Annex D

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The Effects of US Trade Capacity Building Assistance on Trade-Related Outcomes, 1999-2008

Final Report

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Executive Summary

This study investigated the impact of US government trade capacity building (TCB) assistance on trade-related outcomes in 148 recipient countries between 2001 and 2008. Dependent variables were identified at two levels. The first level comprised overall trade performance, with indicators on total exports, imports, and trade integration obtained from sources such as the IMF Direction of Trade Statistics and the UNCTAD Handbook. The second level comprised three intermediate outcomes considered as preconditions for improvement at the main level: 1) improvement of business practices among exporters and importers in the private sector (e.g., number of products exported and export concentration); 2) implementation of improved trade-related practices in the public sector (e.g., reduced tariffs and trade protection); and 3) more efficient and cost-effective movement of goods across borders (e.g., time to export, customs burdens, quality of port infrastructure). Indicators of performance for these intermediate outcomes were also obtained in commonly-used databases such as Doing Business and the Logistics Performance Index project.

The main independent variables were the total amount of U.S. Government trade capacity building (TCB) assistance, and the portion of US Government TCB assistance allocated by USAID, as reported in the U.S. government-wide Trade Capacity Building Database. The models all utilized two year lagged values of the US TCB variables in order to capture a presumed lag in program implementation and impact once funds were allocated. We also examined the impact of USAID allocations that were "directly" related to trade capacity building (i.e., those coded by MSI as not likely to have been undertaken in the absence of a trade rationale) as well as USAID allocations targeted towards each of the three intermediate outcomes, based on MSI's association of TCB Database funding codes with those intermediate outcomes. In this way, the study linked *overall* TCB allocations from the US in general, and from USAID in particular, to *overall* trade-related performance, and linked targeted USAID TCB assistance in three different areas with the respective intermediate outcomes that these allocations were intended to improve.

Using “fixed effects” panel regression models that controlled for a series of general economic and structural factors, and for global time trends in trade outcomes, we arrived at the following set of results:

- Total US government TCB assistance, and USAID TCB assistance, each had significant impact on overall trade performance in recipient countries. Using total merchandise exports as the main dependent variable, we found that a 1% increase in total US government TCB assistance was associated with an average increase of .008% in total exports. For a country that received an average amount of USG TCB and which had an average amount of total exports, the impact of every $1 increase in overall USG TCB was estimated to be a $53 increase in total merchandise exports two years later.
- A similar model was estimated for specific USAID TCB allocations, controlling for non-USAID TCB allocations and all other variables included earlier. The model confirmed the positive effect of TCB assistance, with a statistically significant impact of .004 for USAID and a significant effect of .003 for non-USAID allocations. This translates, for a country that received an average amount of USAID TCB assistance and which had an average amount of total exports, to a $42 increase in exports for every additional $1 of USAID assistance provided.
- We found no evidence that the total trade performance effects were limited to promoting exports to the United States; on the contrary, the impacts were stronger for exports to the rest of the world.
- The positive findings for total exports, however, did not extend to other global indicators of trade performance. We found no significant impact of either total USG TCB allocations or USAID assistance on recipient countries' export share of the world market, export volume, or total imports.
- There was some suggestive evidence that "direct" USAID TCB allocations had a stronger impact than did overall USAID allocations, but this difference was not statistically significant (Table 4). It was the case, however, that the overall impact on total merchandise exports was driven primarily by USAID allocations devoted specifically to export promotion, as opposed to allocations for Trade Related Public Practices and Trade Facilitation. It should be noted that the majority of USAID assistance was targeted in the export promotion category; less than one-quarter of all USAID TCB assistance was targeted for Trade Related Public Practices and Trade Facilitation improvement.
- "Conditional effects" analyses suggested that USG TCB had greater impact among countries with greater need, as indicated in particular by GDP per capita, landlocked

status, and more distance from Amsterdam (an agreed-upon "center" of the global economy). Moreover, USG TCB was shown to have stronger effects on countries that were participating more fully in the multilateral Integrated Framework process.

- The impact of USG and USAID TCB assistance on indicators related to the three intermediate trade outcomes in the Results Framework was more difficult to discern, due to data limitations and sometimes poor quality indicators. As a result, these analyses yielded the least robust set of results. There was some suggestion that overall USAID TCB, and specific USAID TCB allocations targeted for export promotion, had significant impact on the number of products a country exported, one key indicator related to this sector. Overall USG and overall USAID TCB allocations were also linked to indicators related to improved public sector practices such as lower tariffs and increased trade freedoms, though specific USAID allocations targeted for Trade Related Public Practices did not appear to be particularly influential in producing these results. This latter result suggests that the improvements in public sector practices were likely driven by USAID allocations for other sectors, notably those allocated for export promotion. We found no evidence that total USG TCB, USAID TCB, or specific allocations for customs improvements and more efficient movement of goods across borders, had impact on the indicators related to trade outcomes related to this sector. As noted, however, the amount of USAID TCB allocations in this area was relatively small.

1. Introduction: The MSI Results Framework

Our research design is based on the results framework developed by MSI to understand the effects of Trade Capacity Building (TCB) on trade-related outcomes. The framework, summarized in Figure 1, identified a first level of overall trade performance, as well as a second level of performance composed by three intermediate outcomes considered as preconditions for improvements at the main level.

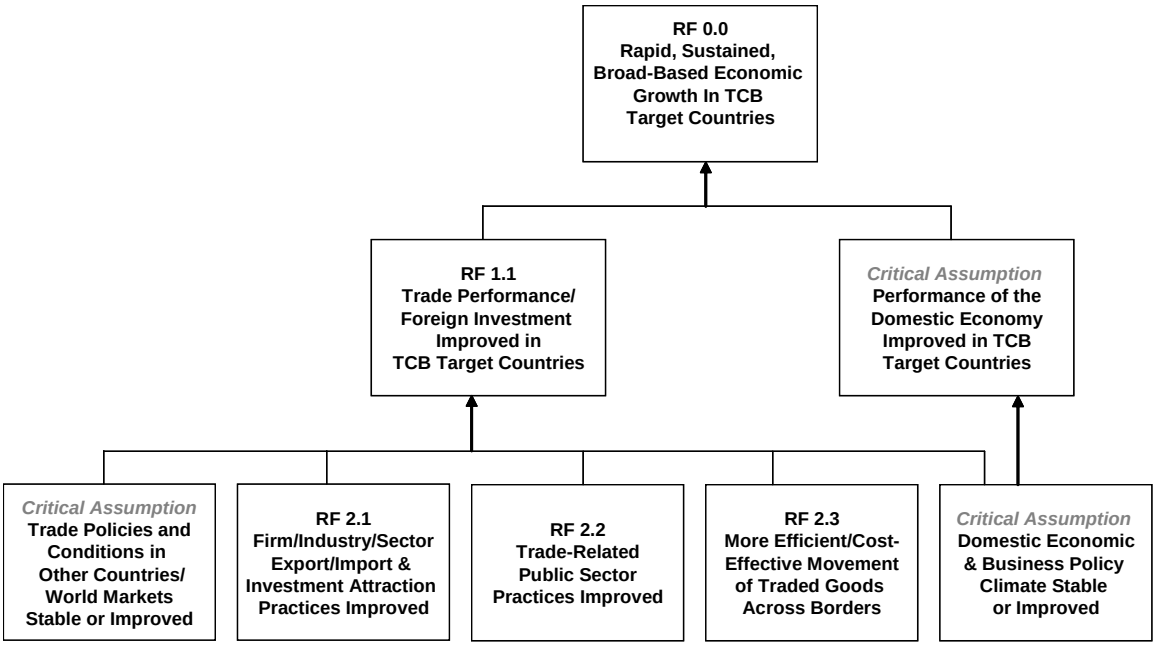
The first level of performance (Level 1.1) refers to general improvements in trade-related outcomes, such as real growth in total trade, an increase in imports, and an expansion of exports to the United States and to the rest of the world. As reflected in Figure 1, performance at this level is assumed to be determined not only by the specific trade environment (reflected by the three factors at the second level) but also by other factors such as macro-economic conditions in each country and trade policies adopted by competitors and potential partners.

The three intermediate outcomes (sometimes discussed in this report as sub-sectoral outcomes), reflected in boxes 2.1, 2.2, and 2.3, are:

1. *The improvement of business practices among exporters and importers in the private sector*. Among those practices are investment in human resources, customer service, product design, extensive participation in the value chain, marketing, the adoption of international standards, and control of the distribution channels.
2. *The implementation of improved trade-related systems and practices in the public sector*. Among those are reductions in trade protection and non-tariff barriers and the adoption and implementation of trade agreements.
3. *A more efficient and cost-effective movement of goods across borders*. For example, this includes a reduction in the number of steps necessary to comply with all administrative procedures required to export or import goods, better logistics, transport costs, and customs infrastructure.

In addition the results framework identifies two other two other sets of variables (trade policies and conditions in other countries, and domestic economic conditions) which were not directly examined by this study. To the extent that was possible, we included indicators of those factors as control variables in our models.

Figure 1. Top Levels in the Results Framework for the TCB Project



Source: Management Systems International

Our quantitative analysis takes the four highlighted performance outcomes (or "boxes") identified in Figure 1 as four separate dependent variables, constructs indicators for the four types of trade-related performance, and develops statistical models to explain variance in those patterns of performance across countries in a world-wide sample. Our main explanatory variables are: total US investment in Trade Capacity Building (TCB), the portion of US TCB that was allocated by USAID, and the specific portions of USAID TCB that were allocated towards improving each of the intermediate or sub-sectoral outcomes in the Results Framework Figure.

In the next section we discuss the measurement of our main TCB-related independent variables, the dependent variables (general trade performance and the sub-sectoral outcomes), and the control variables in our models. In section three we present the main findings of the study, showing the impact of TCB assistance on overall trade performance. Section four discusses the impact of TCB assistance on the three intermediate outcomes. Section five summarizes the conclusions of the study.

2. Data and Measurement

The population for our study is comprised by 188 countries (we use the term loosely to include autonomous territories) that were eligible for official development assistance or official aid according to the Development Assistance Committee (DAC) of the OECD in 1999, the first year in our dataset. Information on trade flows (exports and imports) was not available for nine countries, so the effective sample was reduced to 179 cases.[1] The list of countries is presented in Appendix 1, together with the total US TCB funding received by each nation between 1999 and 2008.

Assistance for Trade Capacity Building

The main source for US TCB assistance has been the US Government *Trade Capacity Building Database* (http://qesdb.cdie.org/tcb/index.html). The MSI team conducted further research to disaggregate funding allocated to each country in terms of the specific sub-sectors identified in the results framework (generally labeled as Export Promotion, Trade Policies and Agreements, and Trade Facilitation). Data on TCB funding was collected for each country-year in the sample.

All measures of foreign assistance for trade capacity building (TCB) were converted to constant (2000) US dollars, and then transformed using the natural logarithm of the dollar value.[2] We make this log transformation for several reasons. First, using logged values instead of unlogged levels helps reduce the influence of outlier observations. Second, paired with a similar transformation of the main dependent variable (total exports in dollars, see below) this log transformation allows for an interpretation of the results in terms of elasticities, or the average percent change in the dependent variable that is produced by a one percent change in the independent variable, thus making it easier to identify the substantive effect of the TCB aid. Third, this transformation follows the convention for the standard "gravity" models employed in

[1] Information was missing for Cayman Islands, Falkland Islands, Gibraltar, Kosovo, Marshall Islands, Northern Mariana Islands, Saint Helena, Tokelau, and the Virgin Islands (UK).

[2] The exact transformation formula for all TCB measures was $X_{it}=\ln(1+TCB_{it})$, where X is the value of the transformed variable for the i-th country at time t, and TCB is the value of assistance for that year in constant 2000 dollars. Thus, if a given country received zero assistance in any given year, X=0; if a second country received $100,000 in aid that year, X=11.5; and if a third country received twice as much, $200,000 in that year, X=12.2. The dependent variables measuring exports in dollars (i.e., export value) are transformed in the same way, to allow for a consistent interpretation.

research on international trade (e.g., Anderson 1979, Bergstrand 1985). It is also important to note that all measures of Trade Capacity Building were lagged 2 years to control for possible "endogeneity" (e.g., reverse causality) and to allow for longer term effects.

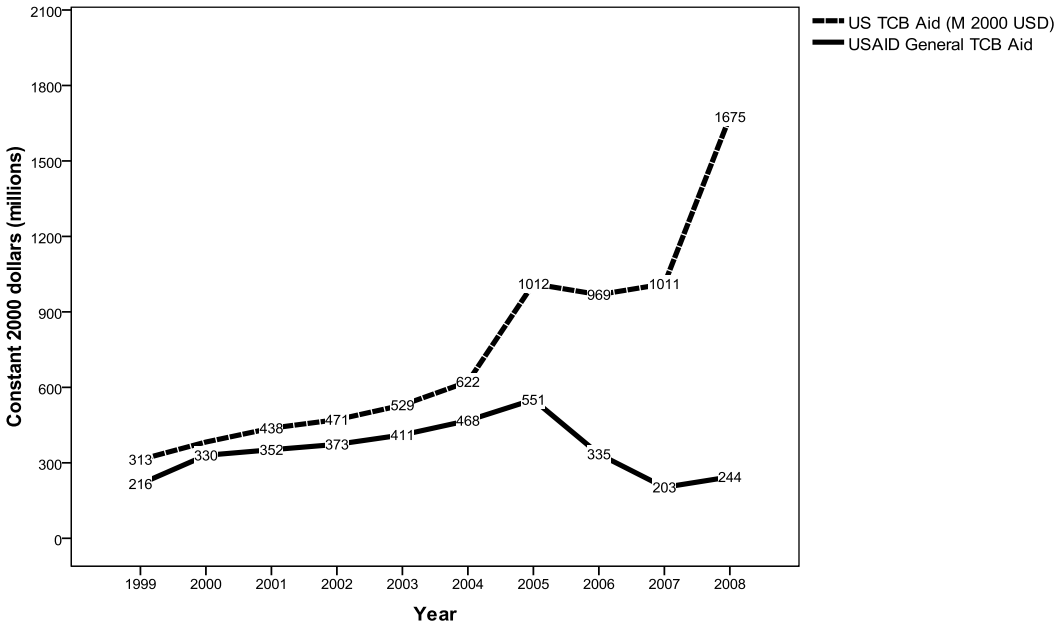
General TCB Measures

1. Total **United States Government (USG) Trade Capacity Building obligations**. For purposes of this study, trade-related investment is a sum of six sub-categories[3]:
    - Customs Operation and Administration, including assistance to help countries modernize and improve their customs offices.
    - E-commerce Development and Information Technologies (IT), including assistance to help countries acquire and use IT to promote trade by creating business networks and disseminating market information.
    - Export Promotion, including assistance to increase market opportunities for developing country and transition economy producers.
    - Business Services and Training, including support to improve the associations and networks in the business sector, as well as to enhance the skills of business people engaged in trade.
    - Regional Trade Agreements (RTA), including assistance to an RTA or to an individual country that increases the ability of the RTA to facilitate trade. It can also include assistance to a potential member of an RTA that improves the analytical capacity of the country's government with respect to RTA issues.
    - Other Trade Facilitation: support to increase trade flows that is not categorized in one of the other five Trade Facilitation sub-categories.

    1.1. Total annual TCB funding by the **United States Agency for International Development (USAID).** This item represents a subset of the total USG TCB obligations. It is based on the official definition of TCB, as assistance in lowering the costs of engaging in international trade flows.

[3] A complete listing of TCB categories tracked by the U.S. government is available on the TCB Database website: http://tcb.eads.usaidallnet.gov/about/definitions.html

Figure 2: Total US Government TCB and USAID TCB, 1999-2008



1.2. **US Government TCB other than USAID**. This variable is the difference between the first and the second items presented above. Over 20 US agencies participate in TCB projects worldwide. Among them are the Departments of Agriculture, Commerce, and Transportation; the US Customs Service; the Environmental Protection Agency; the Federal Trade Commission; the Export Import Bank; the Millennium Challenge Corporation; and the Trade and Development Agency.

1.3. "**Direct" USAID Trade Capacity Building Obligations.** This item is a subset of total USAID obligations. MSI coded TCB Database descriptions of funded activities as being "directly" related to trade when it was unlikely that such activities would have been undertaken in the absence of a trade rationale. TCB Database descriptions of activities that could have been undertaken for more general development purposes, e.g., improve the banking system, were not scored by MSI as being directly trade related.

Figure 2 reflects total annual investment in trade capacity building by the US Government and by USAID in particular between 1999 and 2008. Total TCB funding has escalated from 313 million in 1999 to 1.7 billion in 2008 (in constant 2000 dollars). Until 2005, USAID programs represented a vast majority of the TCB funding allocated by the US

Government. But the creation of the Millennium Challenge Account (MCA) in 2004 created a widening gap between the series for USAID TCB and total US Government TCB. Given the nature of the MCA, in most recent years it is difficult to determine what percentage of the total USG TCB funding has been actually disbursed. Because we employ a two-year lag for the main independent variables in this study (and thus, for instance, exports in 2008 are modeled as a function of TCB allocated in 2006) this potential problem is restricted in our study only to 2005 (explaining outcomes for 2007) and 2006 (outcomes for 2008).

Specific Sub-Sectoral Measures

MSI also disaggregated the "Direct" USAID Trade Capacity Building Obligations into three sub-sectoral measures directly related to the intermediate outcomes identified in the results framework. As in the case of other TCB measures, all sub-sectoral measures of TCB were lagged 2 years to control for possible "endogeneity" and to allow for longer term effects of TCB assistance on intended outcomes.

1. **USAID Assistance for Export Promotion.** This item represents the portion of AIDTCB2 that the MSI team identified as directed towards Export Promotion; Business Services & Training; Trade Related Agricultural Development; Environmental Trade & Standards; Tourism Sector Development, E-Commerce, and Other Services Development. This funding was expected to contribute to **Box 2.1** in the results framework (see Figure 1).
2. **USAID Assistance for Improved Trade Related Public Practices.** This item reflects the portion of USAID TCB funding that the MSI team identified as directed towards promoting more effective trade policies and practices in countries, as well as promoting participation in the WTO (awareness and accession), regional trade agreements, and US FTAs. This funding was expected to contribute to **Box 2.2** in the results framework.
3. **USAID Assistance for Trade Facilitation.** This item represents the portion of AIDTCB2 funding that MSI associated with Customs Operation & Administration; and Other Trade Facilitation, and Physical Infrastructure. This funding was expected to contribute to **Box 2.3** in the results framework.

Figure 3: Total "Direct" USAID TCB Programs, by Sub-Sector, 2002-2006

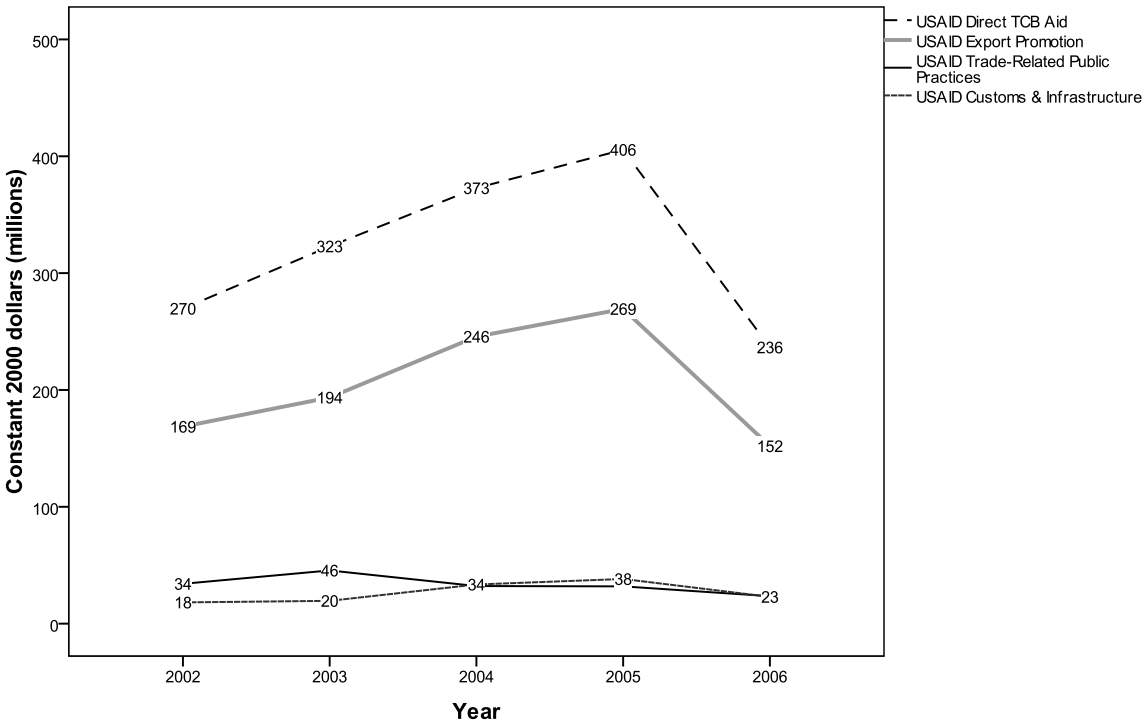


Figure 3 summarizes the total TCB funding allocated yearly to the different sub-sectors. The series indicate that a majority of the funding coded as "direct" TCB assistance corresponds to programs directed towards export promotion, trade-related agricultural development, business services and training, environmental trade and standards, tourism development, and services development (generally labeled "Export Promotion" in the figure). It is important to note that in relative terms, the other two sub-sectors (promotion of Trade Related Public Practices and Trade Facilitation) are small. Note also that this information is available only since 2002, which (given the lagged structure of the independent variables) allows for statistical models explaining outcomes beginning in 2004, as opposed to beginning in 2001 for the overall trade performance models.

Dependent Variables

Category 1.1: Trade Performance in TCB Target Countries

The main sources for the Trade Performance in TCB Target Countries are the International Monetary Fund's *Direction of Trade Statistics* (http://www.imfstatistics.org/dot/), the *United Nations Conference on Trade and Development* (http://www.unctad.org), and the *United Nations Commodity Trade Statistics Database* (http://comtrade.un.org/). The value of exports and imports in TCB target countries was converted to constant (2000) US dollars using the deflator for US dollar amounts available from the Department of Commerce, Bureau of Economic Analysis. These constant values were then transformed to the natural logarithm of the dollar value. As noted above, this transformation follows the convention for the standard gravity models employed in research on international trade and, paired with a similar transformation of the independent variables, also allows for an interpretation of the results in terms of elasticities or impacts on percentage change.

1. **Total Merchandise Exports**: This entry provides the total US dollar amount of merchandise exports on an f.o.b. (free on board) basis. These figures are calculated on an exchange rate basis, i.e., not in purchasing power parity (PPP) terms. Series from the IMF were available for 2001-08.
2. **Total Exports to the United States**: Total exports from each country to the United States. This series was collected from the IMF, using the exports reported by each country to the United States.
3. **Total Merchandise Imports**: This entry provides the total US dollar amount of merchandise imports on a c.i.f. (cost, insurance, and freight) or f.o.b. (free on board) basis. These figures are calculated on an exchange rate basis, i.e., not in purchasing power parity (PPP) terms. Information was collected from the IMF.

The dataset also contains series from UNCTAD for 2001-07, and series from Comtrade for 2001-08 (the latter, however, reported 2008 data for fewer countries at the time of this study). We consider the export data from these two sources to be of lower quality than the IMF data, and so all of our statistical models will use the higher quality IMF trade data. Indeed, this understanding about data quality also explains why we do not report results where extractive

exports have been subtracted from total merchandise exports. The IMF does not report data on extractive exports, although this information is available from Comtrade. Thus, estimating a model of exports minus extractives would force us to either use a low quality trade dataset (i.e. Comtrade) or to combine export measures from two different data sources (i.e. subtract extractives reported by Comtrade from total exports reported by the IMF). Either choice would be problematic, providing less confidence in the statistical results using such a dependent variable.

Figure 4: Exports for the Average Country, by Source, 1999-2008

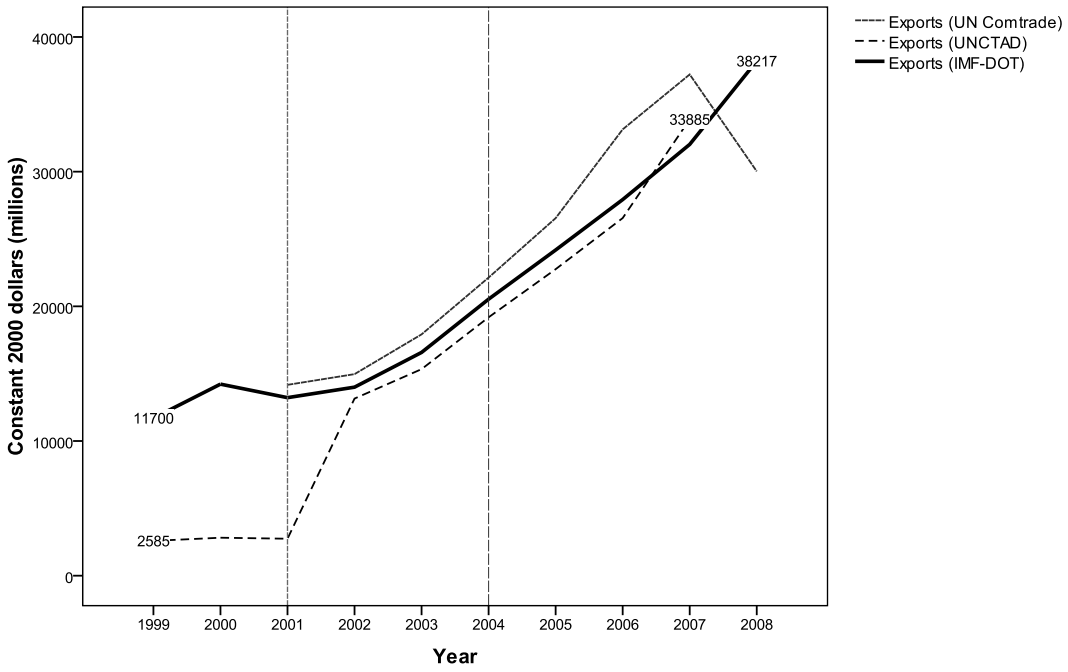


Figure 4 traces the evolution of exports for the average country in our sample between 1999 and 2008. According to the IMF Direction of Trade Statistics (our main source), the average country expanded exports from approximately 12 billion dollars in 1999 to 38 billion in 2008. In the figure we compare this information with equivalent series calculated from alternative sources, Comtrade and UNCTAD. Other sources indicate a similar trend in global trade, although the series generated by IMF-DOT are more consistent and stable. The vertical lines in Figure 4 illustrate the effect of lagging the TCB predictors two years. When TCB data is available since 1999 (for total USG and total USAID TCB), our models explain exports (or other

trade outcomes) starting in 2001. When TCB data starts in 2002 (for specific sub-sectors), the models cover outcomes since 2004.

Alternative Measures of Overall Performance

The *United Nations Conference on Trade and Development* (http://www.unctad.org) and the World Bank *World Trade Indicators* (http://info.worldbank.org) databases are the two main sources for the alternative measures of overall performance. The alternative measures of overall performance like that measures of trade performance in TCB target countries were converted to constant (2000) US dollars, and then transformed using the natural logarithm of the dollar value.

1. **Service Exports**: represents the UNCTAD secretariat calculations based on IMF Balance of Payments Statistics on CD-ROM and other international and national sources. Services are defined as the economic output of intangible commodities that may be produced, transferred and consumed at the same time. Services cover a heterogeneous range of activities that are difficult to capture within a single definition. They typically include changes in the condition of the consumers realized through the activities of the producers at the demand of customers. Ownership rights over services cannot be established. By the time production of a service is completed, it must have been provided to a consumer. Services figures comprise 11 principal services categories according to the concepts and definitions of the IMF Balance of Payments Manual (1993). The categories are transport; travel; communications; construction; insurance; financial services; computer and information services; royalties and license fees; other business services; personal, cultural and recreational services; and government services. The balance-of-payments figures presented here may be somewhat downward-biased as compared with the actual flows of exports and imports of services.
2. **Export Share of World Market**: reflects the export trade market share of a country, expressed a percentage of total world trade.
3. **Export Volume**: is an index computed by UNCTAD secretariat. The volume index is the percentage ratio of the export value index to the corresponding unit value index.

Specific Sub-Sectoral Measures

2.1: Private Sector Export and Import Practices Improved

Number of Products Exported. This indicator reflects the natural log of the number of products exported, calculated at the 3-digit SITC, Revision 2 level. The total number of products reported by the World Bank's World Trade Indicators includes only products whose value exceeds $100,000 or .3 percent of the country's total exports.

Export Concentration Index. This indicator, reported by UNCTAD, measures the degree of market concentration given the number of products exported and the total value for each SITC category. The formula, based on the Hirschman-Herfindahl index, produces values between 0 (maximum dispersion) and 1 (maximum concentration).

Private Business Practices Factor. Using factor analysis, we aggregated information from the Global Competitiveness Report to create a scale of competitive business practices. The index summarizes information on the extent of staff training, customer orientation, the nature of competitive advantage, value chain breadth, control of international distribution, production process sophistication, extent of marketing, and firm-level technology absorption. For technical details of the factor analysis, see Appendix 2.

2.2: Improved Trade-Related Public Practices

Applied Tariff Simple Average. This indicator reported by the World Trade Indicators reflects the simple average of the applied tariff rates (including preferential rates) available at HS 6-digit product level in a country's customs schedule.

Applied Tariff Weighted Average. Reflects the trade-weighted average of the applied tariff rates including preferential rates that a country applies to its trading partners available at HS 6-digit product level in a country's customs schedule.

Share of Duty Free Lines in Tariff Schedule. This indicator, reported by the World Bank, reflects the total share of lines in the country's tariff schedule that are duty free (it is expressed as a percentage of total lines).

Trade Freedom Index. This index, developed by the Heritage Foundation, is a composite measure reflecting the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. The trade freedom score is based on the trade-weighted

average tariff rate and on non-tariff barriers. The index ranges from 0 to 100 (http://www.heritage.org/Index/).

Trade Protection Factor. We used factor analysis to create a composite index summarizing information on tariffs, based on the Trade Freedom Index, the Tariff Trade Restrictiveness Index (MFN applied tariff-All Goods; applied tariff+NTMs); the MFN applied tariffs (simple and weighted averages), the applied tariffs (simple and weighted averages). See Appendix 2 for technical details on factor analysis.

2.3: More Efficient and Cost Effective Movement of Traded Goods Across-Borders

Doing Business Factor. Using factor analysis, we aggregated information generated by Doing Business on time to export, time to import, the number of documents required to export goods, and the number of documents required to import goods.

LPI Factor. We aggregated information from several items in the Logistics Performance Index using factor analysis. The scores summarized information on perceived timeliness of shipments; perceived logistics competence; perceived trackability of shipments; perceived efficiency of customs and other border procedures; quality of transport and IT; perceived quality of transport and it infrastructures; perceptions of international transport costs; and perceptions of domestic transport costs.

Customs Index Factor. This aggregate index is based on information provided by the Global Competitiveness Report. We employed factor analysis to aggregate information on the burden of customs procedures; irregular payments in export & imports; quality of port infrastructure; quality of air transport; and the liner shipping connectivity index (LSCI). See Appendix 2 for information on the construction of this index.

Control Variables

The last set of variables comprises controls for domestic economic and geographic factors. The domestic economic measures were converted to constant (2000) US dollars, and then transformed using the natural logarithm of the dollar value. This transformation follows the convention for the standard gravity models employed in research on international trade outlined in previous pages.

1. **GDP**: GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used (WB- World Development Indicators (WDI) Database). (Natural log).
2. **GDP growth.** The annual percentage growth rate of GDP at market prices based on constant local currency.
3. **GNI per capita**: GNI per capita is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income generated abroad (WB- World Development Indicators (WDI) Database). (Natural log).
4. **Population** : this measure is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates (WDI Database). (Natural log).
5. **Year trend**: In order to capture temporal trends in the series, we included a year count variable (year 2001=0).
6. **Total annual TCB assistance allocated by bilateral (and some multilateral) donors in the Organization of Economic Co-operation and Development (OECD)**. Information, available only after 2001, was collected from the World Trade Organization's *Doha Development Agenda – Trade Capacity Building Database* (http://tcbdb.wto.org/).
7. **Country-specific variables**. These factors represent country specific time-invariant or fixed characteristics. They were omitted in fixed-effects models including indicator or "dummy variables" for each country (because the country indicators subsume these time-invariant characteristics).
    a. **Landlocked**: show which countries are landlocked (Rose, 2004).

b. **Island**: depicts island countries (Rose, 2004).

c. **Surface Area in km^2** : country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes (WB- World Development Indicators (WDI) Database). (Natural log).

d. **Distance from Amesterdam** (ln_d_ROW): intended to capture this distance of the country from the main world markets, this item represents the natural log of distance from Amsterdam, measure in kilometers (Gleditsch, http://privatewww.essex.ac.uk/~ksg/data-5.html).

8. **Mediating factors.** In some models we have explored the role of two additional conditions that potentially mediate the effects of TCB assistance. These factors are:

   a. **Potential Demand for Aid for Trade**: This country-level indicator was created by Elisa Gamberoni and Richard Newfarmer (2008). The scores reflect the country's trade performance and its capacity to trade. Values closer to 1 indicate better conditions (less demand) and values closer to 5, worse conditions (more demand). Countries with higher values present low or negative growth rates of exports, shrinking shares of the global market, deteriorating competitiveness, concentrated sales, lack of diversification, poor infrastructure, poor customs, high tariff peaks, and poor trade policy.

   b. **Integrated Framework**. An ordinal, eight-point scale reflects the degree to which countries have participated in the Integrated Framework Process (http://www.integratedframework.org/index.html). We recoded this variable into a trichotomous scale: a score of 0 indicates that the country is non-eligible; 1 indicates that the process has been initiated (up to the point in which a technical review has been completed), and 2 indicates that the main missions and national validation workshops have been completed or that the DTIS has been completed.

3. First Level: Models of General Trade Performance

Statistical Model

We begin our statistical analyses of general trade performance with a focus on *export levels*, based on the understanding that an important objective of aid for trade, including the U.S. government's trade capacity building (TCB) aid, was to increase the export performance of recipient countries. It is important to state clearly that increased exports are only an intermediate policy goal. The ultimate policy goal is to increase economic growth and reduce poverty based on research showing that trade has positive effects to towards these ends (e.g. Frankel and Romer 1999). But economic growth and reduced poverty are longer term goals and, in this report, our empirical focus centers on the shorter term goal of general trade performance. Thus, the dependent variable in our base statistical model is country/year's total merchandise exports, measured in constant U.S. dollars. Our primary independent variables are the amount of trade capacity building assistance received by the country/year unit from the U.S. government, also measured in constant dollars, and the amount of trade capacity building assistance specifically allocated by USAID.[4]

More specifically, we use the logged value of both exports and TCB aid to produce a log-linear statistical specification. Our use of logged values offers three primary advantages. First, using logged values instead of unlogged levels helps reduce the influence of outlier observations. Second, the log-linear specification will allow us to interpret coefficients as representing the percentage change in the dependent variable produced by a percentage change in the independent variable, making it easier to identify the substantive effect of the TCB aid. Third, logged values are the standard specification in gravity models of international trade with bilateral exports or imports as the dependent variable.

It is also important to note that we will lag the logged measure of TCB aid by two periods, or two years. We use this lag for two different reasons. First, the lag is consistent with an expected delay in implementation after appropriation. In other words, it should take some

[4] Our models take the country/year as the unit of analysis. An alternative unit of analysis would be the country pair/year, which is the standard unit of analysis for gravity models of international trade. We view the country /year unit as preferable for our analysis, since annual US TCB is allocated in order to promote the recipient country's exports to *all* trade partners. Thus a global export measure for a given country in a given year corresponds exactly to the "output" that is designed to be affected by the US TCB "input".

time before TCB aid, once appropriated in Washington, gets implemented (effectively or not) in the recipient country. Second, the two year lag helps to reduce the potential for endogeneity bias as a country's appropriation of U.S. TCB aid may be influenced by its current or past export level, although it is unclear whether this bias should manifest itself in a positive or negative direction.[5] In terms of using a two-year lag, it is worth noting that while there is not much quantitative analysis concerning TCB aid effects, two other papers on the subject (Brazys 2007; Cali and Velde 2008) also use a two-year on TCB aid as an independent variable, presumably for much the same reasons as we do here.

While we use the country/year unit of analysis instead of the country pair/year unit, we nonetheless are able to control for all the factors that are used in the standard gravity model specification. In this regard, one can think of each country/year observation as having the rest of the world as it aggregate trading partner. The logic underlying the gravity model suggests that we need to control for the size of the recipient country and also for the size of the rest of the world. In terms of the first factor (i.e. the size of the recipient country/year), we use a logged value of its GDP and of its population. These two control variables also proxy, respectively, the total capital and labor stock in the recipient's national economy based on the understanding that such factor endowments may explain not only what products a country can export successfully in a competitive world market, but also how much it can export.

To control for the size of the rest of the world, which is different for each country in our statistical sample, we begin with a set of country fixed effects, or N-1 country "dummy variables." Since we also expect growth in the size of the rest of the world to occur over time, we approximate these increases in world demand for the recipient country's exports using a time trend independent variable. And, to the extent that there is also variation relative to the rest of world based on economic growth within the recipient country, we include the country/year's economic growth rate. This variable will also pick up any changes in its export performance that stem from an improvement in domestic economic conditions, rather than from external TCB aid.

[5] Endogeneity would bias the USG TCB coefficient in a positive direction if the U.S. government provided more TCB to countries with a higher export level. To the extent that the U.S. government has provided more TCB aid to countries that have problems exporting, then endogeneity would bias the USG TCB coefficient in a negative direction, potentially cancelling out any positive effects running from USG TCB towards exports.

The standard gravity model framework also controls for a set of time-invariant regressors, which include the country's distance from some trade partner, whether or not it is landlocked, whether or not it is an island, and its land area (which may proxy the country's export potential based on its *land* endowments following a three-factor model with land, labor and capital). Since we include country fixed effects for the reasons described above, all of these time-invariant regressors will drop from our model since they offer no unique variation next to the country fixed effects.[6] Privileging the country fixed effects over the set of time-invariant regressors offers an important advantage in that they control not only for the identified time-invariant factors (e.g. distance, landlocked, island, and land area), they also control for any potentially omitted factors that also vary by country. Omitted variable bias would thus be a more serious problem had we privileged the time-invariant regressors over the country fixed effects.

Finally, we estimate the statistical model just described with a correction for first-order autocorrelation in the residuals or the error term for each unit.[7] This specification models the idiosyncratic error term at one point in time for a given unit as a function of the previous year's idiosyncratic error, thus capturing the extent to which transient unobserved factors affecting trade performance for a country at one point persist in affecting performance at the next point in time. Such a specification costs one observation per country time-series (since the first time point lacks a "lagged" error term), but improves the efficiency of the resultant estimates and captures some of the temporal dependence of the outcome variable over time that is *unrelated* to the primary independent variables of interest.[8] Given this correction and the two-year lag on the TCB aid variable, our model tests the effects of US TCB (and USAID TCB) on overall trade performance in 148 lesser developed countries between 2002 and 08.[9]

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[6] In effect, these country dummy variables allow each country in our sample to have its own intercept, thus controlling for unobserved differences among this set of countries.

[7] Autocorrelation is a problem often found in time-series regression where the estimated error for one observation is correlated with the estimated error for the next observation in the temporal sequence. Such correlations would violate an important assumption for the Ordinary Least Squares estimator: that the errors are independent, or uncorrelated with each other, and statistical models then need to correct for this potential problem.

[8] A test for the presence of autocorrelated disturbances in our base model of Table 1, following Drukker (2003), decisively rejected the null hypothesis of "no autocorrelation" ($F(1, 147) = 36.1$, $p<.001$).

[9] That is, the two year lag has USG TCB allocations between 1999 and 2006 affecting trade performance between 2001 and 2008, but the autocorrelated disturbance term eliminates outcomes from 2001 from consideration.

Results for Merchandise Exports

Having described our statistical model, we now present and discuss the results. Our first model focuses on the effect of TCB aid from the United States Agency for International Development (USAID TCB) while controlling for TCB aid from other U.S. government sources (Other USG TCB). As shown in Table 1, model 1, both aid coefficients are positively signed and statistically significant with at least 90 percent confidence. We interpret these results as being broadly consistent with the proposition of TCB aid effectiveness, at least in terms of increasing recipient country exports.

Table 1: Models of General Trade Performance (Exports)

Model:	**1**	**2**	**3**	**4**
Dependent Variable:	Total Merchandise Exports (logged)	Total Merchandise Exports (logged)	Exports to the Rest of the World (logged)	Exports to the United States (logged)
USAID TCB (logged and lagged 2 years)	0.004* (0.002)			
Other USG TCB (logged and lagged 2 years)	0.003* (0.002)			
USG TCB (logged and lagged 2 years)		0.008*** (0.002)	0.009*** (0.002)	-0.022* (0.013)
Gross Domestic Product (logged)	0.105* (0.060)	0.100* (0.060)	0.110** (0.053)	0.435 (0.295)
Population (logged)	-0.667 (0.771)	-0.601 (0.762)	-0.926 (0.639)	3.026 (3.220)
GDP Growth Rate	0.005*** (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.010 (0.010)
Year trend (2001=0)	0.175*** (0.016)	0.174*** (0.016)	0.182*** (0.013)	0.057 (0.068)
Number of observations	1,030	1,030	1,030	1,030
R^2 Within R^2 Between	0.35 0.30	0.36 0.30	0.46 0.33	0.03 0.34

Cell entries are regression coefficients from a fixed effects model with AR(1) disturbance, standard errors in parentheses. Country dummy variables are not reported for space considerations.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

It is also important to assess the substantive significance of the USAID TCB coefficient, which is estimated to be 0.004. Our log-linear specification means that a 1 percent increase in USAID TCB results, *on average*, in a 0.004 percent increase in recipient merchandise exports two years later. Of course, a given .004 percent change in exports for a given 1% change in USAID TCB will translate into different raw dollar amounts of exports, depending on how much TCB is allocated to the country and what its general level of exports are. But we offer the following illustrative example of the substantive effects of USAID TCB assistance for the "average" country in our sample. The mean country-year value for USAID TCB, among *all* country-years in our sample, was about $2.3 million, meaning that a 1 percent increase in USAID TCB aid from USAID would be about $23,000. The mean country-year value for total merchandise exports, among *all* observations in our sample, was about $24 billion, meaning that a 0.004 percent increase amounts to about $976,000. *Thus, a $1 increase in USAID TCB, for a country receiving an average amount of USAID TCB and with average overall exports, is associated with a $42 increase in total merchandise exports two years later*.[10]

It is possible that we are *under*estimating the coefficient of overall US TCB assistance by dividing its signal into two parallel measures: USAID TCB and Other USG TCB. Thus in Table 1, model 2, we combine them into a single independent variable, which measures total US government TCB aid (USG TCB). The results show the USG TCB coefficient to be positively signed and statistically significant with at least 99 percent confidence. Given its larger coefficient (0.008), it is useful to again interpret its substantive significance with an illustrative example. Our log-linear specification means that a 1 percent increase in total U.S. government TCB aid is associated with, *on average*, a 0.008 percent increase in merchandise exports two years later. The mean country-year value for USG TCB, among *all* country/years in our sample, was about $3.7 million, meaning that a 1 percent increase in total U.S. government TCB aid would amount to about $37,000. The mean country-year value for total merchandise exports for all observations in our sample was about $24 billion, meaning that a 0.008% increase amounts to about $1,952,000. *Thus, a $1 increase in USG TCB, for a country receiving an*

[10] The substantive effect of the USAID TCB coefficient is smaller if the calculations are limited to those country-year observations where some USAID TCB assistance was received. The mean country-year value for USAID TCB, among countries that received it, was about $5 million, meaning that a 1 percent increase in TCB aid from USAID would amount to about $50,000. The mean country-year value for total merchandise exports, among USAID TCB aid recipients, was about $19 billion, meaning that a 0.004 percent increase amounts to about $764,000. Thus, a $1 increase in USAID TCB would be associated with a $15 increase in total merchandise exports two years later.

average amount of USG TCB and with average overall exports, is associated with a $53 increase in total merchandise exports two years later.[11]

Is this substantive effect a large or small one? In response to this question, we note the results from a recent World Bank report by Helble, Mann, and Wilson (2009). These authors found that a $1 increase in total OECD TCB can be associated with a $5 increase in additional trade. While one must be very cautious in directly comparing the results of two studies that use a different statistical model with a different unit of analysis (as discussed earlier), such a comparison would seem to suggest that US TCB aid allocations have been several times more effective in increasing recipient trade than have been average OECD TCB allocations.

Helble *et al.* (2009) also report that a "narrow" measure of OECD TCB aid is associated with a $697 increase in additional trade. This finding would seem to suggest that the substantive effect of US TCB aid has been small compared to "narrow" OECD TCB aid. However, we view their finding as inconclusive, as the model they used to estimate the effect of "narrow" TCB aid did not also include a variable to measure the effect of "broad" TCB aid. Thus, we suspect that the coefficient for the narrow measure of OECD TCB aid is picking up the impact of all forms of OECD TCB aid, both narrow and broad, with the true effect of the "narrow" measure likely being substantially smaller. Moreover, if the OECD effects are being generated in part by "broader" (and larger) quantities of TCB assistance, then the estimated amount of exports generated by a given dollar of assistance would also no doubt be smaller than what was reported.

We can also compare our results to those reported in another recent analysis of US TCB assistance. Brazys (2007) distinguished between two primary export destinations of recipient countries: 1) their exports to the U.S. market and 2) their exports to the rest of the world excluding the United States. His statistical results showed that U.S. TCB aid was only associated with an increase in recipient exports to the U.S. market and had no statistically significant effect in terms of recipient exports to the rest of the world. Brazys thus concluded, by reverse causality logic, that US TCB aid has been driven by donor interest and not by recipient need.

[11] As above, the substantive effect of the USG TCB coefficient becomes smaller if we calculate its effect using only the country-year observations that received USG TCB. The mean country-year value for USG TCB, among the countries that received it, was about $6 million, meaning that a 1 percent increase in TCB aid from USAID would amount to about $60,000. The mean country-year value for total merchandise exports, among USAID TCB aid recipients, was about $28 billion, meaning that a 0.008% increase amounts to about $2,224,000. Thus, a $1 increase in USG TCB would only be associated with a $37 increase in total merchandise exports two years later.

But as also shown in Table 1, we obtain a very different set of results from those reported by Brazys. We find that USG TCB has been associated with a statistically significant increase in merchandise exports to the rest of the world (model 3), but not with an increase in exports to the U.S. market in isolation (model 4). Indeed, the weakly significant negative coefficient for USG TCB in model 4 would indicate a decrease in exports to the U.S. market, although this coefficient becomes statistically *in*significant when we re-estimate the model without the correction for first order autocorrelation. We think that there is a relatively simple explanation for this set of results, consistent with the signal-strength logic offered earlier: most of the exports for any country/year observation go to non-U.S. markets, or to the rest of the world excluding the United States. This means that there is a much stronger signal associated with the dependent variable in model 3 compared to the one in model 4. Based on this logic, one should expect to find a stronger USG TCB effect in model 3 than in model 4.

Additional Robustness Checks

Having considered the robustness of our main result (model 1 in Table 1) to changes in both the primary independent variable (model 2 in Table 1) and the dependent variable (models 3 and 4 in Table 1), we now consider the robustness of our results to changes in the model specification and to alternative statistical estimators. We focus here on models using total U.S. TCB aid.

In Table 2, we begin by adding another independent variable: Other OECD TCB. Considering the TCB aid effect from non-U.S. sources forces us to use data from the World Trade Organization's Trade Capacity Building Database. This does not include TCB aid in certain major categories and has more limited temporal coverage, covering years 2001-2006 in our study (though losing 2001 for the autocorrelation correction as before). Using this smaller sample, (N=638), we add Other OECD TCB (logged and lagged two years) to our model and estimate its effect next to USG TCB. Even with the smaller sample, USG TCB returns a statistically significant positive coefficient (0.009) in Table 2, model 1. However, the coefficient for Other OECD TCB is statistically indistinguishable from zero. We hasten to add that it does not necessarily mean that TCB aid from all non-U.S. sources has been ineffective. Indeed, we strongly suspect that the statistical insignificance of Other OECD TCB is driven at least in part by poor data quality. As the WTO's TCB database does not count certain categories of aid as TCB aid, the signal from a variable using this data source should be relatively weak, raising the likelihood of a statistically

insignificant result.[12] Given the fact that this variable adds no explanatory power to our model, while reducing the size of our statistical sample, we do not include Other OECD TCB in any other statistical models.

Table 2: Robustness Checks for Models of Trade Performance (Exports)

Model:	**1**	**2**	**3**	**4**
Dependent Variable:	Total Merchandise Exports (logged)			
Method of Estimation:	Fixed Effects with AR(1) Disturbances	OLS with lagged dependent variable	Fixed Effects with AR(1) Disturbances	Difference GMM
Lagged Dependent Variable		0.523***		-0.063
		(0.060)		(-0.064)
USG TCB (logged and lagged 2 years)	0.009***	0.011***		0.011***
	(0.003)	(0.003)		(0.003)
USG TCB (logged but with no lag)			-0.001	
			(0.002)	
Other OECD TCB (logged and lagged 2 years)	0.001			
	(0.006)			
Gross Domestic Product (logged)	-0.133	0.106	0.238***	0.184
	(0.098)	(0.080)	(0.050)	(0.115)
Population (logged)	-2.745**	0.123	-0.506	-0.285
	(1.195)	(0.412)	(0.538)	(0.641)
GDP Growth Rate	0.003	0.006**	0.005***	0.005***
	(0.003)	(0.003)	(0.002)	(0.002)
Year trend (2001=0)	0.212***	0.067***	0.129***	0.135***
	(0.024)	(0.015)	(0.011)	(0.018)
Number of observations	638	1,180	1,329	1,030
R2 Within	0.27	0.72	0.35	
R2 Between	0.44	0.97	0.07	

Country dummy variables are not reported for space considerations.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

We explained earlier that our models include a statistical correction for first-order autocorrelation that costs us one observation per country time-series. We could also have used a lagged dependent variable as an additional regressor to deal with first-order autocorrelation, although a lagged dependent variable may create bias when it is included next to country fixed

[12] In fact, if we were to use the measure of U.S. government TCB aid taken from the WTO TCB database, its positive coefficient would be statistically insignificant at conventional levels.

effects, leading us to favor the AR(1) correction.[13] Nonetheless, it is possible to estimate the same model with a lagged dependent variable and without the AR(1) correction. These results (Table 2, model 2) offer a somewhat larger statistical sample (N=1,180) and a somewhat stronger USG TCB coefficient (0.011).[14] We offer these results to show that the statistically significant positive effect for U.S. government TCB aid is not being driven by the AR(1) correction; if anything, this correction tends to weaken the result.

It is also possible that, even with a two-year lag on our TCB aid variable, its coefficient is biased by endogeneity in the form of reverse causality, or by the export level's effect on U.S. TCB aid allocations. This should not be much of a concern if the causality from exports to U.S. TCB aid runs in a negative direction (i.e. a lower level of exports results in greater TCB aid allocations) because this would mean that our positive USG TCB coefficient is understated and, thus, the U.S. government's TCB aid has been even more effective than our estimates would suggest. But if the causality from exports to TCB aid runs in a positive direction, then our USG TCB coefficient may be overstated, or too large in a positive direction. To ascertain whether this is indeed the case, we begin by eliminating the lag on USG TCB, thus estimating a model where the export level is being regressed on the level of U.S. TCB aid in the year that it was appropriated (rather than implemented). If reverse causality runs in a positive direction, then we should be able to observe that the positive USG TCB coefficient gets even larger when the lag is eliminated.

The results in Table 2, model 3 show that this is not case: without a lag, the USG TCB coefficient becomes statistically insignificant (with a negative sign). We interpret this as a favorable result with regards to endogeneity: there is a very low probability that the positive coefficient for USG TCB observed in the earlier models is being supported by a positive relationship that runs from the country/year export level to its appropriation of TCB aid from the U.S. government. If anything, this result would suggest that reverse causality runs in a weakly negative direction as countries with greater exports receive somewhat less U.S. government TCB aid allocations, controlling for other factors. Indeed, if we were to model U.S. government TCB allocations as a function of the export level lagged two years (thus reversing the dependent and primary independent variables), the export coefficient is negative and

[13] On the bias created when a lagged dependent variable is included next to unit fixed effects, see Nickell (1981).

[14] It is important to note that a one-year lag on the dependent variable does not cost us any observations given the two-year lag on USG TCB.

statistically significant, indicating that countries that export less have tended to receive more TCB aid from the U.S. government, or that any reverse causality runs in a negative direction.

We offer another more technical test for endogeneity in these results. Our export model can also be estimated using the "difference" generalized method of moments (GMM), a useful econometric technique when one lacks a set of valid external instruments for potentially endogenous independent variables. This GMM estimator differences all variables in the statistical specification and then uses the lagged levels as instruments for the potentially endogenous differenced regressors (Arellano and Bond 1991). As potentially endogenous regressors, we identify USG TCB, even with a two year lag, and also the logged value of Gross Domestic Product since the Keynesian production function puts exports on the right-hand side of national income, or GDP. Our difference GMM model is estimated in two steps with robust standard errors. To avoid overfitting, it is important that the instrument count not exceed the number of country units in the sample: our sample includes 148 countries and has an instrument count of 104, or 52 per endogenous regressor. The difference GMM results in Table 2, model 4 produce a larger positive coefficient for USG TCB (0.011) than our earlier set of fixed effects regressions, which is consistent with our contention that if there was any reverse causality in our earlier export models, it tended to weaken (not strengthen) the USG TCB coefficient.

Other Aggregate International Trade Outcomes

Having shown what U.S. TCB aid can explain (i.e. recipient exports), we now offer some additional estimates showing what it *cannot* explain. Given the interest in USAID TCB aid effects in particular, the statistical models in Table 3 will use the two parallel TCB aid measures: USAID TCB and Other USG. But this set of (non)results is also robust to using the combined U.S. TCB measure: USGTCB.

Table 3: Models for Alternative Indicators of Overall Trade Performance

Model:	**1**	**2**	**3**
Dependent Variable:	Export Share of World Market	Export Volume	Imports (logged)
USAID TCB (logged and lagged 2 years)	-0.000 (0.000)	0.002 (0.002)	-0.000 (0.002)
Other USG TCB (logged and lagged 2 years)	0.000 (0.000)	0.001 (0.001)	0.000 (0.001)
Gross Domestic Product (logged)	0.029*** (0.008)	0.165*** (0.047)	0.224*** (0.042)
Population (logged)	-0.207 (0.271)	-0.855 (1.313)	-0.210 (0.554)
GDP Growth Rate	0.000 (0.000)	0.001 (0.002)	0.005*** (0.001)
Year trend (2001=0)	0.009 (0.006)	0.001 (0.025)	0.173*** (0.011)
Number of observations	1,048	733	1,030
R^2 Within R^2 Between	0.02 0.14	0.03 0.08	0.56 0.26

Cell entries are fixed effects coefficients with AR(1) disturbances. Standard errors in parentheses.
Country dummy variables are not reported for space considerations.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

In Table 3, model 1, the export share of the world market becomes the dependent variable, and the results show statistically insignificant coefficients for two U.S. TCB aid measures. We do not see this as particularly problematic in terms of TCB aid effectiveness because if most countries are simultaneously experiencing a boost in their exports from U.S. TCB aid, then it would be hard for the average country's share of the world market to increase as a result because their competitors would also be experiencing export growth at the same time.

In Table 3, model 2, export volume (measured as the ratio of the export value index to the corresponding unit value index using UNCTAD data) becomes the dependent variable, and the two U.S. TCB aid coefficients remain statistically insignificant. Not only is this not a problematic result in terms of TCB aid effectiveness, it might even be cautiously interpreted as a positive one based on the following understanding: one goal of the aid for trade agenda was to increase the export capacity of lesser developed countries *by expanding their export base* (in terms of the number of exportable products) rather than by simply increasing the volume of goods (often primary products) that they already could export in lower quantities. This result

suggests that the increase in exports shown earlier is not due to the latter effect (i.e. increasing the volume of primary product exports). We will later offer some additional evidence consistent with the former effect in that U.S. TCB aid has been associated with an increase in the number of products successfully exported by recipient countries, suggesting an expansion of their export base.

In Table 3, model 3, we estimate a model of the logged value of total merchandise imports. Although TCB aid has not been primarily directed towards increasing recipient country imports, these imports are, of course, the exports of some other country that may or may not receive US TCB aid. However, we find no statistically significant effect for either of the two U.S. TCB aid coefficients.

Disaggregating USAID TCB

Having explored other aggregate international trade outcomes, we now return to our primary dependent variable (the logged level of exports measured in constant U.S. dollars) and disaggregate the effect of TCB aid provided by the U.S. Agency for International Development, while controlling for TCB aid from other U.S. government sources. The USAID TCB measure used in Table 1 (model 1) and Table 3 was a general TCB measure, including both direct and indirect aid flows. But we also have data on narrower, or more specific, USAID TCB aid flows, albeit for a more restricted period (2002-06, with the loss of the first observation in the time-series given the correction for first-order autocorrelation). For comparison purposes, we first re-estimate model 1 from Table 1 using this more restricted sample, and the results are presented in Table 4, model 1. These estimates show the USAID TCB coefficient to be positively signed and of generally similar magnitude as before (0.005), but, owing primarily to the smaller sample size (N=586), it loses statistical significance at conventional levels.

Table 4: Impact of USAID TCB Sub-Sectors on Total Exports

Model:	**1**	**2**	**3**
Dependent Variable:	Total Merchandise Exports (logged)	Total Merchandise Exports (logged)	Total Merchandise Exports (logged)
USAID TCB (logged and lagged 2 years)	0.005 (0.004)		
USAID Direct TCB (logged and lagged 2 years)		0.006 (0.004)	
USAID TCB for Export Promotion (logged and lagged 2 years)			0.008* (0.004)
USAID TCB for Trade Related Public Practices (logged and lagged 2 years)			-0.002 (0.003)
USAID TCB for Trade Facilitation (logged and lagged 2 years)			-0.000 (0.003)
USAID Indirect TCB (logged and lagged 2 years)		0.001 (0.003)	0.001 (0.003)
Other USG TCB (logged and lagged 2 years)	0.004 (0.003)	0.003 (0.003)	0.004 (0.003)
Gross Domestic Product (logged)	-0.154 (0.106)	-0.155 (0.106)	-0.161 (0.106)
Population (logged)	-3.009** (1.385)	-3.020** (1.388)	-2.966** (1.396)
GDP Growth Rate	0.002 (0.004)	0.003 (0.004)	0.002 (0.004)
Year trend (2001=0)	0.233*** (0.028)	0.234*** (0.028)	0.233*** (0.028)
Number of observations	586	586	586
R^2Within R^2 Between	0.25 0.43	0.25 0.43	0.26 0.43

Cell entries are fixed effects coefficients with AR(1) disturbances; standard errors in parentheses.
Country dummy variables are not reported for space considerations.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

In table 4, model 2, we separate the USAID TCB measure into two parallel aid flows: USAID Direct TCB and USAID Indirect TCB. While both of these coefficients are positively signed, neither is statistically significant. In model 3, we further disaggregate USAID Direct TCB into three component TCB aid series: 1) USAID TCB for Export Promotion, 2) USAID TCB for Improved Trade Related Public Practices, and 3) USAID TCB for Trade Facilitation. These results show that

USAID TCB for Export Promotion is positively signed and statistically significant, but that the other two component measures (USAID TCB for Trade Related Public Practices and USAID TCB for Trade Facilitation) are statistically insignificant.

We offer three comments about this set of results. First, given that there was already a relatively weak signal for USAID TCB (see table 1, model 1), it is not surprising to see the signal becoming even weaker when this independent variable is further disaggregated and when the statistical sample is made even smaller. Second, to the extent that we can nonetheless find a signal for USAID TCB for Export Promotion (table 4, model 3), this is precisely where one should expect to find it given that the vast majority of USAID's TCB aid has been devoted to "Export Promotion" rather than to the other sectors (see Figure 3 above). We shall return to this point later in the report. Third, it is certainly possible that aid programs for "Trade Facilitation," for example, may require more than two years to produce the desired effect. This possibility would suggest increasing the lag on the TCB variables beyond two years as done in this report. But increasing the time lag will also require a longer TCB time series than is currently available to conduct robust statistical analyses.

Conditional USAID TCB Effects

Having shown that the USAID's TCB aid has, on average, been somewhat effective in promoting recipient country exports, we now turn to a consideration of its conditional effects. More specifically, we want to know if USAID TCB has been *more or less* effective in recipient countries that have a greater need for such external trade assistance. This will help answer the question of whether the USAID's TCB aid has been boosting the exports of more needy recipients or whether the observed effects have been limited to countries where it would have been comparatively easy to boost exports, i.e., that set of countries that do not need much external trade assistance because their traded goods are already relatively competitive in the international market.

It is difficult to identify a single factor or variable that would uniquely identify a country's "need" for TCB aid. But we can identify five variables that are consistent with the concept of a greater need for external trade assistance. The first such variable is GDP per capita based on the understanding that lesser developed countries, or those with a lower GDP per capita, have been often been less successful in exporting their goods and in expanding their export base (in terms of the number and diversity of exported products).

The second factor that may indicate a greater potential need for TCB aid is a country's land area because it may be harder for a larger sized country to move its goods, especially when they are not produced in border zones, into foreign markets. Stated somewhat differently, larger sized countries may have greater physical infrastructure needs, thus making it more costly for producers to ship their goods within their domestic economy in order to reach the export facilities located on or near their national borders.

The third is a country's "landlocked" status. As discussed earlier, a landlocked dummy variable is a standard control in the gravity model of international trade based on the understanding that landlocked countries export (and import) less because it is harder to move goods out of (and into) their national economy given the higher costs associated with shipping over land (as compared to shipping over water) into foreign markets.

The fourth factor is the country's distance from the center of the world market. Following Melitz (2007), we treat the Netherlands as the least remote country in the world trading system and thus identify Amsterdam as the geographic center of the world market. Based on this understanding, one might identify that countries more distant from Amsterdam are also in greater need of TCB aid because they encounter greater shipping/transportation costs in bringing their goods to the world market center. Indeed, this is much the same logic for why distance measures in the gravity model of international trade should be negatively signed (i.e. consistent with lower level of exports).

The fifth variable is Gamberoni and Newfarmer's (2008) "demand for TCB" index, which classifies countries into quintiles based on five measures of international trade performance and five other measures of internal trade capacity. This 5-point ordinal scale thus codes countries with the greatest TCB demand as 5 and the countries with the least demand for TCB as 1, based on these criteria.

Although not necessarily a direct measure of recipient need, we also consider the conditional effect of U.S. TCB aid in terms of a country's participation in the Integrated Framework. The Integrated Framework is a multilateral policy initiative where several international institutions (including the International Monetary Fund, the International Trade Centre, the United Nations Conference on Trade and Development, the United Nations Development Program, the World Bank and the World Trade Organization) have tried to work more directly with TCB aid recipients. Our Integrated Framework variable is coded 0 for country/year observations that are not involved, 1 for the observations that are in the first

phase, and 2 for second phase observations. One might thus expect to observe that U.S. TCB aid has been somewhat more effective for recipient countries that have been participating more fully in the Integrated Framework.

In order to ascertain whether U.S. TCB aid has been more or less effective with regards to these six factors, we will interact our TCB aid measures with each of these six variables in separate statistical models of logged merchandise exports. Model A uses USAID TCB, while model B uses overall USG TCB. As reported earlier, the results tend to be stronger when using the combined measure (USG TCB), so our graphs presented below will focus on these results. But the similar patterns are apparent for the narrower USAID TCB measure. It is very important to understand that with its interaction, the marginal effect of USAID TCB (or USG TCB) now depends on two different coefficients (e.g. the USAID TCB constitutive coefficient and the USAID TCB interactive coefficient) plus the value of the variable with which it has been interacted. Thus, where we find some interesting variation for our interactions results presented in Table 5, we will also present them by graphing the marginal effect of TCB aid over the range of values of its interaction variable.

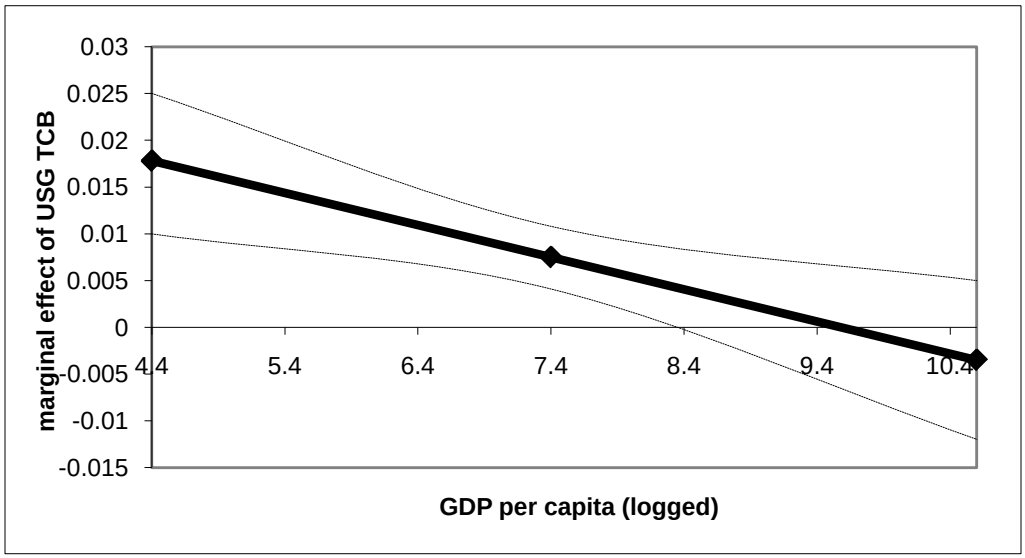
Table 5: Effects of USAID and USG TCB on Exports, Conditional on Mediating Factors

Model:	**1**	**2**	**3**	**4**	**5**	**6**
Dependent Variable:	Total Merchandise Exports (logged)					
Intervening variable	GDP per capita	Land Area (logged)	Landlocked	Distance	Gamberoni and Newfarmer Demand	Integrated Framework (trichotomous)
A. USAID TCB						
USAID TCB (logged and lagged 2 years)	0.021* (0.012)	0.018 (0.015)	0.003 (0.003)	-0.002 (0.035)	-0.004 (0.011)	0.003 (0.003)
Interaction TCB*Intervening	-0.003 (0.002)	-0.001 (0.001)	0.005 (0.006)	0.001 (0.004)	0.003 (0.003)	-0.001 (0.003)
B. Total USG TCB						
USG TCB (logged and lagged 2 years)	0.033*** (0.011)	0.006 (0.011)	0.006** (0.003)	-0.008 (0.030)	0.008 (0.011)	0.005* (0.003)
Interaction TCB*Intervening	-0.003** (0.001)	0.000 (0.001)	0.012** (0.006)	0.002 (0.003)	0.000 (0.003)	0.002 (0.003)
N	1005	1030	1030	1030	818	883

Cell entries are fixed effects coefficients with AR(1) disturbances; standard errors in parentheses.
Control variables omitted for space purposes.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

As illustrated in Figure 5 using the results from Table 5, model 1B, the marginal effect of USG TCB has been greater in more needy countries, defined as those with a lower logged value of GDP per capita. The results in Table 5, model 2A and 2B do not show statistically significant differences for larger or smaller countries in terms of their land area, so we make no effort to graph the marginal effects for TCB interactions with the land area independent variable.

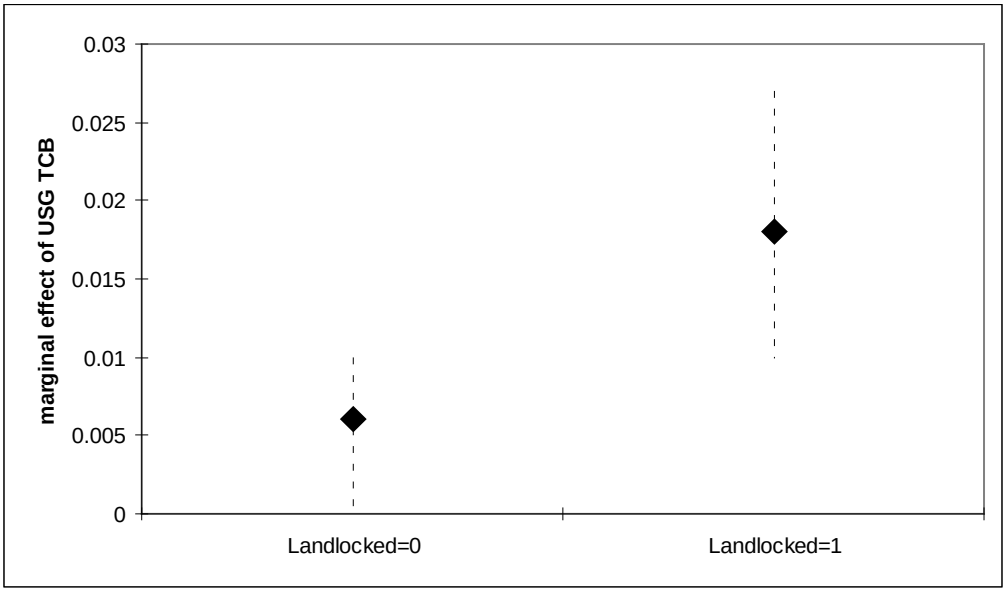
Figure 5: The Marginal Effect of USG TCB conditioned on GDP per capita (logged)



Bolded line indicates the estimated marginal effect with diamonds at the minimum, mean and maximum values for GDP per capita (logged). Dashed lines indicate confidence intervals associated with the .10 significance level.

We do, however, find a statistically significant difference in terms of the landlocked status of recipient countries when using total U.S. government TCB aid. As shown in Figure 6, using the results from Table 5, model 3B, the marginal effect of USG TCB has been greater in landlocked countries, which are arguably needier in terms of TCB aid given greater difficulties in exporting their goods.

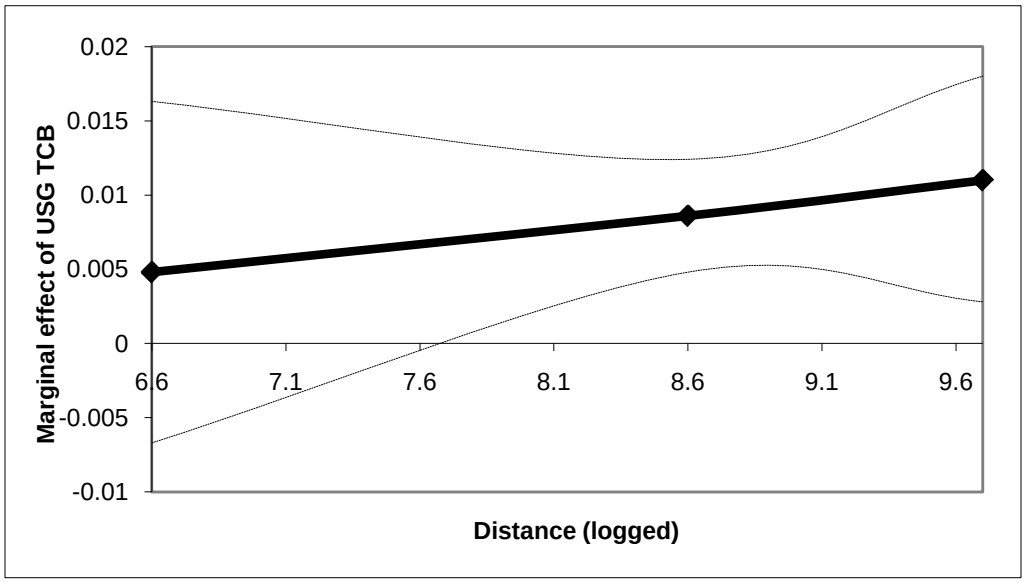
Figure 6: The Marginal Effect of USG TCB conditioned on Landlocked



Diamonds indicate the estimated marginal effect with the dashed lines indicate confidence intervals associated with the .10 significance level.

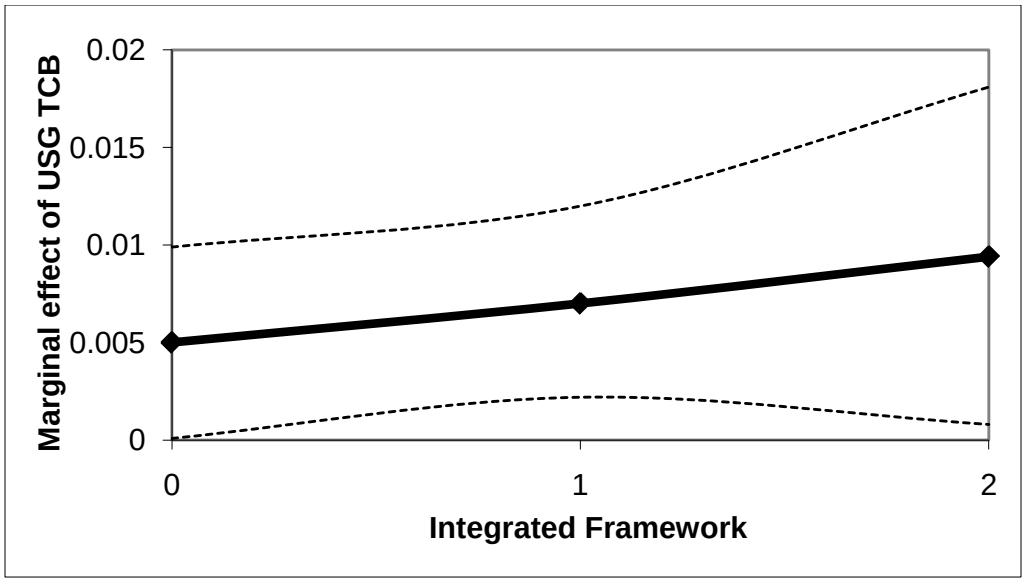
We also find that total U.S. government TCB aid has been somewhat more effective in recipient countries that are more distant from the center of the world trading system. Figure 7 graphs the marginal effect of USG TCB using the results in Table 5, model 4B. While the two USG TCB coefficients were individually insignificant (but positively signed), they become jointly significant (with a larger positive sign) for larger values of distance logged, or for those countries that are further away from Amsterdam, identified as the center of the world market. But using Gamberoni and Newfarmer's index of TCB demand, we do not find statistically significant differences either in terms of USAID TCB (Table 5, model 5A) or in terms of USG TCB (Table 5, model 5B).

Figure 7: The Marginal Effect of USG TCB conditioned on Distance



Bolded line indicates the estimated marginal effect with diamonds at the minimum, mean and maximum values for Distance (logged). Dashed lines indicate confidence intervals associated with the .10 significance level.

Figure 8: Marginal Effect of USG TCB conditioned on Integrated Framework



Bolded line indicates the estimated marginal effect with diamonds at the three possible values for Integrated Framework. Dashed lines indicate confidence intervals associated with the .10 significance level.

Finally, we do find that U.S. TCB aid has been somewhat more effective for recipient countries that have been participating more fully in the multilateral Integrated Framework initiative. As shown in Figure 8 (using the results from Table 5, model 6B), the marginal effect of USG TCB has been greater for recipient country/years that have been more involved with this multilateral policy initiative. It is worth noting that since there are relatively few observations coded as 2 for our Integrated Framework variable (i.e. countries participating in the second phase), the standard error tends to be relatively large for the estimated coefficient (or marginal effect) when Integrated Framework=2.

4. Second Level: Models of Intermediate Outcomes

We now turn to analyzing the effect of U.S. TCB aid on sub-sectoral outcomes. As discussed earlier, we focus on three specific sub-sectors: 1) Export Promotion, 2) Trade Related Public Practices, and 3) Trade Facilitation. In order to perform this analysis, we employ a set of new dependent variables that can be linked, albeit sometimes only indirectly, to each of the three sub-sectoral outcomes. Indeed, for each sub-sectoral outcome, we were able to identify at least three related dependent variables.

While we do believe that these new dependent variables offer the best available data that one can plausibly link to the sub-sectoral outcome in question, we also believe that these new data tend to be of lower quality than the cross-national export data, which was used as our primary dependent variable in the earlier set of regression models. We make this claim about lower data quality for three related reasons. First, several of these new dependent variables represent subjective judgments (albeit by experts) on cross-national trade outcomes, policy, and infrastructure. Second, most of these new variables have more limited country, or cross-sectional, coverage, forcing us to use smaller statistical samples and thus, lowering the confidence in our statistical estimates.

Third, most of these new variables also have very limited temporal, or over-time, variation for countries that are included in the analysis sample. Consequently, we will estimate all of the sub-sectoral models *without country fixed effects*, or without the N-1 set of country dummy variables. In dropping the country fixed effects, it is important to recall that a series of time-invariant regressors (distance, landlocked, island, land area) will re-emerge among our set of regressors because this set of independent variables had been subsumed earlier by the country indicator variables. Without the country dummy variables, variables such as distance, landlocked, island, land area do offer some unique variation in our sub-sectoral regressions. We must also report that given the lack of temporal variation in these new dependent variables, none of the statistically significant results that we will report below would remain so if country fixed effects were included in the model. Consequently, we view the sub-sectoral results as the most fragile set of regressions in this report.

For each sub-sectoral dependent variable, we estimate four different regression models. The first includes Total USG TCB next to the following set of control variables: Gross Domestic Product, Population, the economic growth rate, Distance, Landlocked, Island, Land Area, and the

Year Trend. The second splits the total U.S. government TCB aid measure into its two primary components: USAID TCB and Other USG TCB. The third splits the USAID TCB measure into its Direct and Indirect components, while also controlling for Other USG TCB. Finally, in the fourth model, we employ the parallel series of narrow USAID TCBs measures: USAID TCB for Export Promotion, USAID TCB for Trade Related Public Practices, and USAID TCB for Trade Facilitation. As discussed earlier, these narrow USAID TCB series have a shorter time-series than the other TCB aid series and so our statistical estimation will be less robust for this set of regressions.

Export Promotion

The three variables that we can plausibly link to the sub-sectoral outcome of Export Promotion, defined as improving the export base of and export practices within recipient countries, are: 1) the number of products exported, 2) an export concentration index, and 3) a private business practices variable created through factor analysis. As shown in Table 6, model 1, while USG TCB has a positive sign (indicating its positive association with the number of products exported two years later), it is not quite statistically significant at conventional levels. But its component series, USAID TCB, is both positively signed and statistically significant, a result that is entirely driven by the USAID Direct Component (and not by its Indirect component). In terms of the narrower aid series, we also find that the USAID aid stream devoted to this purpose (i.e. USAID TCB for Export Promotion) is positively signed and statistically significant.

Table 6: Models for 2.1 - Private Sector Practices Improved

Model:	**1**	**2**	**3**
Dependent Variable:	Number of Products Exported (logged)	Export Concentration Index	Private Business Practices Factor
Model A: Total USG TCB			
USG TCB	0.005 (0.003)	-0.000 (0.001)	-0.004 (0.003)
Model B: Total USAID TCB			
USAID TCB	0.005*** (0.002)	0.000 (0.001)	-0.008*** (0.003)
Other USG TCB	0.002 (0.002)	-0.000 (0.000)	-0.001 (0.002)
Model C: Direct and Indirect USAID TCB			
USAID Direct TCB	0.008*** (0.003)	0.001 (0.001)	-0.009*** (0.003)
USAID Indirect TCB	-0.002 (0.002)	0.001 (0.001)	-0.000 (0.002)
Model D: Sub-Sectoral USAID TCB			
USAID TCB for Export Promotion	0.007** (0.003)	-0.000 (0.001)	-0.006 (0.004)
USAID TCB for Trade Related Public Practices	0.003 (0.002)	0.000 (0.001)	0.001 (0.004)
USAID TCB for Trade Facilitation	-0.000 (0.002)	-0.000 (0.001)	-0.003 (0.004)

All TCB aid variables have been logged and lagged two years.
Coefficients for control variables omitted to save space.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

Despite the positive results for the first dependent variable related to Export Promotion, we find no statistically significant positive results for the other two dependent variables: the Private Business Practices Index and the Export Concentration Index.[15] There are two ways to read these non-results. The first is that U.S. TCB aid has had only weak effects in terms of export promotion, as broadly defined above. The second is that the dependent variables used in column 2 and 3 come from relatively poor quality data and, consequently, one should not expect to find statistically significant results when using noisy dependent variables. Since we do

[15] We also ran a set of regressions where UNCTAD's Export Diversification Index, instead of its Export Concentration Index, was the dependent variable. These regressions produced a very similar set of non-results.

not have better data related to this sub-sectoral outcome, we cannot privilege either of these possible explanations.

Trade Related Public Practices

We can link five dependent variables to the sub-sectoral outcome of Trade Related Public Practices, based on the understanding that improving the trade policy and regulations of recipient countries should result in lower forms of trade protection, measured in a variety of ways. We find some evidence that U.S. TCB aid has been associated with reduced trade protection in recipient countries two years later. Measured in terms of the applied tariff weighted average, USG TCB is significantly associated with a reduction in trade protection, as are both of its component measures: USAID TCB and Other USG TCB. In terms of the USAID component, most of this effect comes from USAID Direct TCB (rather than from the Indirect TCB). But it is interesting to note that the narrow USAID TCB aid stream most directed towards this purpose (i.e. USAID TCB for Trade Related Public Practices) is not statistically significant, although two other aid streams (USAID for Export Promotion and USAID for Trade Facilitation) are statistically significant with a negative sign. We find some similar, but generally weaker, results for the next two measures of trade protection (the applied tariff simple average and the share of duty free lines in the tariff schedule). And we find few statistically significant results in models 4 and 5 when the trade freedom index or our trade protection factor becomes the dependent variable.

Table 7: Models for 2.2 – Trade-Related Public Sector Practices Improved

Model:	**1**	**2**	**3**	**4**	**5**
Dependent Variable:	Applied Tariff Weighted Average	Applied Tariff Simple Average	Share of Duty Free Lines in Tariff Schedule	Trade Freedom Index	Trade Protection Factor
A. Total USG TCB					
USG TCB	-0.083***	-0.038*	0.033	-0.005	-0.001
	(0.030)	(0.021)	(0.027)	(0.081)	(0.002)
B. Total USAID TCB					
USAID TCB	-0.086***	-0.035	0.111**	0.059	-0.001
	(0.032)	(0.035)	(0.045)	(0.075)	(0.002)
Other USG TCB	-0.036**	-0.034**	0.046	0.035	-0.000
	(0.018)	(0.014)	(0.057)	(0.057)	(0.002)
C. Direct and Indirect USAID TCB					
USAID Direct TCB	-0.103***	-0.059**	0.102**	0.086*	-0.001
	(0.037)	(0.025)	(0.051)	(0.050)	(0.002)
USAID Indirect TCB	-0.044	0.005	0.017	-0.020	-0.003
	(0.031)	(0.018)	(0.025)	(0.062)	(0.002)
D. Sub-Sectoral USAID TCB					
USAID TCB for Export Promotion	-0.066*	-0.050**	0.080	0.144	0.000
	(0.035)	(0.022)	(0.050)	(0.088)	(0.003)
USAID TCB for Trade Related Public Practices	-0.042	-0.005	0.002	0.010	-0.003**
	(0.036)	(0.018)	(0.044)	(0.075)	(0.001)
USAID TCB for Trade Facilitation	-0.071**	-0.020	-0.061	0.144**	-0.002
	(0.031)	(0.015)	(0.053)	(0.062)	(0.001)

All TCB aid variables have been logged and lagged two years.
Coefficients for control variables omitted to save space.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

Trade Facilitation

For our final sub-sector, Trade Facilitation (general investment in customs and infrastructure), we were able to create three related dependent variables using factor analysis. The Doing Business factor uses the information from Djankov, Freund and Pham's survey of trading costs, trading time, and associated documentation. The LPI factor is built using the components parts from the Logistics Performance Index created by the World Bank. The third factor, based on the Global Competitiveness Report, summarizes information on the burden of customs, irregular payments, quality of ports, quality of air transport, and liner shipping connectivity.

While various authors have shown that these customs practices and improved trade infrastructure are associated with increased exports (e.g. Hoekman and Nicita 2008; Djankov, Freund and Pham 2006; Wilson, Mann, and Otsuki 2004), our results do not show that the U.S. government's TCB aid has been associated with any improvement in the recipient country's customs practices or trade infrastructure, at least when measured using these data. As noted earlier, USAID's TCB aid has not been directed primarily towards this purpose, and thus it is perhaps not surprising that the small amount devoted to this sector has had an undetectable impact.

Table 8: Models of 2.3 – More Efficient Movement of Goods Across Borders

Model:	**1**	**2**	**3**
Dependent Variable:	Doing Business Factor	LPI Factor	Customs Index Factor
Model A: Total USG TCB			
USG TCB	0.001	-0.000	0.004
	(0.003)	(0.000)	(0.003)
Model B: Total USAID TCB			
USAID TCB	0.000	0.000	-0.002
	(0.003)	(0.000)	(0.004)
Other USG TCB	-0.001	-0.000	-0.000
	(0.001)	(0.000)	(0.002)
Model C: Direct and Indirect USAID TCB			
USAID Direct TCB	-0.001	-0.000**	-0.001
	(0.003)	(0.000)	(0.005)
USAID Indirect TCB	0.005**	0.000	0.002
	(0.002)	(0.000)	(0.003)
Model C: Sub-Sectoral USAID TCB			
USAID TCB for Export Promotion	-0.002	-0.000*	-0.003
	(0.003)	(0.000)	(0.003)
USAID TCB for Trade Related Public Practices	-0.002	-0.000	0.000
	(0.003)	(0.000)	(0.003)
USAID TCB for Trade Facilitation	0.001	0.000	0.003
	(0.002)	(0.000)	(0.002)

All TCB aid variables have been logged and lagged two years.
Coefficients for control variables omitted to save space.
Statistical significance: *** p<.01, ** p<.05, and * p <.10.

These results should not be read as showing that TCB aid cannot be effective in terms of improving the customs practices and trade infrastructure of recipient countries. Focusing on total OECD TCB, rather than on the U.S. government's TCB aid as done here, Cali and Velde (2008) found that total OECD TCB aid has been associated with a reduction in trading costs, using Djankov, Freund and Pham's trading cost indicators. But total OECD TCB has been more focused on economic infrastructure (Suwa-Eisenmann and Verdier 2007, 497) than the U.S. government's TCB aid program. Thus, it is possible that one might observe stronger effects for U.S. TCB aid in terms of customs and infrastructure if more U.S. TCB aid were, in fact, dedicated to this specific purpose.

In closing this subsection devoted to trade facilitation, it is interesting to note that there was a set of results in Table 7 that one could cautiously interpret as positive evidence for USAID TCB devoted to trade facilitation. The dependent variable in column 4 of that table was the Trade Freedom Index, which captures a number of factors, including customs restrictions defined as customs clearance procedures, customs valuation procedures, custom classification procedures, and advanced deposit requirements. The inclusion of this set of customs-related factors suggests that improvements in the Trade Freedom Index may be capturing better customs practices, if not improvements in actual trade infrastructure. It is thus perhaps noteworthy that direct USAID TCB was significantly associated with an improvement in the Trade Freedom Index and, more importantly, the sub-sectoral allocation devoted to Trade Facilitation was also significantly associated with an improvement in the Trade Freedom Index.

5. Conclusions

This study investigated the impact of US government trade capacity building (TCB) assistance on trade-related outcomes in 148 recipient countries between 2001 and 2008. Using the MSI "Results Framework" for trade outcomes performance (see Figure 1), dependent variables were identified at two levels. The first level comprised overall trade performance, with indicators on total exports, imports, and trade integration obtained from sources such as the IMF Direction of Trade Statistics and the UNCTAD Handbook. The second level comprised three intermediate outcomes considered as preconditions for improvement at the main level: 1) improvement of business practices among exporters and importers in the private sector (e.g., number of products exported and export concentration); 2) implementation of better trade-related practices in the public sector (e.g., reduced tariffs); and 3) more efficient and cost-effective movement of goods across borders (e.g., time to export, customs burdens, quality of port infrastructure). Indicators of performance for these intermediate outcomes were also obtained in commonly-used databases such as Doing Business and the Logistics Performance Index project.

The main independent variables were the total amount of U.S. Government trade capacity building (TCB) assistance, and the portion of US Government TCB assistance allocated by USAID. The models all utilized two year lagged values of the US TCB variables in order to capture a presumed lag in program implementation and impact once funds were allocated. We also examined the impact of USAID allocations that were "directly" related to trade capacity building (as determined by a detailed coding procedure developed by MSI), as well as USAID allocations targeted toward each of the three intermediate outcomes described above (again, as coded by MSI). In this way we sought to link *overall* TCB allocations from the US in general, and from USAID in particular, to *overall* trade-related performance, and to link targeted USAID TCB assistance in three different areas with the respective intermediate outcomes that these allocations were intended to improve.

We estimated the effects of US TCB allocations in the context of "fixed effects" panel regression models that controlled for a series of general economic and structural factors, global time trends in trade outcomes, as well as for stable country-specific factors (via country "dummy variables") that may influence the level of trade outcomes for a given country at all points in time, over and above the impact of USG TCB allocations and other explanatory

variables. The models also included a correction for first-order autocorrelation of the idiosyncratic time-specific disturbance terms.

The results showed that total US government TCB assistance, and USAID TCB assistance, each had significant impact on overall trade performance in recipient countries (Table 1). Using total merchandise exports as the main dependent variable, we found that a 1% increase in total US government TCB assistance was associated with an average increase of .008% in total exports. Because this effect was estimated in the context of a log-linear model, the substantive or raw dollar impact of these allocations will depend on the amount of USG TCB assistance that the country receives and its general level of total exports. For a country that received an average amount of USG TCB and which had an average amount of total exports, the impact of every $1 increase in overall USG TCB was estimated to be a $53 increase in total merchandise exports two years later.

A similar model (Table 1) was estimated for specific USAID TCB allocations, controlling for non-USAID TCB allocations and all other variables included earlier. The model confirmed the positive effect of TCB assistance, with a statistically significant impact of .004 for USAID and a significant effect of .003 for non-USAID allocations. This translates, for a country that received an average amount of USAID TCB assistance and which had an average amount of total exports, to a $42 increase in exports for every additional $1 of USAID assistance provided.

The results for total exports were robust to a variety of different model specifications (Table 2), including analyses that added non-US OECD TCB assistance as an additional control, and analyses that estimated the effects with alternative statistical methods that allowed for the possibility of endogeneity or "reverse causality" in the US TCB and export relationship. Further, we found no evidence (Table 1) that the total trade performance effects were limited to promoting exports to the United States; on the contrary, the impacts were stronger for exports to the rest of the world.

The positive findings for total exports, however, did not extend to other global indicators of trade performance (Table 3). We found no significant impact of either total USG TCB allocations or USAID assistance on: recipient countries' export share of the world market, export volume, or total imports.

We conducted a series of analyses using *disaggregated* USAID allocations as the primary independent variables. These results (Table 4) provided some suggestive evidence that "direct" USAID TCB allocations had a stronger impact than did overall USAID allocations, but this

difference was not statistically significant. It was the case, however, that the overall impact on total merchandise exports was driven primarily by USAID allocations devoted specifically to export promotion, as opposed to allocations for Trade Policies and Agreements and Trade Facilitation. This result makes sense insofar as the majority of USAID assistance was targeted in the export promotion category; less than one-quarter of all USAID TCB assistance was targeted for Trade Policies and Agreements and Trade Facilitation improvement.

We examined the conditional effect of USG TCB allocations, that is, whether allocation had greater or lesser impact among countries with greater need for trade assistance, and for countries who were participating more intensively in the world-wide Integrated Framework trade initiative. The results (Table 5) suggest that USG TCB had greater impact among countries with greater "need" as indicated in particular by GDP per capita, landlocked status, and more distance from Amsterdam (an agreed-upon "center" of the global economy). Moreover, USG TCB was shown to have stronger effects on countries that were participating more fully in the Integrated Framework process.

The final set of analyses examined the impact of USG and USAID TCB assistance on indicators related to the three intermediate trade outcomes in the Results Framework. These models had more severe data limitations, with the disaggregated allocations being coded for relatively shorter time period, and several of the dependent variables being of relatively weaker quality. As a result, these analyses yielded a more fragile set of results, with none of the findings, for example, being robust to the inclusion of country "fixed effects". Nevertheless, there was some suggestion (Table 6) that overall USAID TCB, and specific USAID TCB allocations targeted for export promotion, had significant impact on the number of products a country exported, one key indicator related to this sector. Overall USG and USAID TCB allocations were also suggestively linked to indicators related to public sector practices such as lower tariffs and increased trade freedoms. Although specific USAID allocations targeted for this sector did not appear to be particularly influential in producing these results, allocations targeted at trade facilitation did show significant results in improving trade freedom. We found little evidence that total USG TCB, USAID TCB, or specific allocations for customs improvements and more efficient movement of goods across borders, had impact on indicators related to trade outcomes related to this sector. As noted above, however, the amount of USAID TCB allocations in this area was relatively small; moreover, outcome data in this area was available only for a limited span of time.

6. Appendices

Appendix 1: Countries in the Sample

Country (by sub-region)	Total USG TCB (Millions of 2000 dollars)
Benin	165.1
Burkina Faso	4.2
Cote d'Ivoire	0.6
Cape Verde	77.3
Ghana	292.5
Guinea	11.9
Guinea-Bissau	1.0
Gambia	0.3
Liberia	16.0
Mali	160.8
Mauritania	0.0
Niger	2.7
Nigeria	37.6
Senegal	17.8
Sierra Leone	0.7
Togo	7.4
**Saint Helena (not included)*	*0.0*
Burundi	1.5
Comoros	0.0
Djibouti	5.5
Ethiopia	45.7
Eritrea	0.8
Kenya	27.2
Madagascar	71.7
Mozambique	244.9
Mauritius	1.3
Malawi	18.8
Rwanda	14.5
Somalia	0.6
Seychelles	0.1
Tanzania	508.4
Uganda	51.0
Zambia	36.0
Zimbabwe	2.0
Mayotte	0.0
Algeria	26.1
Libya	0.2
Morocco	504.3
Sudan	7.9
Tunisia	6.0
Angola	7.4

Central African Republic	0.0
Cameroon	1.9
Congo, Republic of the	0.0
Congo, Democratic Republic of	7.0
Gabon	0.4
Equatorial Guinea	0.1
Sao Tome and Principe	4.0
Chad	1.8
Botswana	2.3
Lesotho	81.9
Namibia	9.7
Swaziland	0.1
South Africa	37.1
Argentina	3.3
Bolivia	79.0
Brazil	50.6
Chile	6.4
Colombia	228.3
Ecuador	47.0
Guyana	15.3
Peru	91.4
Paraguay	15.9
Suriname	0.0
Uruguay	0.2
Venezuela	0.6
**Falkland Islands (not included)*	*0.0*
Belize	0.1
Costa Rica	6.4
Guatemala	40.4
Honduras	231.5
Mexico	42.9
Nicaragua	175.2
Panama	6.9
El Salvador	407.3
Bermuda	0.0
Aruba	0.0
Netherlands Antilles	0.0
Antigua and Barbuda	0.0
Bahamas	0.0
Barbados	0.4
Cuba	0.1
Dominica	0.4
Dominican Republic	60.8
Grenada	0.0
Haiti	53.8
Jamaica	22.4
St. Kitts and Nevis	0.2
Saint Lucia	0.1
Trinidad and Tobago	0.0
St. Vincent and the Grenadines	0.1

Anguilla	0.0
**Cayman Islands (not included)*	*0.0*
**Virgin Islands (UK, not included)*	*0.0*
Montserrat	0.0
Turks and Caicos Islands	0.0
China	23.4
Taiwan	0.0
Korea, Republic of	0.2
Korea, Democratic People's R	0.0
Mongolia	172.5
Hong Kong, China	0.0
Macao	0.0
Brunei Darussalam	0.0
Indonesia	101.6
Cambodia	29.8
Laos	1.1
Myanmar (Burma)	0.0
Malaysia	4.1
Philippines	146.0
Singapore	0.0
Thailand	17.7
Timor Leste	28.1
Vietnam	50.1
Afghanistan	204.3
Bangladesh	29.6
Bhutan	0.0
India	87.0
Sri Lanka	20.8
Iran	0.0
Maldives	0.0
Nepal	13.9
Pakistan	28.1
Kazakhstan	98.7
Kyrgyzstan	58.1
Tajikistan	17.4
Turkmenistan	8.8
Uzbekistan	23.0
United Arab Emirates	0.0
Armenia	172.2
Azerbaijan	34.5
Bahrain	0.5
Cyprus	2.4
Egypt	528.6
Iraq	134.9
Israel	0.0
West Bank and Gaza	127.7
Jordan	156.4
Kuwait	0.0
Lebanon	12.5
Oman	2.1

Qatar	0.2
Georgia	251.4
Saudi Arabia	0.0
Syria	0.0
Turkey	22.9
Yemen	9.4
Albania	15.8
Bosnia-Herzegovina	17.2
Malta	0.0
Yugoslavia (Serbia-Montenegro)	57.4
Croatia	104.3
Macedonia	47.2
Slovenia	0.0
Montenegro	4.7
**Gibraltar (not included)*	*0.0*
**Kosovo (not included)*	26.6
Hungary	1.7
Bulgaria	19.0
Czech Republic	1.0
Slovakia	0.5
Moldova	23.2
Poland	9.7
Romania	78.2
Russian Federation	123.2
Belarus	1.1
Ukraine	112.1
Estonia	0.0
Lithuania	1.3
Latvia	0.6
Fiji	0.0
Papua New Guinea	0.3
Solomon Islands	0.0
Vanuatu	46.7
New Caldonia	0.0
Micronesia, Federated States	0.0
Kiribati	0.0
**Marshall Islands(not included)*	*0.0*
Nauru	0.0
Palau	0.0
**Northern Mariana Islands (not included)*	*0.0*
Tonga	0.0
Tuvalu	0.0
Samoa	0.0
Cook Islands	0.0
French Polynesia	0.0
Niue	0.0
**Tokelau (not included)*	*0.0*
Wallis and Futuna	0.0

Appendix 2: Factor Analysis

Because we had multiple indicators of sub-sectoral trade outcomes, we employed factor analysis to aggregate alternative measures into five composite indices. Factor analysis creates a small number of indices out of several variables by extracting a set of mutually uncorrelated factors containing groups of correlated variables. We included in the factor analysis only indicators that complied with the following criteria: 1) they had a theoretical relationship with each of the outcomes under study; 2) they covered at least three observations (years) per country; 3) they were not a descriptive statistics of another variable in the dataset (e.g., maximum or minimum of tariffs). The following table contains the names of the factors that were obtained for each of the sub-sectoral outcomes.

Table 2.1: Sub-sectoral Outcomes and their Factors

Results Framework Level - Sub-Sectoral Outcome	**Factor(s)**
2.1. Private Sector Export/Import Practices Improved	Private Business Practices
2.2. Trade-Related Public Sector Policies Improved	Trade Protection
2.3 More Efficient and Cost Effective Movement of Goods Across-Borders	Doing Business Logistics Performance Index Customs Index

We used the principal components method to extract the factors, and obtained the final factors using an oblique rotation. This method helped us achieve a more interpretable factor structure and it allowed factors to be correlated, which is a more realistic assumption. By construction, the five measures based on factor analysis have a mean of zero, reflecting the average country-year. Positive values indicate country-years performing above average, while negative values indicate performance below the average. As a rule of thumb, values above 1 in indicate that country-years are in the group with the top performance while values below -1 indicate poor performance. Note, however, that negative values must be interpreted as good performance for the factors measuring Trade Protection and (Restrictions on) Doing Business. The following three tables present the factors with their constituting items, their factor loadings (correlations between the items and extracted factors), the communalities (the proportion of variance of each item accounted by the factor), and the number of countries covered by each factor.

Table 2.2. Components of the Factor Analysis and Factor Loadings

Item	*Description*	*Factor Loadings*
Factor: Private Business Practices		
V2_1_06	Extent of staff training	0.713
V2_1_07	Customer Orientation	0.836
V2_1_08	Nature of competitive advantage	0.367
V2_1_09	Value chain breadth	0.608
V2_1_10	Control of international distribution	0.689
V2_1_11	Production process sophistication	0.905
V2_1_12	Extent of marketing	0.868
V2_1_13	Firm-level technology absorption	0.484
Factor: Trade Protection*		
V2_2_16	Trade Freedom Index	-0.641
V2_2_18	TTRI (MFN applied tariff-All Goods)	0.416
V2_2_20	TTRI (applied tariff+NTMs) - All goods	0.732
V2_2_22	MFN applied tariff-Simple Average – All goods	0.974
V2_2_25	MFN applied tariff-Weighted Average – All goods (%)	0.937
V2_2_26	MFN applied (AV-only) tariff-Simple Average – All goods (%)	0.982
V2_2_29	MFN applied (AV-only) tariff- - Weighted Average –- All Goods (%)	0.918
V2_2_30	Applied Tariff –- Simple Average –- All Goods (%)	0.991
V2_2_33	Applied Tariff –- Weighted Average –- All Goods (%)	0.919
V2_5_01	MA-TTRI (applied tariff incl. prefs.) - All Goods	-0.174
Factor: (Restrictions on) Doing Business		
V2_3_01	Time to Export	0.893
V2_3_02	Time to Import	0.888
V2_3_09	Number of documents required to export goods	0.723
V2_3_10	Number of documents required to import goods	0.825
Factor: Logistics Performance Index*		
V2_3_05	Perceived Timeliness of Shipments – LPI index component	0.884
V2_3_07	Perceived Logistics Competence – LPI index component	0.953
V2_3_08	Perceived Trackability of Shipments – LPI index component	0.940
V2_3_11	Perceived Efficiency of Customs and Other Border Procedures – LPI index component	0.936
V2_3_13	Quality of Transport and IT – LPI index component	0.941
V2_3_3_02	Perceptions of International Transport Costs – LPI index component	0.934
V2_3_3_03	Perceptions of Domestic Transport Costs – LPI Index Component	-0.009
Factor: Customs Index		
V2_3_06	Burden of Customs Procedures	0.542
V2_3_12	Irregular payments in export & imports	0.743
V2_3_3_04	Quality of Port Infrastructure	0.895
V2_3_3_05	Quality of Air Transport	0.861
V2_3_3_06	Liner Shipping Connectivity Index (LSCI)	0.645

Table 2.3. Communalities

Description	*Communalities*
Factor: Private Business Practices	
Extent of staff training	0.508
Customer Orientation	0.699
Nature of competitive advantage	0.135
Value chain breadth	0.370
Control of international distribution	0.475
Production process sophistication	0.818
Extent of marketing	0.754
Firm-level technology absorption	0.234
Factor: Trade Protection*	
Trade Freedom Index	0.436
TTRI (MFN applied tariff-All Goods)	0.611
TTRI (applied tariff+NTMs) - All goods	0.689
MFN applied tariff-Simple Average – All goods	0.854
MFN applied tariff-Weighted Average – All goods (%)	0.917
MFN applied (AV-only) tariff-Simple Average – All goods (%)	0.909
MFN applied (AV-only) tariff- - Weighted Average –- All Goods (%)	0.905
Applied Tariff –- Simple Average –- All Goods (%)	0.901
Applied Tariff –- Weighted Average –- All Goods (%)	0.853
MA-TTRI (applied tariff incl. prefs.) - All Goods	0.837
Factor: (Restrictions on) Doing Business	
Time to Export	0.798
Time to Import	0.788
Number of documents required to export goods	0.522
Number of documents required to import goods	0.681
Factor: Logistics Performance Index*	
Perceived Timeliness of Shipments – LPI index component	0.779
Perceived Logistics Competence – LPI index component	0.907
Perceived Trackability of Shipments – LPI index component	0.883
Perceived Efficiency of Customs and Other Border Procedures – LPI index component	0.873
Quality of Transport and IT – LPI index component	0.904
Perceptions of International Transport Costs – LPI index component	0.878
Perceptions of Domestic Transport Costs – LPI Index Component	0.997
Factor: Customs Index	
Burden of Customs Procedures	0.294
Irregular payments in export & imports	0.552
Quality of Port Infrastructure	0.801
Quality of Air Transport	0.741
Liner Shipping Connectivity Index (LSCI)	0.416

*Two factors were obtained for this construct, but only one was used.

Table 2.4. Number of Countries Included in Factors

Factor	Number of Countries Included
Private Business Practices	114
Trade Protection	96
Doing Business	159
Logistics Performance Index	131
Customs Index	76

7. Works Cited

Anderson, James A. "A Theoretical Foundation for the Gravity Equation." American Economic Review (March 1979) 69: 106-16.

Arellano, Manuel, and Stephen Bond. 1991. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” Review of Economic Studies 58.

Bergstrand, Jeffrey H. “The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence.” The Review of Economics and Statistics, Vol. 67, No. 3. (Aug., 1985), pp. 474-481.

Brazys, Samuel. 2007. “Evaluating the Impact of Trade Capacity Building: Evidence for the Donor-Interest or Recipient-Need Theouy of Foreign Aid? Unpublished paper, Indiana University.

Cali, Massimiliano, and Dirk Willem te Velde. 2008. “Towards a Quantitative Assessment of Aid for Trade.” Unpublished paper, Overseas Development Institute.

Djankov, Simeon, Caroline Freund, and Cong S. Pham. 2006. “Trading on Time.” Unpublished paper, World Bank.

Drukker, D. M. 2003. Testing for serial correlation in linear panel-data models. The Stata Journal (3)2, 1-10.

Frankel, Jeffrey A., and David Romer. 1999. “Does Trade Cause Growth?” American Economic Review.

Gamberoni, Elisa, and Richard Newfarmer. 2008. “Aid for Trade: Matching Demand and Supply.” Unpublished paper, World Trade Organization.

Helble, Matthias, Catherine Mann, and John S. Wilson. 2009. “Aid for Trade Facilitation.” World Bank Policy Research Working Paper 5064.

Hoekman, Bernard, and Alessandro Nicita. 2008. “Trade Policy, Trade Costs, and Developing Country Trade.” World Bank Policy Research Working Paper 4797.

Melitz, Jacques. 2007. “North, South and the Distance in the Gravity Model.” European Economic Review 51.

Nickell, Stephen J. 1981. “Biases in Dynamic Models with Fixed Effects.” Econometrica 49.

Suwa-Eisenmann, Akiko, and Thierry Verdier. 2007. “Aid and Trade.” Oxford Review of Economic Policy 23.

Wilson, John S., Catherine Mann, and Tsunehiro Otsuki. 2004. “Assessing the Potential Benefit of Trade Facilitation: A Global Perspective.” World Bank Policy Research Working Paper 3224.