



Customs



Christian Volpe Martincus^{a,*}, Jerónimo Carballo^b, Alejandro Graziano^a

^a Inter-American Development Bank, USA

^b University of Maryland, USA

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ABSTRACT

All international trade transactions are processed by custom agencies and such processing takes time. Despite the fact that time is a key trade barrier, the time it takes for shipments to clear customs and how customs' processing times affect firms' exports remain largely unknown. In this paper, we precisely estimate the effects of custom-related delays on firms' exports. In so doing, we use a unique dataset that consists of the universe of Uruguay's export transactions over the period 2002–2011 and includes precise information on the actual time it took for each of these transactions to go through customs. We account for potential endogeneity of these processing times by exploiting the conditional random allocation of shipments to different verification channels associated with the use of risk-based control procedures. Results suggest that delays have a significant negative impact on firms' exports along several dimensions. Effects are more pronounced on sales to newer buyers.

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1. Introduction

Time matters in international trade. In a seminal paper, [Hummels \(2001\)](#) shows that each additional day spent in transit reduces the probability that the United States sources a manufactured good from a given country by 1.5%.¹ These transit times are influenced by many factors, including actions of public agencies that intervene in the administrative processing of trade flows. This is particularly the case with customs, which oversee the compliance of shipments with trade regulations. In fact, customs are the gatekeepers of international trade. All transactions leaving or entering countries must be processed by their customs agencies and such processing takes time. How long does it take for a shipment to clear customs? The simple answer to this question is that, so far, we do not really know beyond some “perceived national averages” based on indicators such as those from the World Bank's Doing Business. The truth is, however, that the actual within-country distribution of customs delays is far from degenerate. Thus, for example, export processing times by the Uruguayan customs ranged between 1 and 31 days

in 2011.² Hence, customs-driven, transaction-specific delays can be substantial and highly variable, thus naturally affecting delivery dates. Accordingly, they could have significant effects on buying and selling decisions and thereby on firms' export outcomes. Nevertheless, evidence in this regard is virtually non-existent. In this paper, we fill precisely this gap using an unprecedented dataset for Uruguay that consists of the entire universe of export transactions and, for the first time to our knowledge, real customs clearance times and information on the individual buyers over the period 2002–2011. Furthermore, by exploiting the institutional design of the customs processes combined with this novel dataset, we properly address potential endogeneity of these clearance times.

Delays associated with customs inspections can be seen as trade costs accruing to each transaction. Exporters can respond to these costs by adjusting the number and size of their shipments to given destinations, which could potentially result in changes in their foreign sales, and the intensity of this adjustment can vary across products depending on their characteristics ([Hornok and Koren forthcoming-b](#)).³ On the

* Corresponding author at: Inter-American Development Bank, Stop W0610, 1300 New York Avenue, NW, Washington, DC 20577, United States of America. Tel.: +1 202 623 3199; fax: +1 202 623 2995.

E-mail address: christianv@iadb.org (C. Volpe Martincus).

¹ [Hummels \(2001\)](#) estimates that such a day is worth 0.8% ad valorem for manufactured goods. In the last version of this study, [Hummels and Schaur \(2013\)](#) report that each day in transit is equivalent to an ad valorem tariff ranging between 0.6% and 2.3%.

² To put these figures into perspective, 31 days triples the time required to ship a good from Montevideo, Uruguay's main port, to Baltimore in the United States and amounts to 1.5 times the time needed to reach Singapore. These shipping times have been taken from Sea Rates (www.searates.com), a sea-freight broker based on Miami, assuming a vessel speed of 20 kt (e.g., [Berman et al., 2012](#)).

³ [Hornok and Koren \(forthcoming-a\)](#) develop a simple model of shipping frequency which highlights the trade-off faced by exporters in the presence of such per-shipment costs.

buyer side, timely delivery is a key criterion for choosing a trading partner.⁴ For instance, case study-based evidence indicates that if bicycles arrive in the United States warehouses of importers or wholesalers in May instead of April, the season sale peak will be missed, which can result in increased inventory costs and lower prices. When products are subject to fashion cycles deliveries, delays by a few days can be similarly disruptive (Egan and Mody, 1992). Demand for timely delivery has even been increasing in recent decades, as suggested by the rising share of air cargo in international trade (Hummels, 2007a). Among other factors, this growing importance of timely delivery can be traced back to the dissemination of business practices such as just-in-time manufacturing and lean retailing. These practices, which aim to minimize inventories and their costs, require frequent replenishments of inputs or goods to respond quickly to new market information and cope with demand (e.g., Abernathy et al., 1999; Evans and Harrigan, 2005; Harrigan and Venables, 2006). Importantly, these developments take place in a context of spatial fragmentation of value chains. Thus, production processes increasingly involve a sequential, vertical trading chain that interconnects several countries and require these connections to be timely (Hummels et al., 2001, 2007b).⁵ Delayed delivery of critical inputs from other countries can stop production, which can generate significant costs that can be transmitted throughout the value chain (Harrigan and Venables, 2006; Nordas et al., 2006).⁶ Furthermore, such supply chain disruptions have noticeable economic impacts. For instance, firms suffering from these disruptions tend to have lower stock returns relative to relevant counterparts (Hendricks and Singhal, 2009). It is therefore not surprising that companies proactively seek to diversify their suppliers' base and to reduce sourcing from providers with high variability in their lead times.

Since customs procedures add to the transit time between origins and destinations, custom agencies play a crucial role in facilitating or hindering exports and imports.⁷ A number of papers have estimated gravity models and variants thereof to examine the effects of total time to trade, customs and technical control times, and time at the border on aggregate bilateral trade (e.g., Djankov et al., 2010; Freund and Rocha, 2011; Hornok, 2011), sectoral bilateral trade (e.g., Martínez-Zarzoso and Márquez-Ramos, 2008; Bourdet and Persson, 2010; Zaki, 2010), the product extensive margin (e.g., Persson, 2010), the destination extensive margin (e.g., Nordas, 2006), and the frequency and size of shipments (Hornok and Koren, forthcoming-b) for various samples of countries and product categories.⁸ A few studies use firm-level trade data to explore the influence of time to clear customs on export statuses, export intensity, and destination diversification (Dollar et al., 2006; Yoshino, 2008; Li and Wilson, 2009a, 2009b).⁹ These papers conclude that customs delays have a significant negative impact on export outcomes, especially for time-sensitive products.

While certainly insightful, this literature has two main limitations, which make the evidence on how customs processing times affect firms' export performance at best preliminary and incomplete. First, most analyses rely on cross-country variation in *perceptions* of customs

delays to identify the effects of interest. This identification strategy has the drawback that unobserved country characteristics that are relevant for trade and potentially correlated with perceived administrative delays are not satisfactorily controlled for. More generally, endogeneity problems are not convincingly addressed. Second, virtually all studies utilize the single-value, country-level measure of time to trade (or its components) from the World Bank's Doing Business Indicators.¹⁰ These indicators are very useful as a first approximation, but they have shortcomings that are mainly related to the coverage and underlying assumptions of the survey, which in turn echoes in their precision, and to the fact that relevant heterogeneities are out of the picture. In this paper, we aim to fill the aforementioned gaps in the literature while overcoming the estimation and data problems discussed above.

More precisely, this paper addresses three main questions: what are the effects of delays associated with customs processing of shipments on firms' exports? What are the channels through which these effects arise? To what extent are these effects heterogeneous? In answering these questions, we make several contributions to the existing literature. First, we present entirely new, actual measures of the exact time that it takes to complete customs procedures based on official data that cover the whole universe of a country's transactions and hence of its exporters over a long period of time, 2002–2011.

Second, we provide robust evidence on the effects of these customs delays on firms' export outcomes based on estimations that properly address endogeneity concerns associated with both potential reverse causality (i.e., larger shipments may take longer to clear customs) and simultaneity (i.e., shipments from less well prepared firms are likely to spend more time in customs and be less demanded abroad). Specifically, in order to identify their impacts on firms' exports, we exploit the conditional random variation in clearance times associated with the customs procedures: conditional on firms and product–destination combinations, shipments can be considered to be randomly allocated to physical inspection. Depending on whether shipments have to go through this material verification or not, processing times and thereby transit times increase for some exports while those for others remain the same. We therefore instrument observed delays with the allocation to merchandise control and primarily compare the before and after change in exports subject to increased delays with that in exports that did not suffer from additional delays while rigorously controlling for potential confounding factors. This allows us to consistently estimate the effects of interest. Such effects develop incrementally with the successive transactions over a one year period. We also present the respective ordinary least squares (OLS) estimates, which, notably, convey the same message as their instrumental variable (IV) counterparts.

Admittedly, our identification strategy faces two main challenges. Since variation primarily comes from random shocks to time-in-customs (i.e., deviation from expectations) we might arguably not see any impact on trade. However, this is only true under perfect information. If, as most likely is the case, buyers are imperfectly informed about the reasons behind unexpected delays in delivery, this neutrality does not necessarily hold. We provide evidence thereon mainly by distinguishing between newer and older buyers. The other limitation is that, by the law of large numbers, allocation to verification channels would tend to its population values when exports consist of a relatively large number of shipments passing through the customs. We address this concern by restricting the estimation sample to exports made up of a relatively small number of transactions.

Third, we disentangle the channels through which the effects arise, including the buyer channel as a novelty. Finally, our results provide guidance for future theoretical work on the impact of time on trade

⁴ In a survey conducted in 2011 by BDP International, one of the leading transport and logistics management companies, on-time delivery appeared as the most important concern for supply chain management.

⁵ Clark et al. (2013) show that a 10% increase in supply chain uncertainty as proxied by the deviation of actual arrival dates from expected arrival dates is associated with a 4.2% reduction in imports.

⁶ For example, episodes of production suspensions in companies such as BMW or Nissan due to the delays in arrival of key components caused by the eruption of a volcano in Iceland attest to how critical on-time delivery is in a world in which production is spread across countries.

⁷ In fact, according to lead companies interviewed for the "OECD/WTO Aid for Trade Monitoring Survey", streamlining of customs procedures to reduce border delays is one of the most effective public actions that can help engage suppliers from developing countries into their value chains.

⁸ Wilson et al. (2005) and Portugal-Perez and Wilson (2010) investigate how the customs environment and border and transport efficiency affect total bilateral trade.

⁹ These firm-level studies tend to use relatively small samples of manufacturing firms of heterogeneous countries that are pooled together for estimation purposes.

¹⁰ Some studies use trade facilitation measures from the World Bank's Logistic Performance Index (e.g., Hoekman and Nicita, 2012) and the World Bank's Enterprise Surveys (e.g., Hoekman and Shepherd, 2013; Shepherd, 2013). Like those originated from the Doing Business Indicators, these measures also have noticeable limitations in capturing firms' experiences with customs.

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