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More Speed, Less "Speed Money": Asia-Pacific Firm-Level Evidence on Border Crossing Times as Corruption Incentives

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MORE SPEED, LESS "SPEED MONEY":

ASIA-PACIFIC FIRM-LEVEL EVIDENCE ON BORDER CROSSING TIMES AS CORRUPTION INCENTIVES

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Abstract: This paper shows that the longer it takes firms to move their goods across borders, the more likely they are to be involved in bribing customs and border protection officials. Trade facilitation measures, which lower border crossing times, can therefore help limit trade-related corruption. To support these conclusions, the paper primarily relies on firm-level data on corruption and trade times from the World Bank's Enterprise Surveys. Results are highly robust to alternative specifications and data sources. Moreover, the data suggest that the association between border crossing times and corruption is particularly strong in the Asia-Pacific region. Increased policy attention to trade facilitation could therefore benefit the region both by increasing trade, and helping reduce corruption. Targeting anti-corruption resources at time-sensitive sectors is also likely to have particularly large payoffs. Finally, instigation of a legal "fast track" through customs and border procedures is a way of bringing corrupt, but economically useful, transactions back into the formal economy. [156 Words.]

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1. Introduction

The phenomenon of "speed money" is pervasive in many parts of the world: firms make informal payments in order to "get things done", and more specifically to get their goods across borders as quickly as possible. What can policymakers do to help bring these kinds of payments under control, and thereby reduce the negative effects that corruption has on economic performance and international integration?

This paper suggests a simple answer, which surprisingly has received little attention in the literature: the incentive to pay speed money can be reduced by increasing the official speed of border crossings. A rich, firm-level dataset from the Asia-Pacific provides robust evidence to back up this claim. The fact that these data cover multiple firms in each country makes it possible to focus clearly on the link between trade times and corruption, and to exclude other country-, sector-, and time-specific factors that might otherwise be put forward as alternative explanations for observed corruption prevalence.

The analysis and results in the present paper extend existing work in two main ways. First, establishing a link between trade times and informal payments broadens the range of factors believed to create an incentive for firms and customs officials to engage in corrupt transactions. Fisman & Wei (2004) have shown that higher tariff rates create an incentive for firms to engage in evasion, and thus tend to contribute to higher rates of corruption. Dutt (2009) confirms their results for a wider range of trade policies. In addition, Fisman & Wei (2007) find that restrictive regulations on trade in certain types of goods have similar effects. The only study that looks at the role of time and delays as possible sources of corruption incentives is Sequiera and Djankov (2009). However, their analysis is limited to a small number of ports in Africa, and cannot at this stage be generalized to other regions and contexts.

Second, the evidence presented here tends to suggest that existing work may underestimate the gains resulting from improved trade facilitation, because it focuses only on the direct effects of reducing border crossing times. However, there is ample evidence that corruption can also constitute an important source of trade costs (Anderson & Marcouiller 2002). Trade facilitation policies might therefore have significant second round effects too: faster border crossing times increase trade, but also decrease corruption, which then provides an additional boost to trade.

The paper proceeds as follows. Section 2 presents a conceptual framework to motivate the search for an empirical connection between trade times and corruption. Three different mechanisms by which time can have commercial value, and thus create an incentive to pay “speed money”, are explored: time sensitivity of goods; participation in international production networks; and responsiveness to demand shocks. In section 3, the paper’s principal claim is taken to the data. Two empirical approaches are adopted: firm-level regressions, controlling for a wide range of external influences, identify a robust association between trade times and corruption; and country-level regressions show that the link is particularly strong in the Asia-Pacific relative to other regions. Section 4 concludes, and discusses the policy implications of the paper’s findings.

2. Conceptual Framework

This section motivates the empirical work conducted in the rest of the paper. Its main aim is to develop a series of incentive-based mechanisms that could explain a positive relationship between trade times and corruption prevalence (see Bardhan 2006 for a general review of this approach). The three mechanisms presented here all rely on the same basic intuition. It can be of significant commercial value to a firm to be able to export or import goods more speedily. Conversely, import and export delays can impact negatively on firm performance and profitability. As a result, firms may be prepared to make a payment in order to be able to export and import more quickly. Where such a transaction takes the form of “speed money”—namely a gift or unofficial payment—it can be beneficial to the firm provided that the commercial value of quicker trade times outweighs the risk-weighted penalty due to detection and punishment. In short, longer trade times—or conversely, poor trade facilitation practices—can create an incentive for firms and customs agents to engage in corrupt transactions.

Existing theoretical work in this area largely focuses on the case of tariffs, rather than time, as the source of corruption incentives in trade. For example, Dutt and Traca (Forthcoming) develop a model in which officials choose endogenously between extortion or evasion behaviors, driven in part by the prevailing level of tariffs. In the broader literature on corruption, Ades and Di Tella (1999) emphasize the importance of rents, using natural resources or imperfect competition in product markets as examples. The conceptual framework presented here can be seen as related, but with the rents coming from the ability to trade more quickly. Lui (1985) and Batabyal and Yoo (2007) consider bribery in the context of a queuing model. Different opportunity costs of time across individuals drive selection into bribery. The framework in this paper develops a number of possible micro-foundations for the existence of different opportunity costs of time that lead firms to self-select into those that pay speed money, and those that do not.

The remainder of this section focuses in more detail on three specific mechanisms that support the claim that quicker trade times can be of commercial value to firms: time sensitivity of goods; international production networking; and responsiveness to demand shocks.

a. Mechanism 1: Time Sensitive Goods

Some products are necessarily more sensitive to time delays than others. The most obvious example is perishable goods, such as many agricultural products. In addition, some industrial products are associated with firms that employ "just-in-time" management techniques in an effort to reduce inventory carrying costs. These goods—such as consumer electronics and some kinds of electrical machinery—are also particularly likely to be at the center of international production networks (see below). Clearly, whatever the source of time sensitivity—perishability or management practices—the ability to move these goods across borders quickly and reliably represents a significant commercial advantage to producers. Indeed, the ability to trade in such goods at all may depend crucially on the speed of customs clearance and transport. In cases where customs and border procedures represent an important source of delays, producers therefore have an incentive to make a side-payment in order to achieve quicker clearance.

Recent empirical evidence supports the importance of time as a factor in determining international trade costs and trade flows. Hummels (2001), for example, finds that an additional day's transport time reduces the likelihood that the USA will source from a given country by 1-1.5%. By exploiting variation in the choice of shipping method—air versus sea—he confirms that lower trade times indeed represent a source of commercial value to some firms. One additional day of shipping represents a loss of nearly 1% of the value of the goods being traded.

Djankov et al. (Forthcoming) extend those results using new Doing Business data on export times. Using a gravity model, they find that time is an important determinant of bilateral trade. In addition, they find evidence that countries with faster export times tend to specialize in the export of time sensitive goods. Their analysis applies to perishable agricultural products, as well as to time-sensitive manufactures goods. In both cases, the evidence is suggestive of a mechanism whereby firms value trade times due to the time sensitivity of the goods they produce.

b. Mechanism 2: International Production Networks

The rise of international production networks has been a notable feature of international trade patterns over the last couple of decades. Ando & Kimura (2003) show that this evolution is particularly striking in East Asia, where international production networks have come to represent a significant part of overall regional trade. The same authors analyze these networks in terms of two principal features. First, final goods production processes are divided vertically across a number of countries. Different countries provide different inputs, and perform different intermediate transformations. Second, the production processes are linked into sophisticated global distribution networks. Some sectors are clearly more easily adapted to this form of operations than others. They include machinery and electrical goods, as well as textiles and clothing.

Coordinating operations within international production networks requires a high degree of management sophistication. Moreover, these networks can only function properly if the various parts of the production process can be brought together reliably, and at relatively small cost. This means that the transaction costs associated with trade play an important role in determining the depth and breadth of production networking. The analysis by Ando & Kimura (2003) suggests that changes in tariff policies have played an important role in promoting production networks in East Asia. But the same authors argue that their future development will require greater attention to other types of trade costs, including trade facilitation and border procedures. Trade facilitation not only directly decreases trade costs, but it can also increase the speed at which goods can cross borders. It can therefore make it easier to manage vertically disaggregated production processes, at the same time as reducing inventory costs for producers. This dynamic suggests a second mechanism by which trade time could be of particular commercial value to firms currently involved in, or on the fringes of, internationalized production.

c. Mechanism 3: Response to Demand Shocks

Evans and Harrigan (2005) develop a "lean retailing" model of international trade, and find some empirical evidence from the textiles and clothing sector that is consistent with the implications of their theoretical framework. The central intuition behind their model is that firms that move goods faster can be more responsive to demand shocks overseas. They can produce and ship at a higher frequency than slower firms, and thus can produce more in response to positive shocks, and less in response to negative ones. As a result, fast firms will tend to earn higher profits than slow ones. This dynamic represents an alternative way in which speed can be of commercial value to firms.

Their model is extended by Shepherd (2009) to include the case of a possibly corrupt customs official. In line with the analysis presented here, he finds that the commercial value of speed creates an incentive to make corrupt payments, or "speed money". Cross-country data on trade-related corruption, as well as bilateral trade data, provide strong empirical support for this mechanism.

3. Data, Empirical Models, and Results

Section 2 has set out three possible mechanisms by which trade times may be positively related to corruption prevalence, each of them grounded in the idea that speed is commercially valuable, and thus that firms are willing to pay to avoid delays. In this section, the hypothesis of a positive association between trade time and corruption is tested using a combination of firm-level and country-level data.

a. Data: World Bank Enterprise Surveys

As part of its Enterprise Surveys program (WBES), the World Bank has collected comparable survey data from nearly 100,000 firms in a total of 113 mostly developing countries, including in the Asia-Pacific region. In addition to standard financial and performance data, the WBES also seeks to identify the importance of a number of policy and governance constraints on firm growth and performance, including through their linkages with international markets via import and export transactions. These data include measures of corruption and trade times that will be central to the empirical analysis conducted in the remainder of this paper.

In a subset of countries, WBES survey teams ask firms to identify the prevalence of informal payments or "gifts", both generally within the economy, and specifically with reference to a number of government services. These services generally include customs authorities, and government bodies responsible for granting import licenses. In addition, firms are asked to provide data in relation to the average and longest times taken to import and export goods in the preceding year.

The WBES corruption data are subject to two important caveats. First, firms may be fearful of government reprisals if they admit to having engaged in corrupt transactions. This may lead to under-reporting of corruption. To mitigate this problem, the WBES questions are framed carefully, so as not to imply that the reporting firm itself made irregular payments. For example, firms are asked to respond to the following general question on corruption:

> "We've heard that establishments are sometimes required to make gifts or informal payments to public officials to "get things done" with regard to customs, taxes, licenses, regulations, services etc. On average, what percent of annual sales value would such expenses cost a typical firm like yours?"

They are then asked directly whether a "gift or informal payment was asked for or expected" to obtain various state services such as utilities connections, and—of particular importance here—import licenses.

In addition, the survey teams do not raise questions relating to corruption until well into the survey process, by which time some level of trust should have been established between surveyor and respondent. Before corruption is raised as an issue, respondents are reassured that all survey data are confidential, and that individual firms will not be identified. Although it is impossible to assess the extent of under-reporting that may be present, the precautions taken by WBES survey teams ensure that the data are of as high a quality as could be expected in the circumstances.

A second caveat is that cultural factors may lead respondents in different countries to have divergent views as to what constitutes a corrupt payment. To deal with this difficulty, WBES surveys usually refer to “gifts or informal payments”, rather than to corruption as such. The aim behind this formulation is to try and limit the role of culture in so far as possible: respondents are simply asked to focus on whether payments other than those contained in official texts were required. As with the first caveat, this approach ensures that the data are as reliable as possible, even though there is no way to be sure that formulating the question in this way eliminates the potential for cultural differences to result in under- or over-reporting. In any event, the empirical importance of this problem is limited in the present paper, due to the combined extensive use of fixed effects to control for country-invariant factors including corruption, and the use of cross-country and single-country (cross-firm) data.

Although subject to caveats, there is no doubt that the WBES data represent the best available source on corruption at the firm level. They have already been used in a number of published papers. Prominent examples include: Svensson (2003); Reinikka & Svensson (2006); and Fisman & Svensson (2007).

b. Exploratory Analysis

Before moving to a formal regression framework, it is useful to examine some features of the data that provide initial support for the hypothesis that there is a positive association between trade times and corruption.

One approach to the data is to examine whether or not corrupt firms tend to have quicker trade times than non-corrupt firms. Figure 1 does this using WBES data on the longest import times reported by firms. Those firms which report that a gift or informal payment was required when obtaining an import license are considered to be the only ones that are corrupt.

Comparing the distribution of trade times between corrupt and non-corrupt firms reveals two interesting facts. First, the kernel density estimated using data from corrupt firms shows a larger mass towards the left (short time) boundary, even though the overall shape of the two distributions is quite similar. Second, the kernel density for non-corrupt firms has a much longer right tail than does the density for corrupt firms. An apparent advantage of corrupt over non-corrupt firms would therefore appear to be the avoidance of extremely long trade times. Moreover, summary statistics suggest that reliability and predictability may be an additional benefit: the spread of import times is much narrower for corrupt firms than for non-corrupt ones. This finding lines up well with recent work by Arvis et al. (2007), which shows that uncertainty constitutes a high proportion of overall logistics costs for producers.

An alternative way of looking at the data is by aggregating them to the country-level. Corruption is measured by the percentage of firms that indicate having made a gift or informal payment in connection with obtaining an import license. To measure trade time, Doing Business data on official export and import times are used. As Figure 2 shows, these data clearly disclose an association between higher trade times and more prevalent corruption. It is also interesting to note that 10 out of the 12 Asia-Pacific economies included in this sample lie well above the full sample line of best fit. Inserting an additional line to capture the relationship between trade times and corruption prevalence in the Asia-Pacific indicates an even stronger association, and an apparently much greater sensitivity of corruption to trade times in this region.

At first glance, therefore, the data appear to lend considerable support to this paper's main claim. To investigate them in greater detail, the remainder of this section uses a variety of regression frameworks in order to control for intervening factors, and to better establish causality.

c. Firm-Level Regressions

Define the latent variable $Gift^{*}_{fcst}$, which is a measure of the probability of making a gift or informal payment to customs officials for firm *f* in country *c* and sector *s* at time *t*. All that can be observed in the data, however, is the binary variable *Gift*, which is equal to unity only if a firm indicates having made a gift to customs officials. By assuming that the relation between the latent and observed variables is:

$$Gift_{fcst} = \begin{cases} 1 & if\ Gift^*_{fcst} > 0 \\ else & 0 \end{cases} \tag{1}$$

it is possible to arrive at a baseline empirical model motivated by the conceptual framework from section 2, which explains corruption in terms of trade times, controlling for a range of other influences. The model takes the following form:

$$Gift^*_{fcst} = b_1 \ln(time_{fcst}) + b_2 \ln\left(\frac{sales_{fcst}}{employees_{fcst}}\right) + b_3 foreign_{fcst} + \sum_c \sum_s \sum_t d_{cst} + e_{fcst} \tag{2}$$

The first term on the right hand side, of course, is trade time. In terms of the conceptual framework set out above, we expect $b_1 > 0$. The second term is a simple measure of firm productivity—in fact, labor productivity—based on the level of sales per worker. Recent models of firm heterogeneity in international trade suggest that more productive firms may be able to earn higher profits in equilibrium. To the extent that corrupt customs agents can observe signals of high productivity, they may be able to extract larger bribes from such firms. If this type of mechanism is in operation, the expectation is that $b_2 > 0$. In addition, the baseline model includes an indicator variable (*foreign*) that is equal to unity only if the firm in question is at least 50% owned by foreigners. The rationale for including this variable is twofold. First, there is an extensive literature suggesting that foreign-owned firms tend to be more productive than their domestic counterparts (e.g., Doms & Jensen 1998). This would tend to increase the probability of making a gift. On the other hand, foreign firms—or at least their owners—are more likely to be subject to review by external authorities, and to be required to comply with global anti-corruption norms such as the OECD Anti-Bribery Convention. The overall impact of *foreign* on the probability of making a gift is therefore indeterminate ($b_3 <> 0$).

To control for a wide range of factors external to the firm, the model includes fixed effects by country-sector-year (d_{cst}). In the country dimension, the fixed effects control for influences such as national cultures, as well as the extent of anti-corruption laws, and the quality of their enforcement. By combining country and year fixed effects, the model also accounts for country-specific macroeconomic fluctuations. Sector fixed effects control for sector-specific technologies, as well as particular sector characteristics that might make trade, or making gifts, more or less probable. By combining sector and country fixed effects, the model allows for technology to differ across countries.

By assuming that the error term e_{fcst} follows a standard logistic distribution, parameter estimates for equations (1) and (2) can be obtained using the conditional fixed effects logit model.

i. Baseline Firm-Level Results

Table 1 presents estimates for the baseline model using alternate fixed effects configurations. The preferred specification (column 1) includes fixed effects in the country-sector-year dimension. The countries included in the estimation sample for column 1 are: China (2002, 2003), India (2006), Indonesia (2003), Kyrgyzstan (2003), Laos (2006), Philippines (2003), Sri Lanka (2004), Turkey (2005), and Vietnam (2005). The sample covers the following sectors: textiles, leather, garments, food, beverages, metals and machinery, electronics, chemicals and pharmaceuticals, wood and furniture, non-metallic and plastic materials, paper, other manufacturing, automobiles and automobile components, and other transport equipment.

As expected, trade time carries a positive coefficient that is statistically significant at the 15% level. Thus, higher trade times are associated with a greater probability of making corrupt payments to customs officials. In addition, the indicator variable for foreign-owned companies has a positive and 5% significant coefficient. As discussed above, this finding suggests that increased corruption propensity due to higher productivity and profits tends to outweigh the additional constraints placed on foreign-owned firms due to anti-corruption laws in their home markets. Finally, productivity has an unexpected negative coefficient, but it is not statistically significant.

The results in column 1 also include two measures of goodness of fit. The first, McFadden's R^2, indicates that the model performs better than a simple intercept only model, although the improvement is relatively small. However, this result is not too surprising in light of the fact that the fixed effects account for all variation in the country-sector-year dimension. As a consequence, the model's explanatory power as measured by McFadden's R^2 comes only from the firm-level variables. That the model's performance might be stronger than suggested by this measure seems to be confirmed by the second goodness of fit statistic, Count R^2. This statistic represents the percentage of observations for which the model correctly predicts whether or not a particular firm in fact makes an unofficial payment. The baseline model produces correct predictions around 40% of the time, which represents a reasonable level of explanatory power.

Columns 2-5 gauge the robustness of these results using fixed effects in (respectively) the country, country-year, industry, and country-industry dimensions. Results in relation to trade time prove to be highly consistent across specifications in terms of sign, magnitude, and statistical significance: in columns 2, 3, and 5, the estimated coefficient on trade time is significant at the 1%, 10%, and 5% levels respectively, and is remarkably close in value to the baseline estimate in column 1. Only in column 4 (sector fixed effects) is the estimated coefficient markedly different—it carries an unexpected negative sign—but it is not statistically significant. The reason for this result is undoubtedly the omission of country-specific factors as outlined above.

The indicator variable for foreign firms also performs quite consistently in columns 2-5: it is always positive and statistically significant, as in the baseline model. The effect of productivity, on the other hand, is subject to much greater uncertainty. Its coefficient is negative but statistically insignificant in columns 2, 3, and 5, but positive and statistically significant in column 4. Although this latter result accords more closely with prior expectations than the others, the fact that these estimates do not control for country-specific effects means that it would be unwise to rely too strongly on them.

ii. Robustness Checks 1: Additional Controls

It is important to ensure that results are robust to the inclusion of additional firm-level control variables. These variables are designed to capture other aspects of firm structure and performance that might be relevant to the decision whether or not to make informal payments to customs officials. Columns 6-8 of Table 1 include controls for firm size, management style and competence, and external review. In all three columns, the central result of the baseline model—a positive and statistically significant coefficient estimate for trade time—remains true. Indeed, even the magnitude of the estimated coefficient remains remarkably close to the baseline.

Controlling for firm size is important in light of the overwhelming recent evidence that firms engaged in trade tend to be not only more productive, but also considerably larger than those that serve the domestic market only (see Bernard et al. 2007 for a review of the evidence). Size is proxied here by total sales. Columns 6-8 provide some evidence of a size effect: the estimated coefficient is positive in all cases, however it is only statistically significant (10%) in column 8.

Management style and competence are proxied by two control variables: the firm's inventory of its main input (measured in day equivalents); and its rate of capacity utilization. The first of these variables is designed to capture the extent of "just-in-time" management applied by firms. This factor is important because of the high extent of time dependence it implies: firms with low inventories are presumably highly dependent on being able to obtain new supplies quickly, and thus they could be expected to have a greater propensity to make unofficial payments when necessary to ensure that their supply chain remains unbroken. Columns 7-8 suggest that such a dynamic may well be present in the data: lower inventories are associated with higher rates of unofficial payments, and the relationship is statistically significant at the 10% level or better.

The second management variable included in columns 7-8 is the rate of capacity utilization. This measure is intended to proxy management competence: a higher rate of utilization is suggestive of more cost-effective management techniques. This variable is included in the regression because it seems plausible that more effective managers may be better positioned to deal with the difficulties posed by trade times without resorting to unofficial payments. Once again, the data tend to support the existence of such a relationship: the coefficient on capacity utilization is negative and 15% significant in both regressions.

The final set of controls captures the extent of external supervision to which the firm is subject. The intuition is that firms whose accounts are externally audited, as well as those with ISO 9000 quality certification, may find it harder to disguise informal payments in their accounts, thereby making it more likely that corrupt conduct will be detected and punished. Thus, the expected relationship between these two variables and the making of unofficial payments is negative. Interestingly, column 8 shows that the data support such a mechanism in the case of ISO 9000 certification (negative coefficient, 10% significant), but not in the case of external auditors (positive coefficient, statistically insignificant). One explanation for these results might be that external auditors have a closer relationship to management than do the certification bodies responsible for granting ISO 9000 status. This greater independence might allow certification bodies to provide a more effective check on illegal firm behavior.

iii. Robustness Checks 2: Alternative Measures of Trade Time and Corruption

Given the nature of the problem considered in this paper—trade times and corruption—both the dependent and independent variables used above must be considered as somewhat noisy measures. It is therefore important to ensure that, in so far as possible, the results are robust to alternative variables that measure the same, or similar, phenomena.

Columns 1-5 of Table 2 present robustness checks using alternative measures of trade time. Whereas the baseline model used the longest import time reported by each firm, column 1 uses the average import time. The reason for using this measure as a robustness check is that it is based on multiple observations made by each firm over a period of two years, and therefore may be more representative of reality on the ground than is the longest time, which is necessarily based on a single observation. As expected, this alternative time measure carries a positive and 10% significant coefficient.

Column 2 uses the longest export time reported by each firm in place of import time, and column 3 uses the two together. Export time has a positive and statistically significant coefficient (5%) in the first of the two models. In the second, both export and import times have positive coefficients, but only the latter is 15% significant. However, a test of the null hypothesis that both coefficients are equal to zero is soundly rejected ($\chi^2(2) = 6.28$, prob. =

0.043). The reason that the individual coefficients are not statistically significant surely resides in the relatively strong correlation between them ($\rho = 0.596$). Although this correlation does not bias the coefficient estimates, it can lead to inflated standard errors. The most useful guide to inference is therefore the joint hypothesis test, which confirms that trade times are an important determinant of corruption.

In column 4, the measure of trade time used is the time taken to obtain an import license. Given that the corruption variable that has been used in this paper, i.e. informal payments in connection with obtaining an import license, it seems sensible to expect that the strongest relationship between time and corruption should be here. In fact, results in column 4 are somewhat weaker than in alternative specifications: although the coefficient on time carries the expected positive sign, it is not statistically significant. There are, however, a number of possible reasons that the association is not stronger. First, only a small number of firms have provided data on the time taken to obtain an import license: the sample in column 4 is 383 observations, less than one quarter the number of observations in the baseline model. Second, endogeneity is likely to be most severe when the time and corruption measures relate to exactly the same transaction. Since reverse causality tends to bias the coefficient on time towards zero, it is not particularly surprising that the estimate should not be statistically significant in this case.

The final robustness check in relation to the measurement of trade time is in column 5. The proxy used in this case is a dummy variable equal to unity if a firm identifies customs and trade regulations as either a major or very severe obstacle to doing business. Results using this variable, which is available for a much larger number of firms, are particularly strong: the coefficient on trade time is positive and 1% significant. In line with expectations, and with most other results in Table 1 and Table 2, the coefficients on firm productivity and the foreign ownership dummy are also positive and 1% significant.

In columns 6-7, a similar approach is taken to the issue of robustness of the dependent variables. Two alternative measures are used. The first (column 6) is a more general measure of corruption: firms are asked to indicate if it is common to make unofficial payments or gifts “to get things done” with respect to government regulations, including in the customs and trade area. One advantage of using this variable is that it greatly increases the sample size: the number of observations is about 60% higher than in the baseline model, and the number of country-industry-year groups is doubled. Results in relation to trade time are strong: its estimated coefficient is positive, 5% significant, and very close in magnitude to the baseline. Productivity and the dummy for foreign-owned firms both have negative signs, but only the latter is statistically significant. As discussed above, intuition supports either a positive or a negative overall impact of foreign ownership on corruption prevalence, and so this result should not be regarded as going against the general approach of this paper.

An additional relevant measure of corruption in the WBES data is an indicator variable equal to unity for those firms that identify corruption as a major or very severe obstacle to doing business. As can be seen from column 7, trade time again has a positive and statistically significant (10%) coefficient. Given the substantial increase in sample size with respect to the baseline—nearly 2.5 times as many observations and cross-sectional groups—it is remarkable that the magnitude of the time coefficient is identical to the baseline up to the second decimal place. Although both productivity and foreign ownership have positive coefficients, they are not statistically significant.

d. Cross-Country Regressions using Aggregate Data

Another way of analyzing the WBES data is by aggregating them to the country-level, and looking for cross-country associations between trade time and corruption. This approach is complementary to the firm-level analysis conducted in the previous section. Although it suffers from the identification difficulties common to all cross-country regressions, it has the advantage of making it possible to use alternative data on trade times, which are less likely to suffer from endogeneity bias. In addition, aggregating the data up to the country-level eliminates the risk that the firm-level results might be unreliable due to particularly strong clustering of errors.

To examine the link between trade times and corruption specifically in the Asia-Pacific context, we use a variation on the model developed in Shepherd (2009):

$$\frac{1}{F_c}\sum_f Gift_{fc} = \quad c + b_1 \ln\left(time_c^{DB}\right) + b_2 \ln\left(time_c^{DB}\right) * AsPac_c + \ldots$$
$$\ldots + b_3 \ln\left(gov_c\right) + b_4 \ln\left(voice_c\right) + b_5 \ln\left(cult_c\right) + AsPac_c + e_c \qquad (3)$$

Firms are indexed by *f* and countries by *c*, with the total number of firms in country *c* equal to F_c. With observed unofficial payments (*Gift*) defined as in the previous section, the dependent variable is the percentage of firms in country *c* that report having made a trade-related "gift". Instead of using trade time data reported by firms as the main independent variable, as in the previous section, official trade time data from the Doing Business dataset are included in the model ($time^{DB}$). These data are less likely to be subject to reverse causality, because they represent the time that exports and imports should take, based on all official procedures, and without any side payments or gifts. In order to explore whether or not the relationship between trade time and corruption has any particular features in the Asia-Pacific, the model includes an interaction term between Doing Business trade time and a dummy equal to unity for Asia-Pacific economies, as well as the dummy alone.

One of the advantages of the firm level analysis in the previous section was that it was possible to take account of country-specific features using fixed effects. Such an approach cannot be implemented at the country level. It is therefore necessary to include controls designed to take account of the most important country characteristics that might influence corruption prevalence. Inclusion of these variables also helps deal with the criticism that non-response or false response to firm-level corruption surveys seems to be related to country governance characteristics (Jensen et. al 2007).

Based on the incentive models of corruption discussed above, the empirical model includes: a measure of government effectiveness from the World Governance Indicators (WGI; see Kaufmann et al. 2009) as proxy for detection and enforcement capabilities (*gov*); a WGI variable summarizing the extent of voice and accountability in the national political system, as a proxy for the likelihood that corrupt behavior will be denounced to the authorities (*voice*); and a proxy for cultural acceptance of corruption due to Fisman & Miguel (Forthcoming), namely the number of parking tickets issued to national diplomats stationed at United Nations Missions in New York City (*cult*). Since diplomats are not subject to enforcement of parking rules, their reluctance to park in an area that would otherwise be illegal is an indication of the extent to which their home culture values rule-abiding behavior. Fisman & Miguel (Forthcoming) show that this variable is strongly correlated with standard measures of corruption.

OLS parameter estimates are presented in Table 3, columns 1-3. To provide a baseline for comparison, column 1 shows the corresponding regression from Shepherd (2009), which includes all countries for which WBES data are available. As expected, and as found using firm-level data, the relationship between trade time and corruption is positive and statistically significant: longer trade times are thus associated with more prevalent corruption. Higher levels of government effectiveness and accountability are associated with lower corruption prevalence, although the relationship is only statistically significant in the latter case. Cultural tolerance for corruption is also associated with greater corruption prevalence, with the coefficient being statistically significant at the 10% level.

Column 2 presents results using a restricted sample that includes Asia-Pacific economies only. These estimates should be regarded as no more than suggestive, due to the very small number of observations in the estimation sample. They are clearly an inappropriate basis for inference. Nonetheless, column 2 suggests that the relation of primary interest—between trade time and corruption—continues to hold for Asia-Pacific economies. Indeed, the connection between trade time and corruption may well be stronger in the Asia-Pacific than in the sample as a whole, in line with the preliminary analysis presented above: the coefficient is 0.465** versus 0.099** for the baseline regression. The only other statistically significant coefficient (10%) is culture, which carries a positive sign as expected. Voice and accountability has the expected negative coefficient, but government effectiveness as an unexpected positive coefficient. However, neither of them is statistically significant.

Column 3 presents estimates for the interaction model set out above, which exploits the difference between Asia-Pacific economies and those in other regions in order to obtain more meaningful estimates. Results again suggest that there are important differences between the Asia-Pacific and other regions. The dummy variable is negative and statistically significant (1%), suggesting that Asia-Pacific economies tend to have lower levels of trade-related corruption, keeping all other factors constant. Interestingly, the interaction term has a positive and 1%

significant coefficient, while trade time without the interaction has a positive, but statistically insignificant, coefficient. An F-test of the null hypothesis that the two coefficients sum to zero is strongly rejected (F = 23.37, prob. = 0.000). This result suggests that corruption prevalence in the Asia-Pacific is particularly sensitive to trade time; indeed, it would appear that Asia-Pacific economies are a significant driving force behind the full-sample results reported by Shepherd (2009).

The remainder of Table 3 shows that the results discussed in this section are robust to two common problems with these kinds of data. Column 4 uses the fractional logit estimator due to Papke and Wooldridge (1996) rather than OLS, to take account of the fact that the dependent variable is bounded by zero below and unity above. As can be seen from the table, results change little in terms of sign or significance. Indeed, they become slightly stronger since government effectiveness now has a negative and 10% significant coefficient.

The second robustness check concerns the possible endogeneity of the Doing Business trade data. Although these data are based exclusively on official times, and therefore less subject to endogeneity than the firm-level times used in the previous section, there is nonetheless a possibility that they might be influenced by corruption prevalence. For instance, bureaucrats may vary official trade times in line with an "optimal harassment" model, so as to maximize their combined income from salaries and bribes. To take account of this possibility, we re-estimate the model in column 3 using a two-step GMM estimator. The instruments for trade time and the interaction term are: the internal land area of each economy; the number of documents that must be filled out in order to trade; and the interactions between both of these variables and a dummy for the Asia-Pacific. The rationale behind the choice of instruments is as follows. First, land area should have significant explanatory power for Doing Business trade times because they include internal transit. Indeed, for most countries it is internal transit that represents the largest portion of the trade times captured by the Doing Business data (Djankov et al. Forthcoming). Second, even if times are set endogenously by particular bureaucrats, it is less likely that the same applies to documentary procedures. While times can be determined by individual border control agents, the number of documentary procedures is set through regulatory or quasi-regulatory instruments. The content of those instruments is set at a much higher level of authority, and thus is less subject to endogeneity concerns.

First stage instrumental variables results in columns 6-7 show that the instrument set is strongly correlated with the potentially endogenous variables: first stage F-tests are both above 20, and 1% significant. Second stage results in column 5 suggest that the Asia-Pacific results from column 3 are not unduly affected by endogeneity: coefficient signs, magnitudes, and significance levels are very similar in both cases. This finding is reinforced by a Hausman-type endogeneity test: the null hypothesis that endogeneity is not a major source of bias is not rejected at conventional significance levels. Finally, Hansen's J indicates that the instruments appear to be valid: the null hypothesis that they are uncorrelated with the main equation errors is not rejected.

4. Conclusion and Policy Implications

This paper has used firm- and country-level data to provide robust evidence of a positive association between border crossing times and corruption prevalence in the Asia-Pacific. The intuition behind this result is straightforward: time has commercial value, so firms are willing to pay—even illegally—for increased speed. This relationship appears to be particularly strong in the Asia-Pacific relative to other regions, possibly due to the prevalence of international production networks that rely on importing and exporting time sensitive goods, and being able to maintain low inventory costs in line with "just-in-time" management principles.

There are a number of important policy implications that arise from these findings. First, they highlight once more the importance of trade facilitation policies, broadly understood. Many countries recognize that faster border crossing times are a useful way of boosting international economic integration. This paper suggests a second source of gains: trade facilitation can also reduce corruption, which itself acts as a drag on international trade. Similar results were found by Dutt (2009) in the context of protectionist trade policies. Asia-Pacific economies therefore have renewed incentives to pursue tariff liberalization and trade facilitation both through regional forums like APEC, and also unilaterally.

Although the focus of this paper has been on reducing corruption incentives, rather than on detection and enforcement, its results also have important implications in that area. Particularly in capacity-constrained emerging economies, it is important to target detection and enforcement resources so that they can have the largest possible impact. Since the incentive to pay “speed money” is particularly strong for firms that produce time-sensitive goods, it would make sense to pay particular attention to such firms—and to the customs agents who deal with them—when seeking to root out corrupt conduct. Research by Hummels (2001) and Djankov et al. (Forthcoming) suggests that sectors such as perishable agricultural products, parts and components, and electrical machinery are highly time sensitive, and thus particularly susceptible to this type of corruption.

Finally, policymakers can help transform “speed money” into government revenue by providing legal fast-track services at the border. Since firms have different rates of time preference, some of them will be willing to pay a fee in order to obtain faster customs clearance. To deal with trade-related corruption, it is important not only to improve trade facilitation across the board, but also to provide dedicated, rapid, and reliable border procedures for firms that need them. A legalized fast track can help bring corrupt, but economically useful, transactions into a good governance framework.

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Tables

Table 1: Baseline regression results, and robustness checks with alternative controls, using firm-level WBES data for Asia-Pacific economies.

	(1) Import "Gifts"	(2) Import "Gifts"	(3) Import "Gifts"	(4) Import "Gifts"	(5) Import "Gifts"	(6) Import "Gifts"	(7) Import "Gifts"	(8) Import "Gifts"
Ln(Longest Import Time)	0.112+	0.145***	0.110*	-0.041	0.140**	0.115*	0.140*	0.138*
	[0.072]	[0.049]	[0.058]	[0.057]	[0.065]	[0.068]	[0.079]	[0.076]
Ln(Sales/Employees)	-0.034	-0.008	-0.018	0.273***	-0.016	-0.064	-0.060	-0.080
	[0.041]	[0.031]	[0.028]	[0.027]	[0.042]	[0.048]	[0.056]	[0.059]
Foreign Dummy	0.299**	0.260+	0.263+	0.449**	0.291**	0.287**	0.352***	0.286**
	[0.124]	[0.178]	[0.174]	[0.188]	[0.121]	[0.123]	[0.124]	[0.118]
Ln(Total Sales)						0.034	0.061	0.083*
						[0.037]	[0.051]	[0.050]
Ln(Days of Input Inventory)							-0.095**	-0.089*
							[0.047]	[0.049]
Ln(Capacity Utilization)							-0.273+	-0.263+
							[0.181]	[0.179]
External Auditor Dummy								0.194
								[0.160]
ISO 9000 Dummy								-0.261*
								[0.141]
Observations	1676	2149	1832	4078	1958	1676	1297	1297
Groups	52	10	10	15	52	52	45	45
McFadden's R^2	0.005	0.005	0.004	0.117	0.005	0.005	0.010	0.013
Count R^2	0.385	0.400	0.500	0.533	0.308	0.404	0.400	0.422
Fixed effects	Country-Industry-Year	Country	Country-Year	Industry	Country-Industry	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year

1. Estimation method is logit with conditional fixed effects in all columns.
2. The dependent variable in each regression is a binary variable equal to unity for firms that made "gifts" in connection with obtaining an import license.
3. Bootstrapped standard errors (500 replications) clustered by country-sector-year are reported in square brackets. Statistical significance is indicated by: + (15%), * (10%), ** (5%), and *** (1%).

Table 2: Robustness checks with alternative dependent and independent variables, using firm-level WBES data for Asia-Pacific economies.

	(1) Import "Gifts"	(2) Import "Gifts"	(3) Import "Gifts"	(4) Import "Gifts"	(5) Import "Gifts"	(6) General "Gifts"	(7) Corruption as a Business Obstacle
Ln(Average Import Time)	0.100*						
	[0.060]						
Ln(Longest Export Time)		0.207**	0.091				
		[0.081]	[0.108]				
Ln(Longest Import Time)			0.145+			0.141**	0.111*
			[0.096]			[0.061]	[0.058]
Ln(Import License Time)				0.128			
				[0.199]			
Customs as a Business Obstacle					0.384***		
					[0.090]		
Ln(Sales/Employees)	0.019	0.022	-0.018	-0.054	0.110***	-0.024	0.005
	[0.042]	[0.038]	[0.049]	[0.097]	[0.030]	[0.036]	[0.030]
Foreign Dummy	0.359***	0.516***	0.402***	0.275	0.873***	-0.296**	0.041
	[0.106]	[0.134]	[0.134]	[0.289]	[0.103]	[0.125]	[0.102]
Observations	2212	2150	1226	383	7858	2686	3884
Groups	57	54	47	18	71	108	129
McFadden's R^2	0.005	0.013	0.011	0.006	0.028	0.007	0.002
Count R^2	0.263	0.333	0.468	0.722	0.268	0.565	0.380
Fixed effects	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year	Country-Industry-Year

1. Estimation method is logit with conditional fixed effects in all columns.
2. The dependent variable in each regression is a binary variable equal to unity for firms that made "gifts" in connection with obtaining an import license.
3. Bootstrapped standard errors (500 replications) clustered by country-sector-year are reported in square brackets. Statistical significance is indicated by: + (15%), * (10%), ** (5%), and *** (1%).

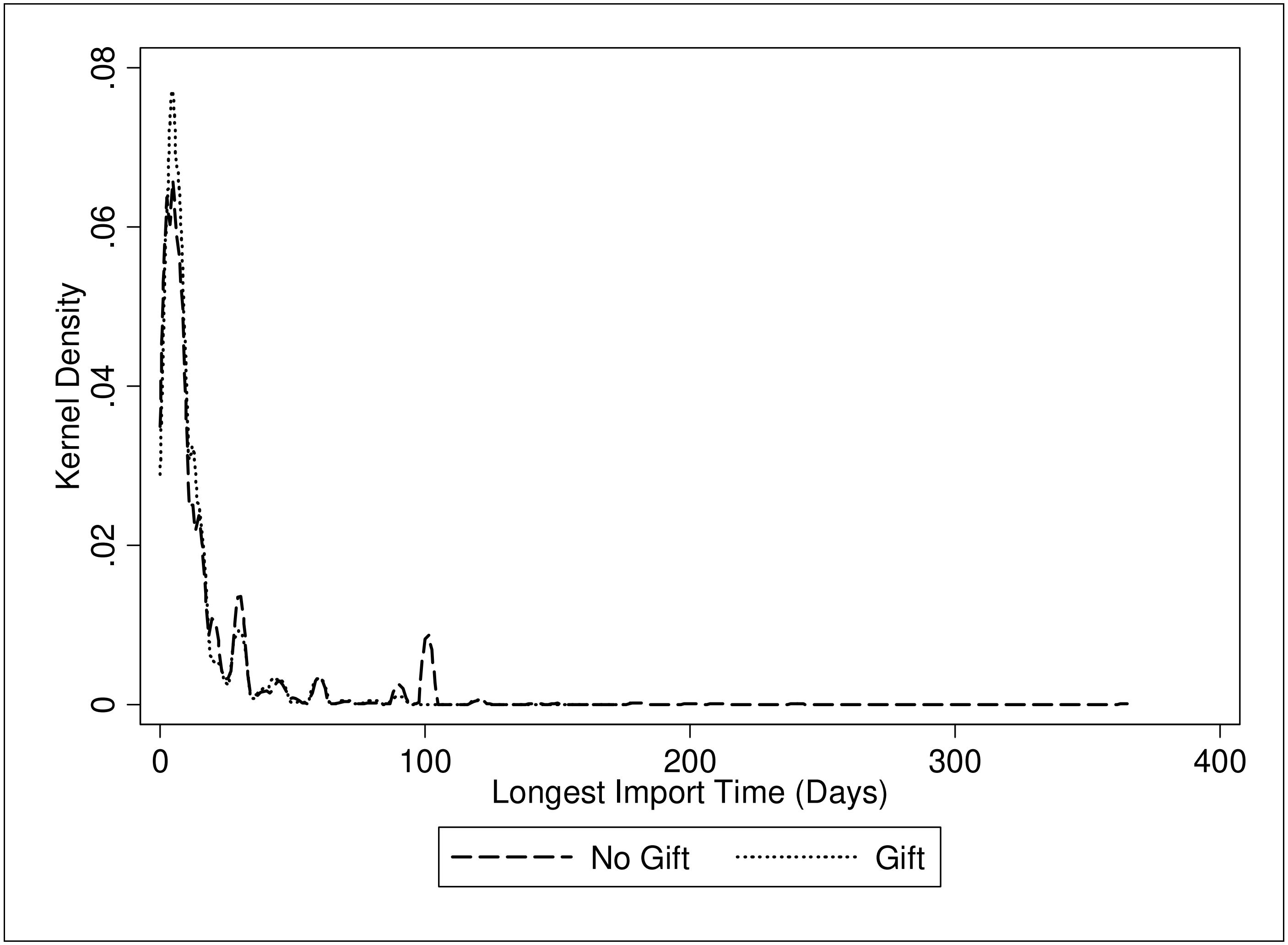
Table 3: Cross-country regressions using firm-level WBES data aggregated by country.

	Baseline	Asia-Pacific Only	Asia-Pacific Dummies	Flogit	IV 2nd Stage	1st Stage – Time	1st Stage – Time * Asia-Pacific
Ln(Doing Business Trade	0.099**	0.465**	0.042	0.405	0.135		
Time)	[0.042]	[0.139]	[0.036]	[0.342]	[0.098]		
Ln(DB Time) * Asia-Pacific			0.255***	0.890*	0.216**		
			[0.066]	[0.457]	[0.108]		
Ln(Gov)	-0.019	0.262	-0.081	-0.815*	-0.007	-0.509**	-0.041
	[0.069]	[0.321]	[0.060]	[0.488]	[0.092]	[0.218]	[0.047]
Ln(Voice)	-0.157**	-0.008	-0.072	-0.413	-0.059	-0.018	-0.059
	[0.078]	[0.062]	[0.077]	[0.448]	[0.065]	[0.116]	[0.044]
Ln(Culture)	0.010**	0.019*	0.011***	0.150***	0.010**	0.024	0.007
	[0.004]	[0.008]	[0.003]	[0.051]	[0.004]	[0.020]	[0.008]
Asia-Pacific			-0.759***	-2.261	-0.616	-1.15	0.287
			[0.233]	[1.723]	[0.392]	[1.076]	[1.048]
Ln(Area)						0.034	0
						[0.029]	[0.003]
Ln(Area) * Asia-Pacific						-0.059	-0.057
						[0.053]	[0.045]
Ln(DB Docs)						0.711***	-0.045
						[0.163]	[0.030]
Ln(DB Docs) * Asia Pacific						0.807***	1.729***
						[0.278]	[0.251]
Observations	74	12	74	74	74	74	74
R^2/ Partial R^2 (IV)	0.34	0.83	0.51		0.48	0.29 (F=21.20***)	0.70 (F=20.86***)
Hansen's J					0.863		

1. The dependent variable in all regressions is the percentage of surveyed firms by country that made a gift or unofficial payment in connection with obtaining an import license.
2. Estimation method is OLS in columns 1-3, fractional logit in column 4, and two-step GMM in columns 5-7.
3. Robust standard errors are reported in square brackets. Statistical significance is indicated by: * (10%), ** (5%), and *** (1%).

Figures

Figure 1: Kernel density plots of the longest import time reported by WBES firms in the Asia-Pacific, no gift vs. gift.



1. Summary statistics for firms that do not make unofficial payments: mean = 16.405, std. dev. = 24.872, range = 0-365 (4360 obs.).
2. Summary statistics for firms that do make unofficial payments: mean = 12.155, std. dev. = 15.991, range = 0-180 (744 obs.).

Figure 2: Unofficial payments (WBES) vs. trade times (Doing Business).