing in the Turkish Lira frees Turkish exporters from exchange-rate risk, whereas a contract in importers' currency or vehicle currency leaves Turkish exporters vulnerable to exchange-rate risk. Panel (i) of Table 1 indicates that exports contracted in either the US dollars or the euro consist of 79 percent[3]. Therefore, most Turkish exporters are exposed to exchange rate risk. The CIA payment also reduces the risk of exchange rate exposure by shortening the time lag between the contract date and the payment date, see Panel A.

So there is no complicated decision-making regarding payment methods for exporters: Exporters prefer the CIA. Fixing all other negotiable components of contracts and controlling for characteristics of exporter and importer, we should observe CIA payment method is a more likely outcome for exporters with stronger bargaining power. The bargaining power of an exporter may arise from various sources, but the productivity of the exporter is one of the most important sources[4].

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[1] Some studies examine the optimal choice of exporters on the payment method: Antras and Foley (2015), Hoefele et al. (2016), Demir and Javoricik (2018), Türkcan and Avsar (2018), and Doan et al. (2020). With a focus on CIA in this study, we contribute to the literature by highlighting the importance of transaction size in determining the optimal payment method.

[2] From the perspective of importers, an importer faces delivery risk with a CIA contract and therefore prefers OA.

[3] We cleansed the dataset by dropping unreliable, unbalanced, small value trade (less than 1,000 dollars), or small firms (less than 5 employees) data. In the raw sample, including small transactions and small firms, the use of foreign currency as invoicing currency is more prominent. The use of the Turkish lira was only 10.94 (9.14) percent of all exports in 2017 (2016).

[4] Bernard et al. (2003) assume Bertrand competition for exporters in the n-country Ricardian model. In their model, a more efficient exporter is more likely to set a higher markup, and as a result, the observed productivity is also higher. By examining Canadian import transaction data, Goldberg and Tille (2014) find supporting evidence that an exporting industry with a higher market share uses more frequently producer currency invoicing, which is a more favorable contract for an exporter.

So our working hypothesis is that a more productive exporter is more likely to choose CIA payments than a less productive exporter, see Figure 2. Using Turkish exports at the transaction level, we evaluate the likelihood of choosing CIA payment methods with firm-level productivity.

We should not oversee another essential aspect of payment contracts: Exporters need to offer the type of payment contracts to potential importers, considering the cash constraint of importers. Panel C describes potential importers' participation patterns for a given set of payment methods. Some importers may not be able to prepare payments in advance, especially for a transaction involving a large amount of payments. Table 1 confirms this intuition. Panel (i) consists of all types of payment contracts, whereas Panel (ii) only includes those export transactions with CIA payment contracts. Many features, such as the productivity of exporters and the use of foreign invoice currency, are similar between the two panels. However, there is one clear distinction between the two panels. The size of transactions is smaller for CIA users. The value of exports is about half the size[5]. We evaluate the effect of transaction size on the nexus of productivity and the CIA in the extended model.

The rest of the paper is organized as follows. The next section describes how two sets of Turkish firm-level data are matched for this research. Section 3 provides the conceptual background for our empirical model. Section 4 describes the estimation results for how the CIA payment method is chosen by Turkish exporters. Section 5 concludes.

2. Turkish Firm-level Datasets

2.1. Database

For the empirical analysis, we use two firm-level databases called Foreign Trade Statistics (FTS) and Annual Industry and Service Statistics (AISS), which are both provided by the Turkish Statistical Institute (TurkStat)[6]. The first data set, FTS, provides detailed information on the universe of Turkey's trade transactions for the period 2002-2017. In addition to the firm identification number, this dataset contains information on many important transaction characteristics, including 12-digit product code, the value of the transaction, the quantity of traded goods, source and destination country, the type of payment methods, the type of currency invoicing among other sets of information. Types of payment methods are grouped into five categories: OA, cash against documents, CIA, letter of credit, and others.

The second dataset for our analysis is derived from the AISS, which provides detailed information on many firm characteristics over the period 2009-2017, including firm identification number, 4-digit NACE (revision 2) sector of primary activity, turnover, employment, input costs,

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Combining these results, associating stronger bargaining power with higher productivity is innocuous.

[5] Also, exporters that use CIA contracts are smaller. They are smaller in terms of the number of products, production size, and employees; they are about half the size.

[6] The studies using Turkish firm-level data are La Turco and Maaggioni (2014), Cebeci and Fernandes (2014), Çoçar and Demir (2016), and Demir and Javorcik (2018).

value added at factor cost, and production value. By merging these two databases through a firm identification number, we can generate firm-level observations that capture Turkish firms' trade and business activities. The latter database allows us to compute firm-level productivity.

2.2. Statistical summary of Turkish exporters

In the AISS dataset, approximately three million firms are recorded each year. By matching the AISS dataset with the FTS dataset using a unique corporate identification number, we find that trading firms in Turkey are only about three percent of all firms. Because the FTS dataset records data for each transaction, there are about 40 transactions annually per trader.

In terms of the number of transactions in 2017, the most popular payment method is OA (65.8%), and CIA (21.45%) follows next. Many of the major trade partners of Turkish exporters are in Europe; Germany (5.8%), the United Kingdom (2.8%), France (2.6%), Italy (2.6%), Bulgaria (2.5%), and Romania (2.1%). Turkish exporters also trade with neighboring countries in the Middle East and Asia; Iraq (4.2%), Azerbaijan (2.8%), and Georgia (2.8%).

3. Empirical Model

We presume that the more efficient (productive) firms via the mechanism in Melitz (2000) are in a better bargaining position over the payment contract. We use labor productivity, calculated as 'production value' divided by 'number of employees' in the AISS dataset, as a proxy for the efficiency (or productivity) of exporters.

We estimate the following probit regression model:

$$y_{ijkt} = \tau_t + \beta \ln productivity_{it} + \sum_{h=1}^{H} \gamma^h X_{ijt}^h + \varepsilon_{ijkt} \quad , \tag{1}$$

where y_{ikt} denotes a binary variable indicating one for the use of CIA payment method for Turkish exporter i to country j for transaction k in year t. Time dummy is denoted by τ_t. Individual exporter dummy is avoided because of the computation burden due to the number of exporters being close to one hundred thousand. Country dummy is not introduced because one of the control variables is time-invariant, i.e., namely distance. The disturbance term denoted as ε_{ijkt} is robust standard errors with clusters for HS 4-digit level of export products. The productivity of Turkish exporter i in year t is in natural log, and other control variables are denoted by X_{ijt}^h. Regarding the choice of payment method, we expect that more productive exporters choose CIA because we assume that their bargaining power proportionately increases with productivity. By considering dependent variables being binary in the selection of estimation methodology, we choose the probit model as suitable for the estimation of the above empirical model.

The extended model that considers the value of the transaction is the following.

$$y_{ijkt} = \tau_t + \beta^0 \ln productivity_{it} + \beta^1 \ln productivity_{it} \cdot \ln exportvalue_{ijkt} + \beta^2 \ln exportvalue_{ijkt} + \sum_{h=1}^{H} \gamma^h X^h_{ijt} + \varepsilon_{ijkt} \quad , \qquad (2)$$

Importers may face the cash constraint for large-sized transactions and hesitate to accept the CIA contract. Therefore, we expect a negative coefficient for the export value[7].

4. Empirical Results

4.1 Productivity and the cash-in-advance payment contracts

The bargaining power hypothesis in this investigation is that an exporter with higher productivity is more likely to choose CIA payment methods, as shown in Figure 2. To this end, we estimate the probit regression for the CIA payment method with individual exporters' productivity, control variables for importing countries, and firms' characteristics.

Column 1 in Table 2 provides the estimation results for the choice of CIA payments. The estimated results on characteristics of importers are consistent with the expected signs: A higher exchange rate volatility of importers' currency and a less-stringent rule of law in an importing country lead to a higher likelihood to choose the CIA. However, contrary to our hypothesis, a more productive exporter is less likely to choose CIA payments. We suspect that some obstructions hinder a high-productivity exporter from choosing CIA payments. For this explanation, we turn to importers' credit conditions that become sensitive to the size of the transaction value.

4.2 Firm size, transaction size, and non-linearity

How does the transaction size relate to the choice of payment methods? The aggregate overview of this relationship is depicted in Figure 3. The broken line represents the share of the CIA on the horizontal axis of the percentile of transaction values. The use of CIA payment contracts is decreasing in the values of transactions. The share of CIA payment at the 10th percentile is 20.8 percent, and that at the 90th percentile is 15.9 percent. In terms of dollar values, the transaction size at the 10th percentile is 1,580 dollars, and the transaction size at the 90th percentile is 147,272 dollars. The monetary size difference between these two is approximately 100 folds. We take this naïve evidence of transaction size effect on the avoidance of CIA payment method to the probit regression analysis in the followings.

Columns 2 through 5 provide estimated results of probit regression that include the

[7] The payment type and the transaction size are determined simultaneously. However, we do not worry about the simultaneous bias in this framework because the transaction size is pre-determined by the demand of downstream firms or consumers in an importing country, whereas the choice of payment type is negotiable.

transaction size variable independently and an interaction term with the productivity variable. Column 2 confirms the findings with Figure 3 that the use of CIA is less likely for a larger value of Turkish exports. More importantly, the effect of productivity is still negative but is no longer statistically significant. We also examine the effect of exporters' size by using the number of employees; however, none of the estimated coefficients in any specifications is statistically significant.

Column 5 additionally controls for non-linearity of productivity on the payment choice by including the squared term of productivity. Interestingly, the estimated coefficient of productivity becomes positive and statistically significant. In addition, the negative and statistically significant estimate of the squared reveals that the CIA contract is associated in a hump shape with the productivity of Turkish exporters. As a Turkish exporter develops from low-productivity to medium-productivity, an exporter steps up to a better bargaining position to sign a CIA contract that favors an exporter. However, as a Turkish exporter further grows to be a high-productivity firm, an exporter's capacity to tolerate payment risk will be larger. Offering other payment methods but CIA will expand the breadth of possible importers. At last, the negative effect of transaction size still holds true when non-linearity of productivity is accounted for.

5. Conclusion

By combining two sets of firm-level databases in Turkey for the period between 2002 and 2017 with the base regression model, we find that the CIA payment method is less used for a more productive exporter. The extended model with the cash-constrained importer hypothesis includes the value of transactions. We find that transaction size matters: exporters are more likely to avoid the CIA payment when the export value is larger. Moreover, we also find a positive relationship between productivity and the use of CIA payment when we control for the transaction size and the non-linearity of productivity.

We should note one caveat: importers face the no-delivery risk with the CIA and the impact of no-delivery increases with the transaction size. The delivery risk of importers may explain the transaction size effect. It is beyond the scope of this study, but combining the firm-level data on importers with the current dataset merits further investigations. Either way of cash-constrained or fear of no-delivery, an offer of a non-CIA contract to a potential importer is more likely to make a deal.

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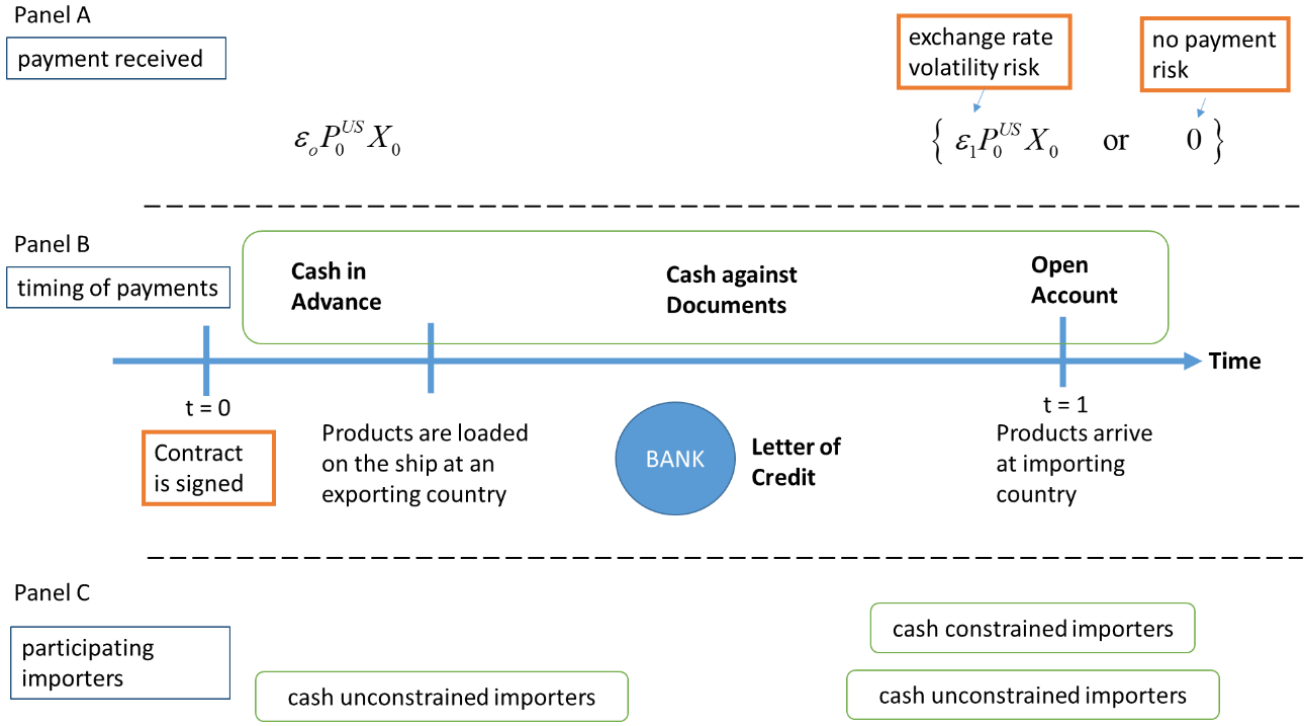
Figure 1. Timing of payments, payments received by exporters, and participating importers



Notes: The timing of the CIA payment is simplified to occur at the time of signing the contract, t = 0.

Figure 2. Exporters' productivity and the expected use of cash-in-advance contract

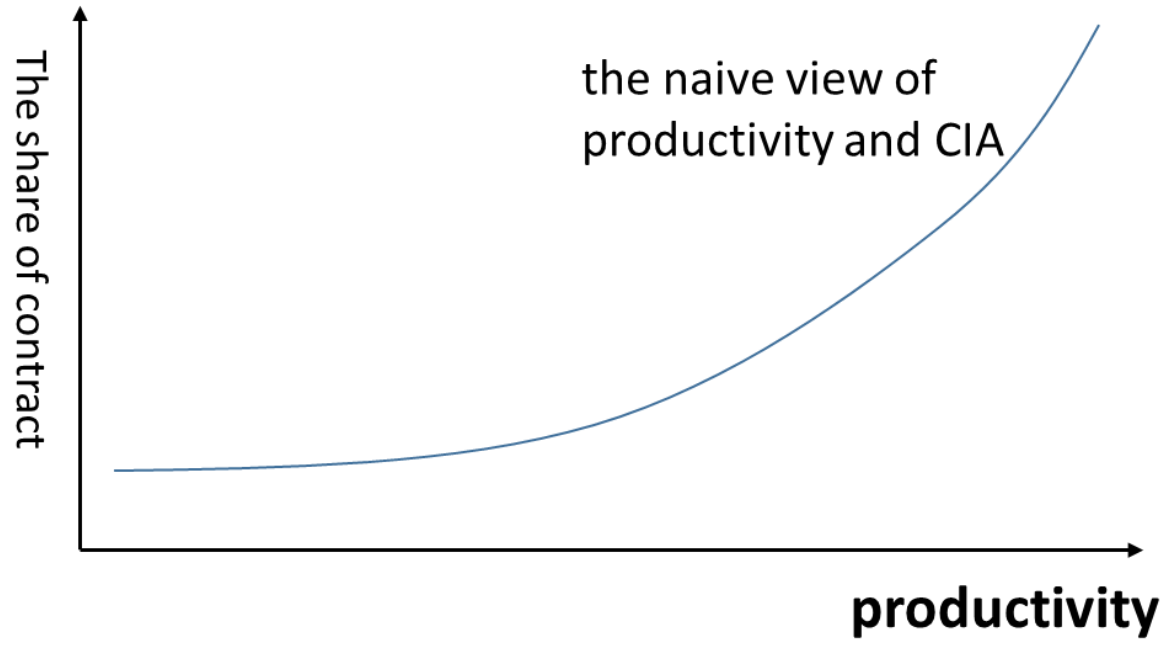
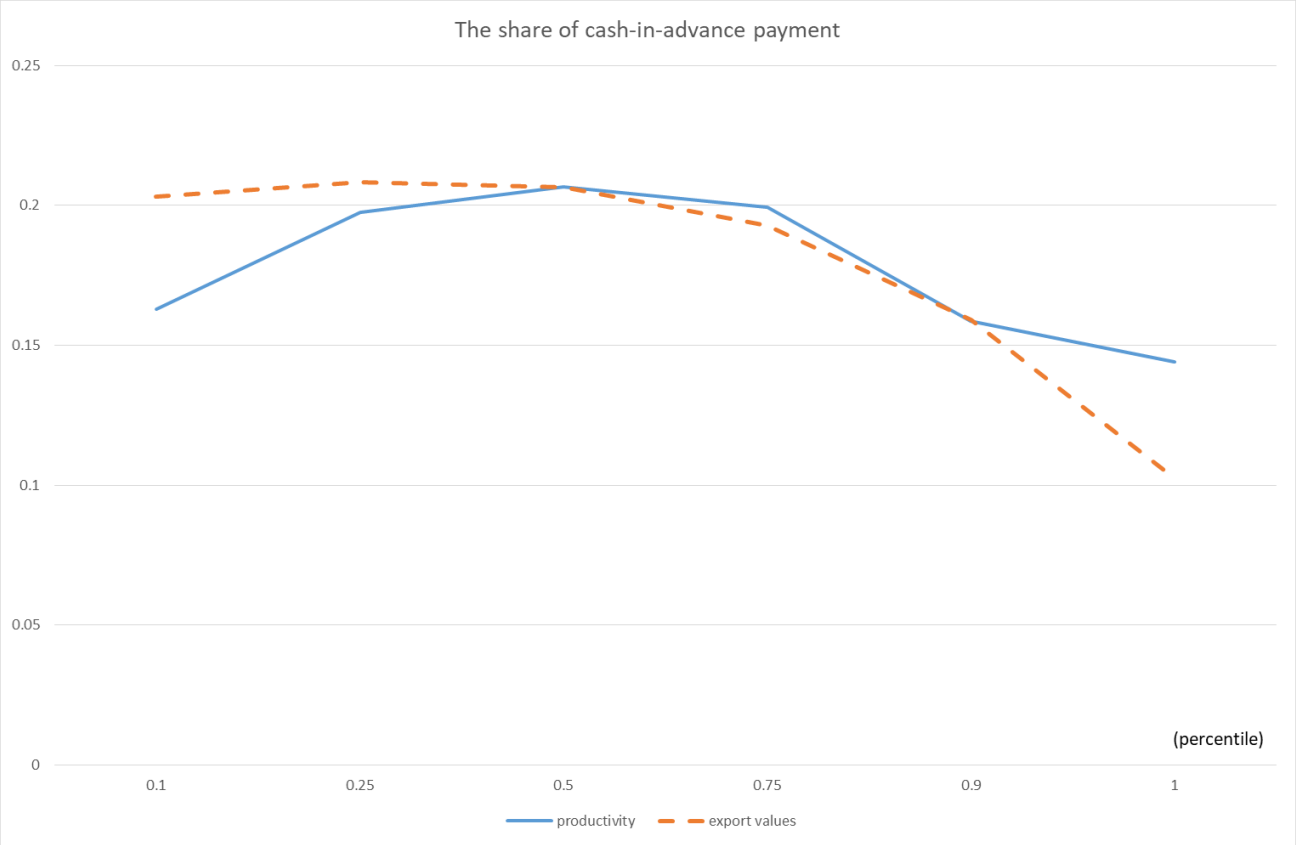


Figure 3. The use of cash-in-advance payment by productivity and export values



Notes: Both lines represent the share of CIA payment methods. The horizontal axis is the percentile of the exporter's productivity or export values. The solid (broken) line is the share of CIA payment by the different levels of productivity (export values). The data points are evenly spaced horizontally for convenience, although the actual ranges between the two data points differ.

Table 1. Statistical Summary

Panel (i). All payment contracts

Variable	Obs	Mean	std dev	Min	Max
ln productivity	6,768,727	12.32	1.20	-6.69	19.82
Dollar	6,790,526	0.47	0.50	0.00	1.00
Euro	6,790,526	0.32	0.47	0.00	1.00
ln GDP (partner)	6,498,144	26.11	1.88	17.12	30.60
ln distance	6,506,349	7.63	0.66	6.57	9.78
reer	5,899,339	1.11	1.16	0.00	8.56
rule of law (partner)	6,565,937	0.12	1.10	-2.45	2.10
number of products	6,790,526	72.85	147.83	1	1,609
number of destination	6,790,526	23.19	25.90	1	145
production value (millions)	6,789,884	203.00	1170.00	-1290	51,700
number of person employed	6,790,526	404.09	1752.07	0	30,341
export value in dollar	6,790,526	146,523	3,186,447	1001	3,600,000,000

Panel (ii). Cash in Advance payment contracts

Variable	Obs	Mean	std dev	Min	Max
ln productivity	1,256,799	12.27	1.05	-5.14	19.82
Dollar	1,259,151	0.50	0.50	0.00	1.00
Euro	1,259,151	0.26	0.44	0.00	1.00
ln GDP (partner)	1,196,734	25.82	1.80	17.38	30.60
ln distance	1,200,305	7.56	0.67	6.57	9.78
reer	1,068,925	1.05	1.20	0.00	8.56
rule of law (partner)	1,215,234	-0.04	1.03	-2.45	2.10
number of products	1,259,151	31.48	66.84	1	1,543
number of destination	1,259,151	19.79	21.88	1	145
production value (millions)	1,259,146	117.00	891.00	-1290	51,700
number of person employed	1,259,151	216.38	938.20	0	30,341
export value in dollar	1,259,151	70,337	4,605,198	1,001	3,600,000,000

Notes: Production values and the number of persons employed are at the firm level from the AISS. Productivity is calculated as the ratio of production values over the number of persons employed. Dollar (Euro) is the share of invoicing currency, and the export value in the dollar is from the FTS. GDP and the rule of law are extracted from World Bank 's World Development Indicators (WDI), whereas distance is obtained from the CEPII's GeoDist database. Bilateral real exchange rates are computed by using bilateral nominal exchange rates (i.e., foreign currency per US dollar) and consumer price index (CPI) taken from the World Bank's World Development Indicators (WDI). The number of products and destinations are calculated by the authors.

Table 2. Probit estimates of cash-in-advance payment

	dependent variable: cash in advance payment (binary values)				
	[1]	[2]	[3]	[4]	[5]
ln(GDP pc)	0.012 ***	-0.067 ***	-0.073 ***	-0.067 ***	-0.067 ***
	(0.004)	(0.011)	(0.011)	(0.011)	(0.011)
ln(distance)	-0.052 ***	-0.086 ***	-0.087 ***	-0.086 ***	-0.087 ***
	(0.007)	(0.008)	(0.079)	(0.008)	(0.008)
reer	0.010 ***				
	(0.002)				
rule of law	-0.145 ***				
	(0.011)				
no of products	-0.003 ***				
	(0.000)				
no of destinations	0.000	-0.003 ***	-0.002 ***	-0.002 ***	-0.002 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln(productivity)	-0.022 ***	-0.019	-0.021 **	-0.010	0.214 ***
	(0.006)	(0.014)	(0.008)	(0.017)	(0.039)
ln(expor value)		-0.054 **		-0.047 **	-0.096 ***
		(0.023)		(0.023)	(0.024)
ln(productivity)・ln(export value)		0.000		-0.001	0.003 *
		(0.002)		(0.002)	(0.002)
ln(employees)			0.013	-0.010	0.004
			(0.040)	(0.041)	(0.043)
ln(productivity)・ln(employees)			-0.004	-0.002	-0.003
			(0.003)	(0.003)	(0.004)
$\{\ln(\text{productivity})\}^2$					-0.011 ***
					(0.011)
constant	-0.505 ***	0.891 ***	0.549 ***	0.864 ***	-0.215
	(0.110)	(0.240)	(0.180)	(0.286)	(0.384)
nob	5,787,587	6,414,323	6,414,323	6,414,323	6,414,323
Wald chi2	4691.25	4220.37	4607.85	4483.67	4521.84
Pseudo R2	0.0496	0.0266	0.0237	0.0280	0.0292
Log pseudo-Likelihood	-2597094.1	-2978961.2	-2987876.9	-2974581.2	-2970977.1

p-values are in parentheses (*p-value<.10, **p-value<.05, ***p-value<.01)

Notes: The dependent variable is the binary variable which takes the value of one if CIA payment method is chosen for a given transaction and zero if vice versa.