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The Time Cost of Documents to Trade

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The paper shows that the number of documents required to export and import tend to increase the time cost of shipments. However, this relationship is far from simplistic, varying sharply in magnitude depending on the income level and the size of the country. Specifically, the increase in the time cost of increased documentation is much larger for countries that are relatively poor and large in size. One interpretation of this finding is that the relatively rich countries that have more resources and the relatively small countries that rely more on trade invest more in building efficient documentation systems. Hence, increased documentation adds less to the time cost at the margin as income level rises and country size becomes smaller. At a broader level, our findings suggest caution in interpreting how input-based measures such as the number of required documents to trade affect the quality of the business environment as far as the associated cost is concerned.

Keywords: Country size, Trade facilitation, Openness

JEL: F10, F13, F15, O24

1. Introduction

With the decline in tariff and non-tariff barriers to international trade, trade facilitation measures are increasingly becoming the focus of policy makers for the continued growth of trade (see for example, Wilson et al. 2003). In a narrow sense, trade facilitation measures simply address the logistics of moving goods through ports and the documentation associated with cross-border trade. The present paper focuses on the number of documents required to export and import. However, instead of taking the number of required documents as a measure of trade facilitation itself, we focus on the associated time cost. Specifically, we analyze the relationship between the number of documents required to export and import and the time it takes to complete all procedures to trade (henceforth, time cost). What is the nature of this relationship?

In answering this question, we follow a novel approach in suggesting that the impact of increased documentation on the time cost may not be a simple positive one; that is, the size of the impact is likely to depend on how efficient the underlying system is in supplying the required documents. To this end, we make two plausible hypotheses regarding the level of development of the economy and the size of the economy. First, the relatively rich countries are likely to invest more in the underlying system of documentation and hence the increase in time cost associated with a unit increase in the number of required documents is likely to be smaller for them than for the relatively poor countries. This is a fairly obvious mechanism.

The second hypothesis is less straightforward. A number of studies have shown that small countries trade more as a proportion of their GDP than the large countries. In fact, trade openness is one of the few cases where country size seems to matter for economic or even social

variables.¹ One argument here is that smallness of markets limits the exploitation of economies of scale, forcing the smaller countries more than the larger countries to expand market size through international trade beyond their political borders (Alesina 2002, Alesina and Wacziarg 1998). If trade is more important to small compared with large countries, we might suspect that the relatively small countries are more likely to invest in efficient documentation system. Hence, it may be that a unit increase in the number of required documents leads to a smaller increase in the time cost in the relatively small countries. However, it is possible for factors to mitigate efficiency of trade facilitation in the relatively small economies such as financial constraints. We explore these possibilities in the conceptual model.

We test the two hypotheses mentioned above using panel data on 125 countries for which data are available on our main variables. The regression results strongly confirm both the stated hypotheses.

The present paper is restricted to only one aspect of trade facilitation; that is, the number of documents required to trade and the associated time cost. The importance of this aspect of trade facilitation cannot be denied, although formal empirical work in this area is still in its infancy. For example, a recent study by Djankov et al. (2010) uses the same time cost measure as we do in the present paper and finds that it has significant effects on the volume of trade. The study estimates that for each additional day that a product is delayed prior to being shipped reduces the volume of trade by more than one percent. Alternatively, each day is equivalent to a country distancing itself from its trade partners by about 70 kilometers on average. In another study, MacPherson (2008) looks at Canadian exports to the US and how these were subjected to more customs delays following the implementation of the U.S. Bio Terrorism Act (BTA) in

¹ For example, Rose (2006) shows that small countries are more open to trade than large countries, but country size does not matter for a number of other economic and social phenomena including inflation, health, quality of institutions and income levels.

2002. The study estimates that sales losses due to customs delays increased from \$14,000 per firm in 2001 (before BTA) to \$55,000 in 2005 (after BTA), and the bulk of this increase in sales losses is attributed to BTA. Also see for example, Liu and Yue (2013) and Freund and Rocha (2010). The present paper complements such studies in highlighting an important determinant of the time cost of clearing all the required procedures for shipment.

Notwithstanding the importance of time costs of shipments and the number of required documents, trade facilitation extends to a number of other dimensions that we do not include in the present study. The traditional view of trade facilitation focuses on transactions at the border, such as documentary requirements, transparency of customs clearance and transit procedures, and disciplines on fees and taxes. However, there is also a more comprehensive approach to trade facilitation in the literature which covers all types of costs that traders and producers face from production until the delivery of their goods and services to the overseas buyer. Hence, this broader view of trade facilitation includes all the transaction costs both directly and indirectly associated with the trading process. Examples include costs associated with internet availability (Freund and Weinhold, 2004), quality of roads connecting factories to ports (Blyde and Iberti, 2014), security concerns not just at the border but also in terms of higher insurance costs, etc. (Walkenhorst and Dihel, 2006), and standards harmonization and automating customs procedures (Herter et al. 2001). Hence, our results discussed below should be treated with due caution and not generalized to other aspects of trade facilitation without further analysis. For example, standards harmonization could reduce time cost of shipment clearance, but this effect could vary depending on the overall efficiency of the customs procedures. Much like our case, the relationship between standards harmonization and the time cost of shipment clearance could

vary between rich and poor countries and between small and large countries. However, this is an empirical issue that requires validation or rejection.

2. Conceptual Model

Evaluating the relationship between the numbers of documents required to import or export and the time cost can provide some insight into the efficiency of trade facilitation. While a positive relationship is duly expected – more documents should imply greater costs – we also uncover how this relationship changes along the dimensions of country development and size. The connection between country development and the number documents – time cost relationship is rather straightforward. Developed countries have the resources to improve the underlying system of documentation relative to less developed countries. This may also involve computerizing the same number of documents leading to increases in overall efficiency of trade facilitation. Thus, it is entirely feasible that the increase in time cost associated with a unit increase in the number of required documents is likely to be smaller as the income level of the countries rise.

The effect of country size on the efficiency of trade documentation can be more complex. On one hand it has been established that smaller economies have a stronger incentive to engage in trade. Given the presence of small markets in small economies, looking beyond the country borders may be necessary to exploit economies of scale. Thus, it is in the interest of the smaller economy much more than of the larger economy to invest in an efficient documentation system. Additionally, smaller economies tend to have less bureaucracy and typically have more efficient methods of tax collection than larger economies (Alesina et al., 2005; Amin and Haidar, 2013). In addition, the relatively more homogeneous nature of smaller economies relative to larger economies may imply that gathering political consensus to implement policy may be more efficient. Thus, policies to improve the efficiency of trade documentation are likely to be

implemented quickly in the relatively small economies. While the mechanisms generally tend to favor greater efficiency of trade documentation for smaller economies than larger economies, one cannot underestimate the issue of financial constraints. Smaller economies may be more financially constrained given their limited tax base and the amount of resources generally available. This may constrain any investment in improving the efficiency of trade facilitation. Thus, which mechanisms dominate is an empirical question.

3. Data description and methodology

Our sample consists of a panel of 125 countries for which data are available for all our main variables. The data span six years from 2005 to 2010. Regression results tend to suffer from endogeneity problems which arise from reverse causality and omitted variable bias. To address the reverse causality problem we follow the literature in using (one year or more) lagged values of all the explanatory variables in the regressions. It is important to note that use of lagged explanatory variables helps raise our confidence against reverse causality but it does not necessarily eliminate the problem. That is, if the dependent variable is forward looking then a feedback effect may occur from the dependent variable to the (lagged) explanatory variables. For example, governments may desire to reduce the time cost of trade next year and this may force them to reduce the number of required documents today. As we argue below, our results are relatively immune to such problems since our focus is not on the correlation between the level of required documents and time cost of trade but on how this relationship depends on the level of income and country size. Our defense against the omitted variable bias problem involves controlling for a number of variables discussed in detail below.

The panel nature of the data allows us to control for all unobserved and time invariant country specific factors through country fixed effects. Similarly, we are able to control for all time or year specific factors common to all countries through time fixed effects. That is, the regression results discussed below are obtained from fixed-effects panel data estimation method.² However, given the short span of the panel data, there is not enough variation over time in either the income level or country size measured by total population. Hence, the variation in the effects of the number of required documents to trade on the time cost across countries that are at different levels of income and total population (country size) is estimated with income and total population assumed to be constant over time; only the number of required documents is allowed to vary temporally. This is discussed in more detail below. Note that since we control for country fixed effects, we cannot recover from the regressions the estimated impact of population and income on the dependent variable. What we can recover from the regressions is the estimated impact of the number of required documents to trade on the dependent variable and how this impact varies between countries at different levels of income and population.

All regression results discussed below are obtained using the Ordinary Least Squares (OLS) estimation method. All standard errors used for computing the significance levels of the estimated coefficient values in the regressions are Huber-White robust and clustered at the country level. Throughout the paper, significance level is denoted by *** (1 percent or less), ** (5 percent or less) and * (10 percent or less).

A formal definition of all the variables used in the paper is provided in Table 1. Summary statistics of the main variables and the correlation between the main explanatory variables are provided in Table 2 and Table 3, respectively.

² That is, we use the Ordinary Least Squares estimation method with country and year fixed effects included in the specification.

3.1 *Dependent variable*

The dependent variable equals the log of the time (recorded in calendar days) it takes to clear all procedures to export and import ($Time_{it}$). The subscripts i,t denote the country and year, respectively. As mentioned above, the time span for the variable is 2005 to 2010. However, since we use lagged values of the explanatory variable, number of required documents, we lose the first year (2005) values of $Time$. The data source for the variable is World Bank's Doing Business project. We note that $Time$ includes the time cost of all procedures as well as the waiting time between procedures (for example, during unloading of the cargo). Hence, only part of the variation in the time cost of shipments across countries and time can be explained by the variation in the number of required documents.

In the full sample, the mean value of $Time$ equals 3.98 and the standard deviation is .51. Averaging over all years, the value of $Time$ is highest for Iraq (5.27) and lowest for Panama (2.89). Computing the annual change in the value of $Time$, the change averages -.047 or about 1.2 percent of the mean value of $Time$. In terms of the frequency, about 36 percent of the countries witnessed a change in the value of $Time$ in any two consecutive years on average. Further, over the entire time span of 2006-2010, every country in the sample experienced a change at least once in the value of $Time$.

3.2 *Main explanatory variables*

Our first explanatory variable is the (log of) number of documents required to export and import as measured by the World Bank's Doing Business project ($Documents$). As mentioned above, to avoid simultaneity problem, we use one year lagged values of the variable. The mean value of

Documents equals 2.73 and the standard deviation is .27. Averaging over time for each country, the highest value of *Documents* is observed in Central African Republic (3.23) and lowest in Panama (1.96). Computing annual changes in the value of *Documents*, the mean value of the change equals -.024 or .89 percent of the mean value of *Documents* and the standard deviation equals .12. On average, in any two consecutive years, over 13 percent of the countries in the sample witnessed a change in the value of *Documents*. Further, every country in our sample witnessed a change in the value of *Documents* at least once over the time period under study.

To see how the correlation between *Time* and *Documents* varies by income and country size, we interact *Documents* with a measure of per capita income level and country size. For income level, we use log of GDP per capita, PPP adjusted and at constant 2005 International Dollars. Values of GDP per capita used in the paper are average values taken over 2001-2005 (*Income*). The data source for the variable is World Development Indicators, World Bank. We note that lagged values of GDP per capita are used in order to avoid the potential simultaneity problem with our estimation results. Also, due to the short span of the data, we do not exploit variations over time in the level of income. Hence, what our results seek to establish is the differential effect of the number of required documents on the time cost across countries that are at different levels of income to begin with. The same holds for our measure of country size which equals the log of the average level of total population of a country where the average is taken over 2001-2005 (*Population*). The data source for *Population* is World Development Indicators, World Bank.

Briefly, the mean value of *Income* equals 8.0 and the standard deviation equals .94. For *Population*, the corresponding figures equal 15.6 and 2.03, respectively. We check all our results

for potential outliers, especially with respect to countries that are very small (island countries) and the very large countries.³

Our estimation equation takes the following form

$$\begin{aligned}
 Time_{it} = & \alpha + \beta_1 Documents_{it-1} + \beta_2 Documents_{it-1} * \text{Log of average over 2001-2005 of GDP per capita}_i \\
 & + \beta_3 Documents_{it-1} * \text{Log of average over 2001-2005 of total population}_i + \textit{Country fixed effects} \\
 & + \textit{Time fixed effects} + \textit{Other controls} \quad \dots\dots\dots (1)
 \end{aligned}$$

3.3 Other explanatory variables

The remaining explanatory variables in the regression results discussed below are motivated to guard against the potential omitted variable bias or spurious correlation problem. We would like to mention here that our main focus is on the interaction terms in the equation above. That is, how the relationship between the number of required documents and the time cost varies across countries at different levels of income and population. The chances of spurious correlation for our interaction terms are less severe than it is otherwise the case with level variables. For example, it is plausible that the relatively richer countries have less corruption. So, our income variable could easily pick up the effect of corruption (if any) on the dependent variable. However, there is little theoretical or empirical reason to believe that corruption should affect the strength of the relationship between the number of required documents and the dependent variable. In short, while income may spuriously pick up the effect of corruption on the dependent variable, there is no reason to suggest that this holds for the interaction term also

³ We do find that Afghanistan, China and Tanzania have unduly large effects on our results. Including China in the sample makes our results weaker while the opposite holds for Afghanistan. For Tanzania, the results vary depending on the specification. To ensure that our results are not unduly affected by individual countries, we exclude Afghanistan, China and Tanzania from our sample.

(*Documents*Income* picking up the effect of *Documents* Corruption* level). Nevertheless, we show that our results survive a number of controls such as for corruption, etc.

Our first set of controls includes the country and year fixed effects. As discussed above, these controls ensure that our main results are robust to all time invariant country specific factors (country fixed effects) as well as world-wide shocks to the dependent variable in a given year (time fixed effects). In short, what these controls imply is regressing changes in the explanatory variables on changes in the dependent variable. Such first-differenced regressions tend to suffer less from omitted variable bias problem than regressions based on the actual levels of the variables (cross-section data).

One could still argue that the differential effect of the required documents on the time cost across income and population levels could be spuriously driven by a non-linearity in the documents-time cost relationship. That is, the reason why the effect of documents on the time cost varies with the income (or population) level is that income (population) simply picks up higher or lower values of *Documents* and that the effect of *Documents* on the dependent variable varies over its range. To guard against this possibility, we control for the square of the number of required documents (*Documents*²).

A number of studies have shown that smaller countries have more open trade policies than the larger countries and that the same holds for the relatively rich compared with poor countries. One might then speculate that the reason why income and population matter for the strength of the documents-time cost relationship is because income and population are picking up the effect of trade openness. To check for this possibility, we control for (log of) average

tariff rate over 2001-2005 (*Tariff rate*) interacted with the number of required documents (*Documents* Tariff rate*).⁴

The argument in the previous paragraph can be extended to another variable: the quality of the overall business climate. For example, higher income countries are likely to be less regulated (less burdensome business climate). Hence, the differential effect of the number of required documents on the time cost across countries at different income levels could potentially be the differential effect across less and more regulated economies if regulation and required documents to trade are complements for the time cost. To guard against this possibility, we control for *Documents*Business Climate*, where *Business Climate* equals the log of the average value over 2001-2005 of the overall score of economic freedom as measured by the Index of Economic Freedom, Heritage Foundation.

Another factor that is known to be correlated with income level and the business regulations is corruption. Typically, corruption falls with higher income levels and increases with various aspects of more stringent regulation (such as, the number of documents required to export and import). The relationship between corruption and country size is less clear, in part due to little research work so far in this area. To ensure that our measures of income and/or country size are not spuriously picking up the effect of corruption on the dependent variable, we control for *Documents*Corruption*, where *Corruption* is measured by the “freedom from corruption” sub-index of the Index of Economic Freedom, Heritage Foundation. We use log of the average values of the freedom from corruption sub-index where the average is taken over 2001-2005.

Next, we control for social, cultural and political factors interacted with *Documents*. It is argued that one disadvantage of being large is that large countries are also more diverse such as along ethnic lines. The greater diversity makes it more difficult to closely cater to individual

⁴Tariff rate is the weighted tariff rate as reported in World Development Indicators, World Bank.

preferences over public goods and in reaching consensus over reforms. Independently of country size, studies have shown that greater ethnic fractionalization has a direct adverse effect on various aspects of overall development and the quality of institutions. To ensure that neither our income nor the population measure is picking up the effect of ethnic diversity, we control for the (lagged) degree of ethnic fractionalization (*Ethnic*) interacted with *Documents*, where the measure of ethnic fractionalization is taken from a recent study by Alesina et al. (2003). The remaining controls include (lagged) dummy variables for the largest religious group in the country (Catholic, Muslim, Protestant and the residual category of all other religions) and a measure of the quality of democracy taken from the Polity IV database, average over 2001-2005 (*Polity*). The controls for the main religious group (interacted with *Documents*) are in the nature of robustness checks, although theory provides little guidance on how religion correlates with trade facilitation, income or country-size. For *Polity*, one might suspect it to be higher (better democracy) in the richer countries. Further, reflecting better governance, higher values of *Polity* may be correlated with lower levels of the number of required documents to trade. Hence, income could easily pick up the effect of better quality of democracy on the time cost of shipments.

4. Estimation

Regression results for the main specification are provided in Table 4. Regressing *Time* on *Documents* without any other controls shows a significant positive relationship between the two (column 1). The estimated coefficient value of *Documents* equals 1.08, significant at less than the 1 percent level. As we argue below, the coefficient value implies a economically large relationship. Controlling for country fixed effects causes the estimated coefficient value of

Documents to decline sharply to .331, but it remains significant at less than the 1 percent level (column 2). Given our double log specification, the estimate implies that a 1 percent increase in the number of required documents (without logs) leads to .331 percent change in the time cost of shipments (without logs). Alternatively, moving from the smallest value of *Documents* in our sample to its largest value is associated with an increase in the time cost of shipments (without logs) that equals about 69 percent of its initial value. This is an economically large effect.

Controlling for time fixed effects causes the estimated coefficient value of *Documents* to decline to about half its value from .331 above to .161 (column 3). However, the coefficient value is still economically large and statistically significant at the 1 percent level. What the results show so far is that the number of required documents to export and import is strongly positively correlated with the time cost of shipments, notwithstanding the fact that our measure of time cost includes various factors such as time taken for unloading the cargo that has nothing to do with the number of required documents.

We now explore how the *Time-Documents* relationship highlighted above depends on the income level and country size. To this end, we add the interaction term between *Documents* and *Population* and the interaction term between *Documents* and *Income* separately to the specification above. Regression results in column 4 (of Table 4) show that controlling for the interaction term between *Documents* and *Population* alone does not give any significant variation in the effect of *Documents* on *Time* across countries of different sizes. That is, the estimated coefficient value of *Documents*Population* is statistically insignificant at the 10 percent level (p value of .131). In contrast, when we control for the interaction term between *Documents* and *Income* alone, the results show the *Documents-Time* relationship is significantly more positive at relatively low levels of income than at relatively high levels of income. That is,

the estimated coefficient value of *Documents*Income* is negative and statistically significant at the 5 percent level (column 5). Given that some studies show that smaller countries are somewhat richer, it is best to control for both the interaction terms simultaneously to guard against either of income or population (or both) picking up the effect of the other. Controlling for both the interaction terms simultaneously we find that it is indeed the case that individually controlling for the two interaction terms tends to bias their estimated coefficient values towards zero. That is, in column 6 where we add both the interaction terms to the specification, the estimated coefficient values of both the interaction terms are economically large and statistically significant at less than the 5 percent level. Further, consistent with our initial hypothesis, the effect of required documents on the time cost is positive but significantly larger at the relatively low levels of income and at relatively small population levels. In other words, our results do not reject the claim that the relatively rich and relatively small countries are more efficient (in terms of the time cost) in their documentation process. Furthermore, our empirical results seem to suggest that financial constraints faced by the relatively small economies do not limit their ability to invest in increasing their efficiency in trade facilitation. Financial constraints in smaller economies may be offset by lower levels of bureaucracy and increasing efficiency of tax collection and the process of policy consensus and implementation as explained in the conceptual model.

We complete the description of our results for the baseline specification by adding the square of the number of required documents to the specification above. Regression results confirm that doing so makes no difference to the qualitative nature of the results discussed above (column 7).

To get a sense of the magnitudes, consider the slightly more conservative estimates for the interaction terms obtained in column (6). Now consider a move from the smallest to the highest value of *Documents* in our sample. What is the estimated impact of this on *Time* and how much does this effect vary with the income level and the population level? Focusing on income level first, the change implies that for an average sized country (population fixed at its mean value), the consequent change in *Time* equals .87 units (against the sample mean of 3.98 of *Time*) or 1.7 standard deviation units of *Time* for the poorest country in our sample, The stated change is significant at the 1 percent level. In contrast, the change in *Time* when we move from the lowest to the highest value of *Documents* for the richest country in the sample is actually negative (statistically insignificant at the 10 percent level) and equals -.39 units (9.8 percent of the sample mean of *Time*) or -.76 standard deviation units of *Time*.

Now, consider how population affects the magnitude of the *Time-Documents* relationship. Fix the income level at its mean value and consider a move from the smallest to the highest value of *Documents* in our sample. The associated change in *Time* for the country with the smallest population in our sample equals -.348 units (8.7 percent of the sample mean value of *Time*) or -0.68 standard deviation units of *Time*; the stated change is statistically insignificant (at the 10 percent level or less). In contrast, the corresponding change is positive and significant at the 1 percent level for the country with the largest population in our sample and it equals .662 units (16.6 percent of the mean value of *Time*) or 1.29 standard deviation units of *Time*.

The results above strongly confirm that the relationship between increased documentation and the time cost in exporting and importing is not a simplistic one; it depends strongly on the income level and the size of the country.

Robustness of the results for the interaction terms discussed above is confirmed in Table 5. The table provides regression results adding the remaining controls discussed in the previous section to the specification discussed above. Briefly, the additional controls in the table include the interaction terms between *Documents* and corruption, business climate, ethnic fractionalization, quality of democracy, main religious group in the country, and the tariff rate. Regression results adding these controls sequentially to the specification above are provided through columns 1-5, Table 5. These results confirm the findings discussed above qualitatively and also quantitatively. That is, adding the mentioned controls only serves to strengthen our main results - the estimated coefficient values of our main interaction terms are only increased (in absolute value) (column 7 in Table 4 vs. columns 1-5 in Table 5).

For the various controls discussed above, we find that they have little effect on the dependent variable. This is not too surprising as we stated earlier. That is, while corruption for example, may be expected to be well correlated with the time cost of shipments, there is no strong reason why the strength of the relationship between time cost and the number of required documents should vary with the level of corruption.

We conducted additional robustness checks. First, we replaced the measure of trade openness, *Tariff rate*, with (log of) ratio of merchandise trade to GDP ratio (average value over 2001-2005). We also controlled for the (log of) ratio of services trade to GDP ratio (average value over 2001-2005) interacted with *Documents*. However, neither of these modifications had any effect on the results discussed above qualitatively. Second, we experimented with using a dichotomous classification of rich vs. poor countries and small vs. large countries. The dichotomous classification provides a somewhat more convenient interpretation of how the relationship between the time cost and the number of required documents to trade varies between

rich vs. poor countries and between small vs. large countries. To this end, we tried a number of different cut-off levels for rich vs. poor countries and small vs. large countries and found our results to be sharpest at about the 33rd percentile values of *Income* and *Population*. Hence, we define a dummy variable equal to 1 for a country with *Income* above the 33rd percentile value and 0 otherwise (*Rich country*). Similarly, we define a dummy variable equal to 1 for a country with *Population* above the 33rd percentile level and 0 otherwise (*Large country*). We replaced *Income* in the regression above with *Rich country* and *Population* with *Large country* dummy. Regression results using these dummy classifications are provided in Table 6 and these are qualitatively similar to the ones discussed above. For example, consider the baseline specification discussed in detail above that includes the two interaction terms, country fixed effects and the year fixed effects (column 6 of Table 4 and column 2 of Table 6). Moving from the smallest to the highest value of *Documents* implies a change in the value of *Time* equal to .484 units (12 percent of the mean value of *Time*) or 0.95 standard deviation units of *Time* for the poor countries, significant at the 1 percent level; the corresponding change for the rich countries is actually negative (decrease in *Time*) equaling -.061 (2 percent of the mean value of *Time*) or -0.12 standard deviation units of *Time*, insignificant at the 10 percent level or less.⁵ For small vs. large countries, the stated change in *Documents* implies an increase in the value of *Time* equal to 0.289 units (7 percent of the mean value of *Time*) or 0.57 standard deviation units of *Time* for large countries, significant at the 1 percent level; for the small countries, the corresponding change in *Time* is actually negative although statistically insignificant (at 10 percent level) equaling -.201 (5 percent of the mean value of *Time*) or -.39 standard deviation units of *Time*.⁶

⁵ The changes in the value of *Time* discussed here for rich vs. poor countries are calculated fixing the value of *Large country* dummy at its sample mean.

⁶ The changes in the value of *Time* discussed here for small vs. large countries are calculated fixing the value of *Rich country* dummy at its sample mean.

5. Conclusion

The paper shows that the number of documents required to export and import do add to the time cost of shipments, but this positive effect varies sharply depending on the income level and the size of the country. Simply comparing the number of required documents does not give us an accurate picture as to which countries face higher time cost of shipments. More broadly, simply comparing input-based measures across countries or over time may not give us an accurate picture of the actual quality of the business climate as experienced by the private agents. We hope that the present paper inspires future work to better understand how input-based measures need to be interpreted in terms of their impact on the functioning of economies.

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Table 1: Description of Variables	
Variable	Description
<i>Time</i>	Log of the time it takes to clear all procedures for exporting and importing a good. That data span from 2006 to 2010. The time for exporting and importing is recorded in calendar days. The time calculation for a procedure starts from the moment it is initiated and runs until it is completed. If a procedure can be accelerated for an additional cost and is available to all trading companies, the fastest legal procedure is chosen. Fast-track procedures applying to firms located in an export processing zone are not taken into account because they are not available to all trading companies. Ocean transport time is not included. It is assumed that neither the exporter nor the importer wastes time and that each commits to completing each remaining procedure without delay. Procedures that can be completed in parallel are measured as simultaneous. The waiting time between procedures – for example, during unloading of the cargo – is included in the measure. <i>Source: Doing Business, World Bank.</i>
<i>Documents</i>	Log of the number of documents required to export and import. One year lagged values are used. The data span from 2005 to 2009. All documents required per shipment to export and import the goods are recorded. It is assumed that the contract has already been agreed upon and signed by both parties. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks are taken into account. Since payment is by letter of credit, all documents required by banks for the issuance or securing of a letter of credit are also taken into account. Documents that are renewed annually and that do not require renewal per shipment (for example, an annual tax clearance certificate) are not included. <i>Source: Doing Business, World Bank.</i>
<i>Population</i>	Log of the average level of total population of a country, where the average is taken over 2001-2005. <i>Source: World Development Indicators, World Bank.</i>
<i>Income</i>	Log of the average level of GDP per capita (PPP adjusted and at constant 2005 International \$), where the average is taken over 2001-2005. <i>Source: World Development Indicators, World Bank.</i>
<i>Tariff rate</i>	Log of the average level of weighted import tariff, where the average is taken over 2001-2005. <i>Source: World Development Indicators, World Bank.</i>
<i>Corruption</i>	Log of the average level of the “freedom from corruption” score as measured by the Heritage Foundation’s Index of Economic Freedom, where the average is taken over 2001-2005 values. <i>Source: Heritage Foundation.</i>
<i>Business Climate</i>	Log of the average level of the “overall” score of economic freedom as measured by the Heritage Foundation’s Index of Economic Freedom, where the average is taken over 2001-2005 values. <i>Source: Heritage Foundation.</i>
<i>Ethnic</i>	A measure of ethnic fractionalization. Higher values imply more ethnic fractionalization or diversity. <i>Source: Alesina et al. (2003), Journal of Economic Growth, June 2003; Table A1.</i>
<i>Polity</i>	Polity variable from Polity IV data. Higher values imply better quality of democracy. Average values of the variable taken over 2001-2005 are used. <i>Source: Polity IV Database.</i>
<i>Catholic</i>	A dummy variable equal to 1 if the largest religious group in the country is Catholic and 0 otherwise. <i>Source: La Porta et al. (1999).</i>
<i>Muslim</i>	A dummy variable equal to 1 if the largest religious group in the country is Muslim and 0 otherwise. <i>Source: La Porta et al. (1999).</i>
<i>Protestant</i>	A dummy variable equal to 1 if the largest religious group in the country is Protestant and 0 otherwise. <i>Source: La Porta et al. (1999).</i>
All other religious groups	A dummy variable equal to 1 if the largest religious group in the country is the residual group (other than Catholic, Muslim and Protestant) and 0 otherwise. <i>Source: La Porta et al. (1999).</i>

Table 2: Summary statistics

Variable	Mean	Standard deviation	Minimum	Maximum	Observations
<i>Time</i>	3.98	0.51	2.89	5.31	625
<i>Documents</i>	2.73	0.27	1.95	3.53	625
<i>Population</i>	15.57	2.03	10.76	20.78	625
<i>Income</i>	2.17	0.60	0.53	3.31	545
<i>Tariff rate</i>	64.37	30.98	20.30	177.80	605
<i>Corruption</i>	28.84	13.48	10.00	73.40	515
<i>Business Climate</i>	55.91	8.35	16.40	76.72	515
<i>Ethnic</i>	0.49	0.25	0	.93	605
<i>Polity</i>	2.92	5.86	-9.2	10	525
<i>Catholic</i>	0.33	0.47	0	1	625
<i>Muslim</i>	0.30	0.46	0	1	625
<i>Protestant</i>	0.14	0.34	0	1	625
<i>All other religious groups</i>	0.24	0.43	0	1	625

Table 3: Correlation between the explanatory variables

<i>Documents</i>	1										
<i>Population</i>	0.29	1									
<i>Income</i>	-0.36	-0.16	1								
<i>Tariff rate</i>	0.02	-0.11	0.24	1							
<i>Corruption</i>	-0.21	-0.17	0.48	-0.24	1						
<i>Business Climate</i>	-0.21	-0.17	0.30	-0.30	0.67	1					
<i>Ethnic</i>	0.17	0.29	-0.37	0.13	-0.28	-0.13	1				
<i>Polity</i>	-0.37	0.00	0.26	-0.40	0.38	0.57	-0.14	1			
<i>Catholic</i>	-0.15	-0.10	0.12	0.0	0.17	0.35	-0.10	0.30	1		
<i>Muslim</i>	0.19	0.24	-0.13	0.14	-0.27	-0.31	0.13	-0.39	-0.45	1	
<i>Protestant</i>	-0.01	-0.22	0.02	-0.04	0.20	0.12	0.05	0.22	-0.28	-0.26	1
<i>All other religious groups</i>	-0.04	0.03	-0.01	-0.11	-0.04	-0.12	-0.07	-0.05	-0.39	-0.36	-0.22

Table 4: Base regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Dependent variable: Time</i>							
<i>Documents</i>	1.081*** [0.000]	0.331*** [0.000]	0.161*** [0.010]	-0.323 [0.307]	1.351** [0.026]	0.594 [0.185]	0.773 [0.326]
Country fixed effects		Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects			Yes	Yes	Yes	Yes	Yes
<i>Documents*Population</i>				0.030 [0.131]		0.064** [0.025]	0.065** [0.022]
<i>Documents*Income</i>					-0.153** [0.043]	-0.188** [0.020]	-0.195** [0.018]
<i>Documents</i> ²							-0.025 [0.796]
Constant	1.032*** [0.001]	3.080*** [0.000]	3.639*** [0.000]	3.677*** [0.000]	3.719*** [0.000]	3.818*** [0.000]	3.634*** [0.000]
Observations	625	625	625	625	625	625	625
R-squared	0.320	0.096	0.330	0.332	0.344	0.350	0.351
Countries	125	125	125	125	125	125	125

p-values in brackets. All standard errors used are Huber-White robust and clustered at the country level. Significance level is denoted by *** (1%), ** (5%) and * (10%).

Table 5: Robustness results					
Dependent variable: <i>Time</i>	(1)	(2)	(3)	(4)	(5)
<i>Documents</i>	1.161 [0.203]	2.199 [0.138]	2.445* [0.081]	2.093 [0.151]	1.768 [0.200]
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
<i>Documents*Population</i>	0.073** [0.019]	0.079** [0.014]	0.095*** [0.007]	0.089** [0.011]	0.113*** [0.009]
<i>Documents*Income</i>	-0.268*** [0.006]	-0.363** [0.014]	-0.368** [0.016]	-0.352** [0.022]	-0.371** [0.014]
<i>Documents2</i>	-0.038 [0.705]	-0.086 [0.328]	-0.169 [0.222]	-0.094 [0.596]	-0.095 [0.592]
<i>Documents*Corruption</i>	0.010 [0.376]	0.014 [0.251]	0.013 [0.329]	0.008 [0.535]	0.010 [0.452]
<i>Documents*Regulation</i>	-0.003 [0.783]	-0.002 [0.847]	-0.002 [0.837]	-0.005 [0.638]	-0.007 [0.531]
<i>Documents*Ethnic</i>		-0.439 [0.341]	-0.475 [0.285]	-0.296 [0.533]	-0.425 [0.404]
<i>Documents*Catholic</i>			0.108 [0.720]	0.157 [0.598]	0.169 [0.571]
<i>Documents*Muslim</i>			0.129 [0.466]	0.155 [0.374]	0.132 [0.436]
<i>Documents*Protestant</i>			-0.423 [0.242]	-0.495 [0.174]	-0.549 [0.132]
<i>Documents*Polity</i>				0.019 [0.333]	0.022 [0.278]
<i>Documents*Tariff rate</i>					0.103 [0.365]
Constant	3.455*** [0.000]	2.972*** [0.000]	2.476** [0.036]	3.121** [0.039]	3.065** [0.043]
Observations	515	510	510	480	450
R-squared	0.368	0.371	0.374	0.383	0.386
Countries	103	102	102	96	90

See the note at the bottom of Table 4.

Table 6: Dummy specification for rich vs. poor and small vs. large countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: <i>Time Documents</i>	0.124*	0.103	0.535	0.844	0.923	1.031	0.72
	[0.059]	[0.105]	[0.454]	[0.239]	[0.377]	[0.389]	[0.506]
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Documents*Large country</i>		0.310***	0.331***	0.339***	0.354***	0.364***	0.422***
		[0.006]	[0.002]	[0.002]	[0.003]	[0.006]	[0.001]
<i>Documents*Rich country</i>		-0.345***	-0.393***	-0.514***	-0.517***	-0.525***	-0.547***
		[0.003]	[0.000]	[0.000]	[0.001]	[0.001]	[0.000]
<i>Documents</i> ²			-0.11	-0.147*	-0.167	-0.19	-0.175
			[0.238]	[0.079]	[0.263]	[0.342]	[0.371]
<i>Documents*Corruption</i>			-0.003	-0.003	-0.003	-0.003	-0.001
			[0.739]	[0.763]	[0.792]	[0.832]	[0.914]
<i>Documents*Regulation</i>			0.005	0.008	0.008	0.009	0.009
			[0.645]	[0.410]	[0.515]	[0.513]	[0.448]
<i>Documents*Ethnic</i>				-0.397	-0.383	-0.423	-0.602
				[0.279]	[0.302]	[0.329]	[0.182]
<i>Documents*Catholic</i>					0.02	0.009	-0.013
					[0.945]	[0.976]	[0.964]
<i>Documents*Muslim</i>					0.028	0.025	-0.04
					[0.883]	[0.895]	[0.824]
<i>Documents*Protestant</i>					-0.617*	-0.608*	-0.655*
					[0.068]	[0.082]	[0.058]
<i>Documents*Polity</i>						-0.004	-0.002
						[0.843]	[0.912]
<i>Documents*Tariff rate</i>							0.127
							[0.213]
Constant	3.751***	3.869***	3.104***	2.762***	2.826**	2.638	2.711
	[0.000]	[0.000]	[0.000]	[0.000]	[0.026]	[0.112]	[0.101]
R-squared	0.348	0.385	0.388	0.391	0.395	0.395	0.398
Observations	450	450	450	450	450	450	450
Number of countries	90	90	90	90	90	90	90

p-values in brackets. All standard errors used are Huber-White robust and clustered at the country level. Significance level is denoted by *** (1%), ** (5%) and * (10%). Sample restricted to countries for which data are available on all the variable used in regressions to ensure that the cut-off level for *Rich country* and *Large country* dummies is the same (about 33rd percentile level) across the various specifications shown.