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Trade Facilitation, Regulatory Quality and Export Performance¹

Tomasz Iwanow² and Colin Kirkpatrick³

Impact Assessment Research Centre
Institute for Development Policy and Management
School of Environment and Development
University of Manchester

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² Research Assistant and Doctoral Student in the Impact Assessment Research Centre, Institute for Development Policy and Management (IDPM), School of Environment and Development, University of Manchester, (tomasz.iwanow@manchester.ac.uk)

³ Hallsworth Professor of Development Economics and Director of the Impact Assessment Research Centre, Institute for Development Policy and Management (IDPM), School of Environment and Development, University of Manchester (colin.kirkpatrick@manchester.ac.uk.)

Abstract

As the pace of trade liberalisation accelerates, the costs of cumbersome trade procedures and other ‘behind the border’ barriers to trade are receiving increasing attention. Trade facilitation reforms are intended to lower the trade-related transaction costs for firms in global commerce, thereby enabling the continued growth in cross border trade in goods and services. The objective of this paper is to quantify the potential gains in trade performance from the implementation of trade facilitation reform measures. The study applies a gravity model augmented with trade facilitation, regulatory quality and infrastructure indicators to assess the impact of trade facilitation and other trade-related constraints on export performance. The results confirm that while trade facilitation can indeed contribute to improved export performance, improvements in the quality of the regulatory environment and the basic transport and communications infrastructure are equally, or more important, in facilitating export growth. The conclusion is that trade facilitation alone is unlikely to result in a significant improvement in export performance in developing countries. For this to be achieved, there needs to be an integrated programme of strategic investments aimed at relaxing the supply side constraints that limit an economy’s responsiveness to improved market opportunities.

I. Introduction

Trade facilitation has become a significant part of the current debate on trade liberalisation policy and the related ‘aid for trade’ measures. Within the WTO Doha Round negotiations, trade facilitation is one of the main ‘implementation related issues and concerns’ (Finger and Wilson, 2006). The 2005 WTO Ministerial Meeting Declaration recognised the importance of technical assistance and capacity building to enable developing country members to benefit more fully from multilateral trade liberalisation, and stated that ‘aid for trade should aim to help developing countries, particularly LDCs, to build the supply side capacity and trade related infrastructure that they need to assist them to implement and benefit from WTO agreements and move broadly to expand their trade’ (WTO, 2005: para. 57).

Trade facilitation is generally understood to involve reducing all the transaction costs associated with the enforcement, regulation and administration of trade policies, and reforms in this area are designed to reduce the costs involved in the cross border movement of goods and services (Staples, 2002). In a narrow sense, the definition of trade facilitation reform measures is limited to the logistics of moving goods through ports or more efficiently processing documentation associated with cross border trade. A broader definition includes the environment in which transactions take place, transparency and professionalism of customs and regulatory environments, as well as the harmonisation of standards and conformance with international or regional regulations (OECD, 2005).

Despite the high expectations of gains from trade facilitation, empirical estimates of the impact of reforms on trade performance have been limited and it has proved difficult to provide strong supporting evidence of a causal link between trade facilitation reforms and trade performance. Consequently, much of the evidence in support of trade facilitation is focused on the improvements in procedures rather than the outcomes.⁴ This paper provides an econometric testing of the trade facilitation argument, by assessing the influence that trade facilitation costs have on export performance. From a policy perspective, the findings of the study are intended to improve understanding of the potential contribution of trade facilitation reforms, relative to other trade related reforms, to improving export performance.

The paper is structured as follows: Section II provides a review of the recent literature relating to trade facilitation and other determinants of export performance, particularly in developing countries. Section III

⁴ Walsh (2006) notes that ‘although it is hard to quantify with any accuracy the potential benefits of modernizing customs administration, there is ample evidence of the improvements that can be made in raising revenue and improving service to the trade community. These gains can be considerable’.

describes the methodology and data used in the study. Section IV presents the results. Finally, Section V concludes.

II. Literature Review

The reductions of tariff barriers in successive rounds of international trade negotiations, the continued expansion of world trade, and the growth in global supply chain management practices have resulted in a heightened concern with the impact of on-the-border and inside-the-border trade transaction costs on international trade. It has been argued that trade transaction costs are a major factor in explaining the pattern of international trade and investment flows (Deardorff, 2001; Obsfeld and Rogoff, 2000). Estimates of the share of directly incurred trade transaction costs range from 2 to 15 percent of total trade (OECD, 2005). As the pace of global integration continues, developing countries' ability to link with global and regional markets is increasingly affected by the costs that the private sector incurs in trade transactions. Country characteristics such as poor trade facilitation environment, deficiencies of trade related infrastructure or burdensome regulatory environment entail a negative externality on private transaction, raise trade transaction costs, and distort industrial organization with negative effects on trade and economic growth.

The quantification of the economic impact of trade facilitation represents a major analytical challenge. There are difficulties in defining and measuring trade facilitation, as well as choosing an appropriate modeling methodology to estimate the importance of trade facilitation for trade flows (Wilson et al. 2004). Another challenge is identifying causality: an increased volume of trade can lead to increased pressure on customs administrations to provide more efficient services. Wilson et al (2003, 2004) estimated the impact of trade facilitation on trade flows within a gravity model methodology.⁵ Their results indicate large potential increases in trade and growth rates from trade facilitation reform, in countries that have above average trade transaction costs. Djankov et. al. (2006) find that on average, each additional day that a product is delayed prior to being shipped reduces trade by at least 1 percent. Nordas et. al. (2006) analyse the relation between time for exports and imports, logistics services and international trade and find that time delays result in lower trade volumes and reduce the probability that firms will enter export markets for time sensitive products. Clarke (2005) has studied factors that affect the export performance of manufacturing enterprises in African countries using a cross country manufacturing survey and finds that manufacturing enterprises are less likely to export in countries with poor customs administrations and restrictive trade and customs regulations.

⁵ The authors use a broad definition of trade facilitation which covers port efficiency, the customs environment, regulatory harmonization and internet access and use.

Several studies have estimated the effects of trade facilitation reform within a general equilibrium (CGE) modelling framework (Francois et al 2005; Walkenhorst and Yasui, 2005; Hertel and Keeney, 2006). A reduction in trade transaction costs is assumed and the impact on economic welfare is calculated.⁶ The results of the CGE modelling studies show that the welfare gains from trade facilitation are large, relative to the gains from trade and services liberalisation, but still represent a small share (<1%) of GDP.

The literature indicates that developing countries can expect to benefit from trade facilitation reforms. The empirical results may overstate, however, the magnitude of the potential gains. In most studies a reduction in trade transaction costs is simply assumed to occur as a result of the trade facilitation reforms being adopted. Furthermore, the reduction in transaction costs is assumed to be passed back to the producers, either in the form of increased demand or higher prices, whereas in practice the savings may be passed forward in increased profits and/or lower prices for purchasers and consumers. In addition, the studies do not allow for the costs of implementing the trade facilitation reforms. Since many of the requirements of trade facilitation – human capital capacity in the form of computer literate work force, computerised systems, functioning telecommunication system, use of IT solutions, harmonised payment system and standardised transport facilities – are likely to be inversely related to the country's overall level of development, costs of implementing such improvements will be higher in low income developing countries. Duval (2006) undertakes a quantitative experts survey on the costs and benefits of implementation of twelve specific trade facilitation measure based on their experience, and confirms that long-term savings/benefits exceed the implementation cost for the measures considered. However, in the absence of comparative cost measures this study give only an indication of financial needs for implementing trade facilitation reform.

Despite the apparent benefits of trade facilitation reform, the implementation of these measures on their own is unlikely to bring significant improvement in export performance in developing countries. For this to be achieved requires an integrated programme of strategic investment aimed at improving the quality of the broader regulatory environment and physical infrastructure, which will relax the supply side constraints that inhibit an economy's response to changing trade incentives. For trade facilitation reform to be successful in enhancing export performance complementary policies that boost the efficiency of the whole export supply chain are vital (Helquist, 2003). Any reduction in trade transaction costs resulting from trade facilitation reform therefore, may have a relatively small effect on export performance if not implemented along with other reforms designed to relax the export supply capacity constraints.

⁶ In some cases trade facilitation is indirectly modeled by an increase in the assumed trade elasticities.

It is widely recognised that institutions play a important role in determining the outcome of policy reform measures, and institutional reform and capacity building is now part of the ‘new’ Washington consensus (Rodrik, 2006). Building on the work of North (1991), there is a growing literature that investigates the impact of institutional factors on international trade flows.⁷ Anderson and Marcouiller (2002) show that strong institutions and, in particular, legal systems capable of enforcing commercial contracts and impartial formulations and implementations of government economic policy, contribute to the growth in trade. Ranjay and Lee (2004) also examine contract enforcement regulation and report similar results. Jensen and Nordas (2004) provide evidence that institutional quality is positively related to the overall level of openness while de Groot et. al. (2004) show that similarity between trading partners in the quality of their institutions promotes trade. Freund and Bolaky (2004) identify regulations that govern labour market flexibility, business entry and bankruptcy and show, within a growth regression model, that trade enhances growth rates in economies with good regulatory quality. Chang et. al. (2005) run growth regressions on panel data for a large sample of countries and show that a broad mix policies and institutions play an important role in determining the outcome of trade liberalization.

Recent literature highlights that differences in institutional quality can themselves be a source of comparative advantage. Levchenko (2004) shows that better contract enforcement regulation is a source of comparative advantage in relatively more productive goods that require a large number of intermediate inputs. A theoretical paper by Acemoglu, Antràs and Helpman (2006) emphasizes instead the elasticity of substitution across intermediate inputs, as low substitutability makes the sector more sensitive to contractual frictions. The authors find that better contracting institutions lead to the choice of more sophisticated technologies, and that the impact of contracting institutions on technology choice is larger in sectors with lower elasticities of substitution across intermediate inputs.

The quality of domestic infrastructure is another important variable that has been found to impact on trade transaction costs. Limão and Venables (2001) find that own infrastructure accounts for 40 per cent of transport costs for coastal countries while own-country and transit-country infrastructure contributes 60 per cent of transport costs for landlocked countries. Nordas and Piermartini (2004) find that domestic infrastructure has a significant impact on bilateral flows and that this impact is particularly important for time-sensitive sectors such as clothing and automobiles.

Cross-country evidence from manufacturing surveys has also been used to identify specific behind-the-border factors that constrain countries’ export supply capacity. Clarke (2005) shows that government

⁷ North (1991) notes that ‘institutions determine costs and hence the portability and feasibility of economic activity’ and therefore the nature of institutions that govern these exchange relations affect trade’s magnitude and direction (cited in Ranjan and Lee, 2005).

policies can improve exporting performance by upgrading communications facilities. Yoshino (2006) in a study of African exporters finds that behind-the-border factors, including electricity services and internet services, not only characterize how much manufacturing firms can export but also the geographical orientation in exports.

Differences in behind the border regulatory and infrastructure quality as well as in on-the-border trade facilitation procedures can be expected to result in significant cross country differences in trade transaction costs. The recent World Bank report '*Doing Business in 2006*' documents the wide diversity among countries in their trade facilitation and contract enforcement characteristics. For example in Sub-Saharan Africa, on average, it took 59 days and 18 signatures from regulatory agencies to export a standard container of goods, whereas in OECD countries an identical good would only take 18 days to export and require 3 signatures. Similarly, in terms of contract enforcement legislation, in South Asia it took 38 procedures and 968 days from the moment the plaintiff files the lawsuit until actual payment, as opposed to 22 procedures and 351 days in OECD countries. In the next section we examine the impact of these constraints on export performance.

III. Methodology and Data

A standard methodological approach that quantifies export performance in relation to trade costs is the gravity model and this econometric tool will also be used in this study⁸. Despite early criticism of Tinbergen's (1962) original application of the gravity model in terms of its lack of theoretical underpinning, recent developments in trade theory have strengthened the theoretical basis for the gravity model, confirming its usefulness in empirical testing of bilateral trade flows (Baldwin and Taglioni, 2006).

Standard gravity models assume that the volume of trade between two countries is positively related to the size of these economies as measured by GDP and negatively related to the trade costs between them. A number of variables are normally used to capture trade costs. These include whether a country is landlocked, is an island economy, the distance between the exporter and importer as well as various 'dummy' variables that indicate whether the country pair belongs to an RTA, Currency Union, shares a common language, border or colonial heritage. Our methodology is to augment the 'standard' gravity model with policy variables that impact directly on trade costs and to assess their relative importance in determining export performance. The basic structure of the augmented model is as follows:

⁸ See Piermartini and Teh (2005) for a discussion on theoretical underpinnings and research questions analyzed in a gravity model framework. Also, Greenaway and Milner ,2002, Anderson and Wincoop, 2003.

$$\ln(\text{EXP}_{ij}^t) = \beta_0 + \ln \beta_1 \text{GDP}_i^t + \ln \beta_2 \text{GDP}_j^t + \ln \beta_3 \text{POP}_i^t + \ln \beta_4 \text{POP}_j^t + \ln \beta_5 \text{DIST}_{ij} + \ln \beta_6 \text{REMOTE}_i + \ln \beta_7 \text{TARIFF}_{ji}^t + \beta_8 \text{dRTA}_{ij} + \beta_9 \text{BORDER}_{ij} + \beta_{10} \text{dLANG}_{ij} + \beta_{11} \text{dCOLONY}_{ij} + \ln \beta_{12} \text{REG}_i^t + \ln \beta_{13} \text{REG}_j^t + \ln \beta_{14} \text{TF}_i^t + \ln \beta_{15} \text{TF}_j^t + \ln \beta_{16} \text{INFRA}_j^t + \alpha_{ijt} + e_{ij}^t \quad (1)$$

where i denotes the exporter, j denotes the importer, t denotes a year ($t=2000, \dots, 2004$) and the variables are defined as follows:

- EXP_{ijt} denotes the natural logarithm of exports in manufactured products from i to j at time t ,
- GDPpc_i and GDPpc_j is the natural logarithm of *per capita* GDP of exporting and importing country, respectively,
- POP_i and POP_j denote population of exporting and importing country, respectively.
- DIST_{ij} is the distance between i and j
- REMOTE_i is the remoteness variable measured as exporters i weighted average distance to all other countries, weighted by GDP
- TARIFF is a simple average tariff applied by country j on importing products;
- LANG is a binary “dummy” variable which is unity if i and j have a common language and zero otherwise,
- COLONY is a binary variable which is unity if i and j were ever colonies after 1945 with the same colonizer,
- BORDER is a binary ‘dummy’ variable which is unity if i and j share a common border,
- RTA is a binary variable that is unity if i and j both belong to the same regional trade agreement,
- TF is exporting country’s i or importing country’s j trade facilitation variable,
- REG is exporting country’s i or importing country’s j quality of regulation variable,
- INFRA is exporting country’s i infrastructure variable,
- α_{ijt} is a set of importer and time “fixed effects”,
- e_{ij}^t is the error term that is assumed to be normally distributed with mean zero.

We estimate the model with 5 year panel data running from 2000 to 2004 for 78 countries⁹. Following Francois and Miriam (2006) we include time specific and partner (importer) country specific fixed-effects.¹⁰

⁹ . One advantage of using panel data rather than cross sectional data, which is often used in partial equilibrium models, is that the estimates are much less sensitive to omitted variable bias because they do not assume that one year of data is representative of the long-run equilibrium (Blonigen, 2005 cited in Leshner and Miroudot, 2006).

¹⁰ The use of time varying country specific variables related to institutions precludes the use of time-varying reporter (exporter) dummies.

Recent literature illustrates that a sample selection bias can arise if the gravity model is estimated as in (1). Helpman et. al. (2006) show that almost half of all countries do not trade with each other and that the rapid growth of trade between 1970-2000 was predominantly due to growth in the volume of trade among countries that already traded with each other, rather than due to the expansion of trade among new trade partners. With the standard logged specification (1) the gravity model does not allow for trade values to take the value of zero.¹¹ To deal with this problem of sample selection bias we follow Helpman et. al. (2006) who propose the use of the Heckman two-step procedure (Heckman, 1979). First, we estimate a probit model that determines the probability that a country pair engages in trade. Next, a standard gravity regression is run to estimate the level of trade with a selectivity term obtained from the probit regression.¹² In order to correct the sample selection bias we need an identification variable(s) i.e. a variable that influences the probability of engaging in trade but does not affect its volume. Helpman et. al. (2006) show empirically that a common religion variable, defined as the probability that two randomly drawn persons, one from each country sharing the same religion, satisfies this condition. In our estimates we confirm the result of Helpman et. al. (2006) and use the common religion variable for the identification procedure¹³.

We also employ an alternative methodological approach to verify the robustness of our results. We regress the indexes of trade facilitation, regulatory quality and infrastructure availability against per-capita income and population and taking the residuals as representative of deviations from income conditional expected values for the respective indexes¹⁴.

¹¹ Two common approaches to handle the presence of zero trade include simply discarding the zeros from the sample or adding a constant factor to each observation on the dependent variable. This strategy is correct as long as the zeros are randomly distributed. However, if the zeros are not random, as is usually the case, then this induces a selection bias. Even though the proportion of observations with zero trade may vary somewhat depending on, among other things, the size of the sample, it is usually quite significant suggesting that the proper handling of these zeros is potentially very important. In our sample, for example, over 10% of the trade volumes are zeros.

¹² We can define the selection mechanism in terms of two latent dependent variable sub-models as follows:

$$y^*_1 = \alpha Y + u_1, \quad u_1 \sim N(0, \sigma_u^2), \quad (a)$$

$$z^*_1 = \beta Z + u_2, \quad u_2 \sim N(0, \sigma_u^2), \quad (b)$$

where Y and Z are vectors of observations on exogenous variables that determine trade patterns, and u_1 and u_2 are the error terms, which have a correlation σ and are normally distributed. In fact the trade volume variables that are actually observed are y_1 and z_1 and they relate to y^*_1 and z^*_1 as follows:

$$y_1 = y^*_1 \text{ if } z^*_1 > 0; \text{ } y_1 \text{ is missing otherwise}$$

$$z_1 = 1 \text{ if } z^*_1 > 0; \text{ } z_1 = 0 \text{ otherwise}$$

The dependent variable y_1 is the value of manufacturing exports, while z_1 is a dummy variable taking the value one if trade occurs while zero otherwise. The equation (a) shows how the value of exports is affected by different factors, while equation (b) explains why trade occurs at all between two partner countries.

¹³ The common religion variable was calculated with data from Robert J. Barro dataset on Religion Adherence available at <http://www.economics.harvard.edu/faculty/barro/data.html> available. Here we would like to express our gratitude to Robert J. Barro for kindly sharing his data sets.

¹⁴ The results of these regressions are presented in Appendix Table A1.

$$\ln \text{INDEX}_{i,t} = \alpha_0 + \alpha_1 \ln pcGDP_{i,t} + \alpha_2 \ln \text{POP}_{i,t} + e_{i,t} \quad (2)$$

The deviations $e_{i,t}$ then correspond to the internal trade costs indexes used in (1). This methodology is important for two reasons. *Firstly*, it ensures that we are no longer comparing countries at different levels of development. We are thus correcting for the fact that regulatory or trade facilitation environment could have divergent effect depending on the level of per capita income. *Secondly*, it reduces problems of multicollinearity arising from the fact that proxies for institutional, trade facilitation and infrastructural quality are correlated among themselves and with per capita income¹⁵.

Our dataset contains around 25, 000 observations of bilateral trade in the manufacturing sector for the period 2000-2004¹⁶. These data for 78 countries are obtained from UN Comtrade database. We follow the literature and define the manufacturing sector as commodities in categories 5 to 8 in SITC rev. 2 except those in category 68 (non-ferrous metals). The standard variables used in gravity model analysis are included in our model. Recent studies (Jensen and Nordas, 2004) emphasize trade policy as an important omitted variable in the standard gravity equations; we thus include a measure of simple average tariffs, obtained from TRAINS database¹⁷. Anderson and van Wincoop (2003) show that bilateral trade is determined by relative rather than absolute trade costs and to control for this factor we include a remoteness term in the model defined as the weighted average distance to all other countries, weighted by GDP. As a proxy for market size we include nominal GDP *per capita* at constant 2000 prices and population from the World Development Indicators. Other variables that are intended to capture variation in trade costs between country pairs such as distance, regional trade agreement membership, adjacency, or whether countries share a common language or colonial past, are taken from Rose (2004) database¹⁸.

The main focus of the paper is on the effect of behind the border trade costs on export performance. We use data from a variety of sources to construct institutional indicators for trade facilitation, infrastructure and regulatory quality for all countries in our sample.

We define trade facilitation as a weighted average of two perception-based indicators taken from the *Global Competitiveness Report*. These measures are:

¹⁵ Appendix Table A2 gives the correlation matrix of dependent and independent variables.

¹⁶ We are constrained to a 5 year period because data for institutional variables are only available from 2000 for most of the countries in our sample. A list of the 78 countries in our dataset is given in Appendix Table A3.

¹⁷ For bilateral import protection, we use applied tariffs, $\ln T_{j,t} = \ln (1 + t_{j,t})$. $t_{j,t}$ indicates the applied tariff rate offered by importer j to rest of the world exporters in period t .

¹⁸ Here we would like to express our gratitude to Andrew Rose for kindly sharing his data sets which are available on his website at <http://faculty.haas.berkeley.edu/arose/RecRes.htm>

- Hidden export barriers
- Irregular payments in export and imports.

We also construct an aggregate index of trade facilitation based on time and costs of custom procedures from the *Doing Business* database. The index consists of the following components:

- number of all documents required to export/import goods
- time necessary to comply with all procedures required to export/import goods
- cost associated with all the procedures required to export/import goods

Our main regulatory quality variables are taken from Kaufmann et. al. (2005) dataset. The authors constructed 6 variables to describe various aspect of institutional quality for 144 countries in their dataset. These are: voice and accountability, political stability, government effectiveness, control of corruption, regulatory quality, and rule of law. The indicators are available for the period 1996-2004 and are compiled from 25 different data sources taken from 18 different organizations. We are particularly interested in the last two indicators which directly measure regulatory quality. The ‘rule of law’ variable indicates the quality of the legal system and the enforceability of contracts whereas ‘regulatory quality’ is focused on the quality of implemented policies. It includes perceived incidence of policies that inhibit the market mechanism, and excessive regulation of business development, and as such closely relates to transaction costs that result from policy intrusion by the state in private trade. Kaufman’s et. al. (2005) institutional indicators are perception-based measures and thus can be biased by stages in economic development or recent events¹⁹.

An alternative regulatory quality variable was constructed using information relating to the cost effectiveness of regulation from the World Bank’s ‘Doing Business’ initiative. This dataset contains information on time and money spent on bureaucratic procedures and thus gives a more precise and consistent account of regulatory efficiency. Using the ‘Doing Business’ dataset we construct a contract enforcement index and a business regulation index.²⁰

The contract enforcement regulation index consists of the following subcomponents:

- number of procedures in a court case involving bridging a contract;
- time in calendar days to resolve the dispute;
- cost in court fees and attorney fees, where the use of attorneys is mandatory or common, expressed as a percentage of the debt value.

¹⁹ For an overview of problems related to perception based indicators consult World Bank ‘Doing Business’, 2003.

²⁰ The literature review, in the previous section, indicated that legislation in these two regulatory subcomponents might be particularly important for export performance.

The business regulatory index measures restrictions in factor movement, across and within industries, and consists of three subcomponents:

- *Labour legislation index* – is an average of three indices covering flexibility of hiring, conditions of employment and flexibility of firing constructed by Botero et. al. (2003) from detailed analysis of labour markets around the world.
- *Index of business entry* – comprises of a number of all procedures required to register a firm, average time spent during each procedure, official cost of each procedure.
- *Bankruptcy regulations* – consist of cost of the bankruptcy proceedings, average time to complete a procedure and a recovery rate, which calculates how many cents on the dollar claimants (creditors, tax authorities, and employees) recover from an insolvent firm.

Unfortunately, data from the ‘*Doing Business*’ reports are only available from 2004 onwards and thus will be included in the model as a country-specific constant.²¹

Finally, we construct a domestic infrastructure indicator, which consists of data on the share of paved roads, road and rail density, per 1000 population and the number of telephone and mobile phone subscribers, per 1000 population. The data are obtained from the World Development Indicators and International Telecommunication Union.

The original data used to construct the trade facilitation, regulatory quality and infrastructure variables described above were derived from a variety of sources and are measured in different metrics, including, survey results indices, percentages, and number of users. In order to ensure compatibility between the various variables used, all indicators were indexed and rescaled to vary from 0 to 1 so that higher quality of regulation, trade facilitation and infrastructure correspond to higher values of the index.

IV. Results

The results of applying the model described in section III are presented in Tables 1, 2 and 3. Table 1 reports the results from regressions using the two Kaufmann indices for regulatory quality and the Global Competitiveness Report measure for trade facilitation.²² Both of these indicators are available in time series, thus partner (importer) and yearly fixed effects are used in all regressions. Our approach is to

²¹ If the regulatory or trade facilitation indexes are included in the model as a country-specific constant, the within-country variation is lost, which theoretically could bias our results. However, we have included results derived from the ‘*Doing Business*’ database because this allows us to analyze the impact of certain subcomponents of the regulatory environment on export performance and also because we feel that these indicators are a more adequate measure of regulatory quality.

²² Our methodological approach imposes the assumption that the error terms are normally distributed, however this assumption is often violated in large datasets where the error term is heteroskedastic. We thus use robust standard errors without specifying a cluster group in all the regression.

regress trade facilitation, regulatory quality and infrastructure on bilateral trade volumes while controlling for the standard gravity model controls such as country size and geographical indicators²³.

Table 1 shows the results of applying the second-stage Heckman procedure that gives unbiased estimates for the model, with a selectivity term included that controls for sample selectivity bias²⁴. The results for the standard gravity model variables are consistent with the literature and in almost all cases are statistically significant. Our results also suggest that, *ceteris paribus*, countries that are members of Regional Trade Agreements trade more among themselves. Trade cost variables related to geography and culture are important for export performance. Both distance from a trade partner and remoteness from the rest of the world exert a negative, statistically significant effect on bilateral trade flows. Common language and colonial heritage continue to play a significant part in determining bilateral trade patterns.

The regression in column 1 includes trade facilitation variable as a sole determinant of internal trade costs. The results confirm the hypothesis that better trade facilitation environment has a (large) statistically significant effect on bilateral trade flows. In columns 2 and 3 we have included the alternative rule of law and regulation quality variables (using the measures provided in the Kaufmann dataset) and the infrastructure variable, along with the trade facilitation indicator. As expected, all these coefficients are significant at 1% level and have a positive impact on trade volumes. However, the size of the coefficients for the trade facilitation, regulation and infrastructure variables vary significantly. Our results show that regulatory quality, proxied by the Kaufmann rule of law and regulatory quality indices, is the most robust institutional determinant of export performance. The impact of the infrastructure index, which measures both transport and communication infrastructure quality is also large, although marginally smaller than that of regulatory quality. Improvements in border procedures and customs environment, as measured in the trade facilitation index, also impact positively on export performance but the impact is significantly smaller than of the other two institutional variables. The size of the trade facilitation coefficient is also smaller in columns 2 and 3, compared to column 1, indicating that failing to control for regulatory quality and infrastructure determinants of internal trade costs tends to exaggerate

²³ Our various regulatory variables from Kaufman et. al. (2005) and ‘Doing Business’ dataset are highly correlated, with an average coefficient of correlation of about 0.85, thus if included in the model their impact could be indistinguishable due to multicollinearity. Furthermore, contract enforcement regulation and excessive business regulation account for a separate cost element, which adds to the total costs incurred by companies that engage in international trade. Appendix Table A2 contains correlation matrix for the institutional variables and economic variables.

²⁴ Results of the 1st Step Heckman procedure are presented in Appendix Tables A4 and A5. Column 1 (Table A4) shows that our identification variable (the probability that two randomly drawn people from a country pair share the same religion) is insignificant in GLS estimates of trade volumes but seems to be important in determining that a country pair engage in trade at all (Column 2). Econometrically, this provides the needed exclusion restriction for identification of the second stage trade flows equation. Common religion variable is, thus, used as an exclusion variable in the construction of the inverse of mills ratio for the second stage Heckman procedure (Table 1, Column 1).

the significance of trade facilitation reforms.²⁵ Quantitatively, our results imply that, *ceteris paribus*, a 10 percent improvement in the regulatory environment will result in an equivalent increase in manufactures export performance. An identical rise in the infrastructure index would increase bilateral exports by a little over 8 percent, and a similar trade facilitation improvements would yield a rise in exports of about 5 percent.

We have also tested for reverse causation, where improvements in export performance could influence regulatory quality or trade facilitation efforts. We use the number of documents required to exports and colonial era settler's mortality data as instruments for trade facilitation and regulatory quality, respectively.²⁶ The intuition is that the number of documents required for exports is a measure of excessive bureaucracy that slows down trade facilitation, but is not a result of shipping volumes. Colonial period settlers mortality is a standard instrumental variable that proxies institutional (regulatory) environment. Here, the assumption is that depending on mortality rates European settler established either extractive colonies with little incentives for institutions building or created permanent settlements and attempted to imitate institutional environment present in the old world. Thus, colonial era settler's mortality will be correlated with the institutional and regulatory environment in a colony but is unlikely to be the outcome of increasing growth rates and export levels. Our results (column 4) confirm that both instruments for policy variables are important for export performance indicating that endogeneity was not a significant problem in our sample.

²⁵ The results from probit analysis in Appendix Table 4 (Columns 2 and 4) indicate that our institutional policy variable not only impact for export performance but also for probability of trade occurring.

²⁶ We follow Djankov et. al (2006) and Acemoglu et. al. (2001) in the choice of these instruments

Table 1: Heckman procedure regression results with regulatory variables from Kaufman dataset*

<i>GLS: 2nd Step Heckman</i>				
Explanatory Variable	(1)	(2)	(3)	(4)
GDP per capita	1.178*** (.016)	.634*** (.019)	.784*** (.019)	.707*** (.026)
GDP per capita partner	1.917*** (.309)	2.01*** (.295)	2.02*** (.301)	1.877*** (.527)
Population	1.315*** (.009)	1.44*** (.009)	1.44*** (.009)	1.18*** (.016)
Population Partner	-1.394 (.990)	-1.407 (.947)	-1.21 (.964)	-1.07 (1.66)
Distance	-1.51*** (.016)	-1.435*** (.0163)	-1.447*** (.0164)	-1.27*** (.035)
Remoteness	-.006*** (.002)	-.013*** (.002)	-.006*** (.002)	-.014 *** (.003)
Colony	1.329*** (.081)	1.214*** (.08)	1.068*** (.08)	
Language	.037 (.035)	.381*** (.035)	.284 *** (.035)	.402*** (.057)
Border	.612 *** (.073)	.756*** (.072)	.774*** (.072)	.618*** (.131)
RTA	.126*** (.011)	.147*** (.011)	.153*** (.011)	.195*** (.016)
Trade Facilitation	.627*** (.05)	.501*** (.049)	.450 *** (.129)	
Rule of Law		.993*** (.047)		
Regulatory Quality			1.01*** (.059)	
Infrastructure		.807*** (.031)	.862*** (.033)	
Documents for exports				.339*** (.083)
Settlers Mortality				.895*** (.030)
Selectivity Term (Inverse Mills Ratio)	-2.05*** (.072)	-1.12*** (.033)	-.95*** (-.042)	-1.93*** (.101)
No. of Ob	26732	26732	26732	10825
R ² / Pseudo R ²	0.7186	0.7539	0.7645	0.7033
Prob > F	0.00	0.00	0.00	0.00

*-For all tables * indicates significance at 10%, ** at 5% and *** at 1% level, respectively. Robust standard errors in parenthesis.

Table 2 gives results of the application of the second-stage Heckman procedure for the gravity model with more direct measures of regulatory quality based on cost and time of bureaucratic procedures, using data from ‘Doing Business’ reports. In these regressions we use only time (yearly) fixed-effects and thus can also investigate the impact of partner (importer) regulatory and trade facilitation indicators²⁷.

In column 1 we include both exporter and importer trade facilitation environment as determinants of on-the-border trade costs. As expected, the coefficients have a statistically significant and positive effect on bilateral trade flows. The coefficient on exporter trade facilitation is much higher than on the equivalent importer variable indicating that a country’s own trade facilitation trade reform measures are important in expanding exports. In column 2 we have also included variables that capture contract enforcement regulation and infrastructure. As before, we find that variables related to regulatory and infrastructure quality have a higher effect on export performance than trade facilitation environment. Estimated coefficients indicate that a 10 percent improvement in contract enforcement regulation index will result in a 11 percent rise in export performance (column 2).²⁸ Furthermore, the estimated coefficient on trade facilitation indicates that a 10 percent rise in this indicator would increase export performance in a country by 4 percent.²⁹ Columns 1 and 2 also show that partner’s (importer’s) contract enforcement regulation and trade facilitation efforts are significant and impact positively on exports. The estimated coefficients are however, much smaller than own indexes giving further evidence that a country’s own reforms are the key to improving export performance. The elasticity associated with the infrastructure quality is similar to the one obtained in Table 1 and indicates a 10 percent rise in exports if infrastructure quality index rises exports by around 9 percent. Column 3 shows second-stage Heckman procedure regression results where regulatory quality is proxied by the index of business regulation that includes labour flexibility, business entry and bankruptcy laws. The results again highlight the importance of the regulatory environment on export performance, with the regulation on business variable statistically significant for trade volumes. The estimated coefficient indicates that the index of business regulation is similar in size to that of contract enforcement regulation. Finally, trade policy variables continue to exert an impact on trade volumes. The coefficient on importing country’s tariffs is negative and significant for export performance but its magnitude is small (around -0.01), suggesting that while tariffs act as a constraint on market access for manufactured goods, this effect may diminish as tariff levels decline.

²⁷ We cannot introduce partner (importer) regulatory variables with partner fixed effects because this would create a significant problem of multicollinearity between these variables and fixed effects.

²⁸ According to the definition of contract enforcement regulation index, this would indicate that a decrease in time, cost, and number of procedures by 50 days, 3 percent of the cost of debt and two procedures, respectively in a court case involving bridging a contract, would raise export by the above amount.

²⁹ A 10 percent raise in the indicator would entail, on average, a drop in time, cost and number of procedures involved in exporting a good by two days, \$90 and 0.6 of a procedure.

In column 4 we show the results of an interaction term between trade facilitation and contract enforcement regulation. *A priori*, one would expect this measure to have high explanatory power as these two complementary policies designed to relax export supply constraints should have significant effect on export performance, if implemented simultaneously. Our results confirm this view. The interaction term is highly significant and indicates that countries that simultaneously increase their trade facilitation and contract enforcement regulation indexes by 10 percent expand their trade by nearly 20 percent. Column 5 gives results for the interaction term between business regulation and trade facilitation index. The results are quantitatively similar to those reported in the previous regression, giving further support to the conclusions above.

Table 2: Second-stage Heckman procedure regression results with regulatory variables from Doing Business dataset

<i>GLS: 2nd Step Heckman</i>					
Explanatory Variables	(1)	(2)	(3)	(4)	(5)
GDPpc	1.304*** (.011)	1.08*** (.014)	1.09*** (.015)	1.13*** (.013)	.778*** (.016)
GDPpc partner	.750*** (.012)	.790*** (.013)	.791*** (.012)	.841*** (.011)	.854*** (.011)
Population	1.267*** (.009)	1.33*** (.009)	1.33 *** (.009)	1.345*** (.009)	1.363*** (.009)
Population Partner	.835*** (.008)	.868*** (.008)	.866*** (.008)	.877*** (.008)	.895*** (.008)
Distance	-1.343*** (.013)	-1.3*** (.013)	-1.306*** (.013)	-1.33*** (.013)	-1.562*** (.016)
Remoteness	-.003*** (.002)	-.018*** (.002)	-.017*** (.002)	-.021 *** (.001)	-.006 (.002)
Tariffs	-.022*** (.002)	-.023*** (.002)	-.024*** (.002)	-.025*** (.002)	-.022*** (.002)
Colony	1.392*** (.103)	1.125*** (.107)	1.07*** (.108)	1.089*** (.103)	1.158*** (.079)
Language	.3*** (.033)	.503*** (.035)	.495*** (.035)	.639*** (.034)	.118** (.034)
Border	.55*** (.061)	.683*** (.061)	.702*** (.061)	.747*** (.062)	.645*** (.072)
RTA	.178*** (.008)	.202*** (.008)	.201*** (.008)	.185*** (.008)	.12*** (.011)
Trade Facilitation	1.054*** (.099)	.406*** (.076)	.448*** (.130)		
Trade Facili. Partner	.491*** (.132)	.097*** (.063)	.103*** (.061)		
Contract Enforcement		1.131*** (.097)			
Contract Enfor. Partner		.429*** (.130)			
Business Regulation			1.083*** (.096)		
Contract Enf. * Trade Facili.				1.957*** (.062)	
Reg. Quality * Trade Facili.					2.264*** (.071)
Infrastructure		.899*** (.037)	.911*** (.037)	.683*** (.037)	.823*** (.035)
Selectivity Term (Mills Ratio)	-2.32*** (.1)	-1.817*** (.099)	-1.82*** (.099)	-1.36*** (.091)	-1.50*** (.072)
No. of Ob	26732	26732	26732	26732	26732
R ² / Pseudo R ²	0.7318	0.7645	0.7400	0.7525	0.7463
Prob > F	0.00	0.00	0.00	0.00	0.00

*-For all tables * indicates significance at 10%, ** at 5% and *** at 1% level, respectively. Robust standard errors in parenthesis

Finally, we estimate the effects of on and behind the border trade costs on export performance while controlling for the level of development of the countries in the sample. In Table 3 column 1 we present the regression results where we replace the internal trade cost variables with estimated income conditional expected values of these indices³⁰. The results show that relative to the average level for its income cohort, better trade facilitation performance, improved regulatory quality and better infrastructure availability have a statistically significant, positive effect on export performance. A similar set of results to those in previous tables indicates that our estimates were not significantly biased by multicollinearity or differential effects of diverse development levels.

An alternative approach to estimate the effects of trade costs on export performance while controlling for the level of development is to divide the sample by countries' level of development, as proxied by the level of GDP per capita. The remaining regressions (columns 2-4) in Table 3 show results of the second-stage Heckman procedure for various split samples of our dataset. What we are looking for is evidence of a differential role, at the margin, for trade facilitation, regulatory quality or infrastructure depending on the level of development. Column 2 shows the result of a regression where the sample is restricted to developing countries.³¹ As before, the internal trade costs coefficients have a statistically significant and positive effect on bilateral trade flows but their magnitude appears to be larger. This suggests that on-the-border and behind-the-border factors play a more important role in determining export performance in developing countries than for the world as a whole. In particular, the coefficient on infrastructure availability nearly doubles, indicating the vital importance of improving infrastructure in relaxing export supply capacity in developing countries.³² In column 3 we present results where we constrain the sample to lower-income developing countries³³. The results further highlight the importance of regulatory and infrastructure reforms relative to trade facilitation improvements, in improving export performance particularly for developing countries. Finally, in column 4 we present results of the gravity model with developing countries' exports to OECD countries. As before, all variables that capture internal trade costs are statistically significant and have a positive effect on trade flows. Trade facilitation, in particular seems to have a strong effect on the ability to export to sophisticated markets in the north.

³⁰ The results of regressions specified in equation 2 are included in Appendix Table A1.

³¹ Developing countries were defined according to the World Bank's country classification as countries that fall into 3 groups: low income, \$875 or less; lower middle income, \$876 - \$3,465; upper middle income, \$3,466 - \$10,725;

³² On the role of infrastructure investment in economic growth, see Kessides (2004), Kirkpatrick et al (2006)

³³ This group is defined according to the World Bank's country classification as countries that fall into 2 groups: low income, \$875 or less; lower middle income, \$876 - \$3,465;

Table 3: Heckman procedure regression results with Developing countries sub-samples

<i>GLS: 2nd Step Heckman</i>				
Explanatory Variable	Deviation from predicted values	Developing Countries Exports	Lower Income country Exports	South - North Exports
GDPpc	1.39*** (.011)	.669*** (.027)	.564*** (.022)	.495*** (.045)
GDPpc partner	.848*** (.011)	1.872*** (.392)	1.722*** (.313)	-.354 (1.53)
Population	1.40*** (.009)	1.550*** (.014)	1.205*** (.056)	1.46*** (.021)
Population Partner	.899*** (.008)	-1.17 (1.247)	-1.22 (1.523)	-.982 (3.47)
Distance	-1.497*** (.016)	-1.472*** (.021)	-1.372*** (.036)	-1.547*** (.027)
Remoteness	-.002 (.002)	-.019*** (.002)	-.008*** (.0045)	-.025*** (.003)
Colony	1.348*** .0816	1.076*** (.093)	-.063 (.298)	1.140*** (.101)
Language	.071*** (.035)	.397*** (.048)	.36*** (.080)	.430*** (.060)
Border	.653*** (.073)	.870*** (.085)	.944*** (.267)	.794*** (.093)
RTA	.125*** (.0116)	.146*** (0.035)	.213*** (.038)	.140*** (.014)
Trade Facilitation	0.104*** (0.005)	.345*** (.072)	.363*** (.090)	.536*** (.12)
Rule of Law	0.243*** (0.010)	1.257*** (.105)	1.072*** (.062)	.934*** (.077)
Infrastructure	0.194*** (0.03)	1.762*** (.0299)	1.553*** (.0235)	1.253*** (.0305)
Selectivity Term (Inverse Mills Ratio)	-2.04*** (.072)	-1.171*** (.090)	-2.716*** (.192)	-1.439*** (.095)
No. of Ob	26732	17630	5943	11932
R ² / Pseudo R ²	0.7285	0.6649	0.4995	0.5195
Prob > F	0.00	0.00	0.00	0.00

VI. Conclusions

Despite the theoretical argument in favour of trade liberalization acting as an engine of growth in developing countries, the impact of trade liberalization on economic performance has varied significantly across countries, suggesting that country specific factors play an important part in determining an economy's response to changes in trading opportunities and incentives.

Following the adoption of the Doha Development Agenda as the framework of international trade negotiations, the role of trade facilitation has received much attention in recent years. Improvements in border customs and trade administrative procedures have been seen by many observers as offering a

relatively low cost and immediate means of accelerating the volume of multinational trade flows, particularly in developing countries.

The purpose of this paper has been to assess the contribution of trade facilitation to export performance. Using a standard gravity model framework, we have shown that trade facilitation reforms can indeed contribute to improved export performance. But other reforms, including the quality of the regulatory environment and the quality of the basic transport and communications infrastructure are also needed and are often more important than on the border trade facilitation reforms in facilitating export growth.

Concluding, there seems to be no easy policy ‘fixes’ for improving the export performance of developing countries. For this to be achieved requires an integrated programme of ‘second generation’ reforms aimed at improving the quality of the institutional and physical infrastructure that will complement the necessary improvements in trade facilitation, thereby enhancing an economy’s capacity to respond to the export market opportunities provided by trade liberalisation.

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Appendix:

Table A1: OLS regressions – Estimation of income conditional institutional variables

Dep/Ind Variable	Trade Facilitation	Rule of Law	Regulatory Quality	Infrastructure
<i>Ln GDPpc</i>	.120*** (.001)	.199*** (.000)	.162*** (.000)	.338*** (.002)
<i>Ln POP</i>	.009*** (.001)	-.012*** .000	-.020*** .0006	-.045*** (.001)
R-squared	0.2336	0.5567	0.6534	0.5096

Table A2: Correlation Matrix of dependant and independent variables

	gdppc	gdppcpar	pop	poppar	tariff	tf	tfpar	rlaw	regq	linfra
Trade value	1.000									
GDP per cap.	-0.0450	1.0000								
Population	-0.1311	-0.0115	1.0000							
Population p	-0.0119	-0.1218	-0.0182	1.0000						
Tariffs	0.0224	-0.5812	0.0022	0.3397	1.0000					
Trade Facil.	0.7675	-0.0401	-0.1650	-0.0111	0.0208	1.0000				
Trade F. Par	-0.0306	0.7713	-0.0074	-0.1496	-0.5450	-0.0300	1.0000			
Rule of Law	0.8481	-0.0481	-0.2175	-0.0128	0.0307	0.7928	-0.0368	1.0000		
Regulation Q.	0.7396	-0.0431	-0.2478	-0.0119	0.0234	0.7714	-0.0343	0.9173	1.0000	
Infrastructu.	0.6105	-0.0469	-0.2182	-0.0111	0.0310	0.6145	-0.0331	0.7202	0.6796	1.0000

Table A3: Countries included in the database

Argentina	El Salvador	Korea, Rep.	Russian Federation
Australia	Estonia	Latvia	Singapore
Austria	Finland	Lithuania	Slovak Republic
Bangladesh	France	Malaysia	Slovenia
Belgium	Germany	Mauritius	South Africa
Bolivia	Greece	Mexico	Spain
Botswana	Guatemala	Morocco	Sri Lanka
Brazil	Haiti	Namibia	Sweden
Bulgaria	Honduras	Netherlands	Switzerland
Canada	Hong Kong, China	New Zealand	Thailand
Chile	Hungary	Nicaragua	Trinidad and Tobago
China	Iceland	Nigeria	Tunisia
Colombia	India	Norway	Turkey
Costa Rica	Indonesia	Panama	Ukraine
Croatia	Ireland	Paraguay	United Kingdom
Czech Republic	Israel	Peru	United States
Denmark	Italy	Philippines	Uruguay
Dominican Republic	Jamaica	Poland	Venezuela, RB
Ecuador	Japan	Portugal	Vietnam
Egypt	Jordan	Romania	Zimbabwe

Table A4: 1st Step Heckman Procedure for regressions with Kaufman institutional indices

<i>GLS: 1st Step Heckman</i>				
Regression	Censored Sample	Probit	Censored Sample	Probit
Explanatory Variable	(1)	(2)	(3)	(4)
GDPpc	.745*** (.019)	.604*** (.012)	.575*** (.019)	.607*** (.012)
GDPpc partner	2.02*** (.298)	.400*** (.010)	2.02*** (.293)	.429*** (.011)
Population	1.488*** (.007)	-.047** (.021)	1.451*** (.007)	-.470*** (.027)
Population Partner	-1.02 (.954)	-.021 (.014)	-1.197 (.938)	-.002 (.015)
Distance	-1.88*** (.018)	-.606*** (.023)	-1.66*** (.017)	-.588*** (.025)
Remoteness	-.006*** (.002)	-.002* (.001)	-.005*** (.001)	-.002* (.001)
Colony	.544*** .090	-.426*** (.067)	.370*** (.085)	-.528*** (.069)
Language	.269*** (.043)	.368*** (.045)	.584*** (.041)	.497*** (.046)
Border	.159* (.083)	-.291* (.152)	.177* (.078)	-.321** (.160)
RTA	.128** (.014)	.026 (.025)	.161*** (.013)	.051 (.027)
Trade Facilitation	.638*** (.107)	1.599*** (.108)	.302*** (.115)	.578*** (.123)
Rule of Law			1.12*** (.092)	.947*** (.083)
Infrastructure			1.06*** (.033)	.840*** (.032)
Common Religion	.503 (.461)	.1536*** (.057)	.335 (.259)	.403*** (.060)
No. of Ob	26732	29809	26732	29809
R ² / Pseudo R ²	0.7118	0.4065	0.7355	0.4439
Prob > F	0.00	0.00	0.00	0.00

Table A5: 1st Step Heckman Procedure for regressions with ‘Doing Business’ institutional indices

<i>GLS: 1st Step Heckman</i>				
Regression	Censored Sample	Probit	Censored Sample	Probit
Explanatory Variables	(1)	(2)	(3)	(4)
GDPpc	.842*** (.016)	.579*** (.012)	.844*** (.016)	.581*** (.012)
GDPpc partner	.880*** (.010)	.390*** (.010)	.831*** (.011)	.398*** (.010)
Population	1.422*** (.007)	.237*** (.013)	1.42*** (.007)	.102*** (.019)
Population Partner	.931*** (.007)	-.042*** (.015)	.926*** (.007)	-.028*** (.015)
Distance	-1.46*** (.014)	-.616*** (.023)	-1.363*** (.014)	-.563*** (.024)
Remoteness	-.004*** (.001)	-.012*** (.004)	-.020*** (.002)	-.013*** (.003)
Tariffs	-.025*** (.002)	-.016*** (.004)	-.024*** (.005)	-.014*** (.002)
Colony	1.21*** (.082)	-.365*** (.069)	.953*** (.081)	-.484*** (.071)
Language	.505*** (.035)	.325*** (.047)	.617*** (.035)	.402*** (.048)
Border	.306*** (.070)	-.379 (.150)	.397*** (.069)	-.308 (.152)
RTA	.184*** (.011)	.024*** (.025)	.215*** (.011)	.041*** (.025)
Trade Facilitation	.915*** (.040)	.199*** (.031)	.337*** (.032)	.357*** (.039)
Trade Facili. Partner	.421*** (.039)	.094*** .033	.089*** (.033)	.438*** (.038)
Business Regulation			1.031*** (.095)	.341*** (.091)
Infrastructure			.923 *** (.026)	.904*** (.025)
Common Religion	-.393 (.048)	.045*** (.056)	-.031 (.049)	.160*** (.059)
No. of Ob	26732	29809	26732	29809
R ² / Pseudo R ²	0.7318	0.4076	0.7400	0.4111
Prob > F	0.00	0.00	0.00	0.00