User Guide and Explanatory Note for the ESCAP Trade Analytics Portal

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INTRODUCTION

The purpose of this explanatory note is to narrate how to use the ESCAP Trade Analytics Portal and corresponding datasets by researchers and practitioners. While this note mainly discusses the datasets, its sources of data, how to use the database properly, and how to interpret results for policy analyses, kindly refer to Shepherd (2016), "The Gravity Model of International Trade: A User Guide (An updated version)" for a detailed theoretical explanation and other technical detail and application of the gravity model of trade.[1]

ACCESSING THE PORTAL

To access the ESCAP Trade Analytics Portal, please type the following link into a modern web browser's (such as Firefox, Chrome or Safari) address bar:

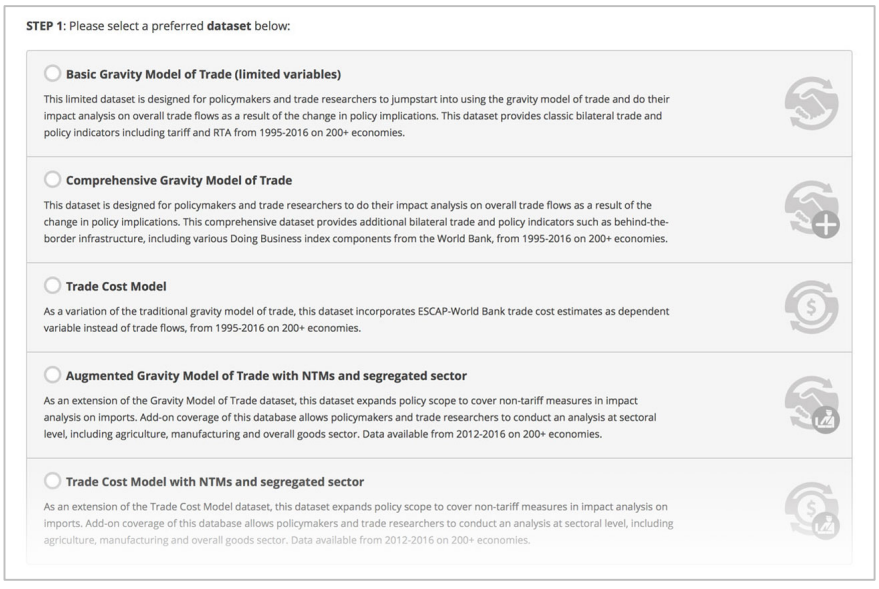
https://trade.unescap.org/analytics

OVERVIEW OF DATASETS AND THEORY

Screen 1 shows five available datasets that gravity models can be applied to answer policy questions based on policymakers' interests. The following datasets are currently available:

1. Basic Gravity Model of Trade (limited variables)
2. Comprehensive Gravity Model of Trade
3. Trade Cost Model
4. Augmented Gravity Model of Trade with NTMs and segregated sector
5. Trade Cost Model with NTMs and segregated sector

Screen 1: Selecting a preferred dataset



[1] Online available at https://artnet.unescap.org/publications/books-reports/gravity-model-international-trade-user-guide-updated-version

Basic gravity model of trade, comprehensive gravity model of trade, and trade cost model

Basic gravity model of trade gives an introduction what the gravity model is. In brief, gravity model is the application of Newton's theory in gravitation: bilateral trade flows are determined by the size of economic mass, measured by GDP of 2 countries; and distance between 2 countries. The model is widely used to quantify impacts mainly from trade-related policies. This database introduces a limited set of independent variables (i.e., gravity-related variables) and limited number of traditional policy variables (such as tariffs and RTA).

Comprehensive gravity model of trade provides an exhaustive list of independent variables, especially policy-related and behind-the-border trade facilitation variables for gravity models. *Table 1* classifies types of dependent and independent variables in this dataset, while *Table 2* categorizes additional types of independent variables in this dataset.

Table 1: dependent and independent variables in "Basic Gravity Model of Trade (limited variables)"

Dependent variables	**Classic gravity-related independent variables**
• Bilateral imports • Bilateral exports • Bilateral trade	• GDP of reporting countries and trading partners • Geographical distance between reporting countries and trading partners • Other geographical aspects between 2 countries e.g., contiguity, landlockedness • Cultural distance between 2 countries e.g., sharing common language, historically being the same country in the past, sharing colonial tie
	Classic policy-related independent variables
	• Bilateral tariffs • Bilateral RTA

Table 2: additional independent variables in "Comprehensive Gravity Model of Trade"

Classic gravity-related independent variables	**Other policy-related and behind-the-border independent variables**
• GDP of reporting countries and trading partners and other GDP-related indicators e.g. real GDP, GDP growth, per capita GDP (both real and nominal figure)	• Behind-the-border trade facilitation e.g., Ease of doing business indicator / ease of trading across border / logistics performance index • Quality of cross-border infrastructure e.g., Liner shipping connectivity

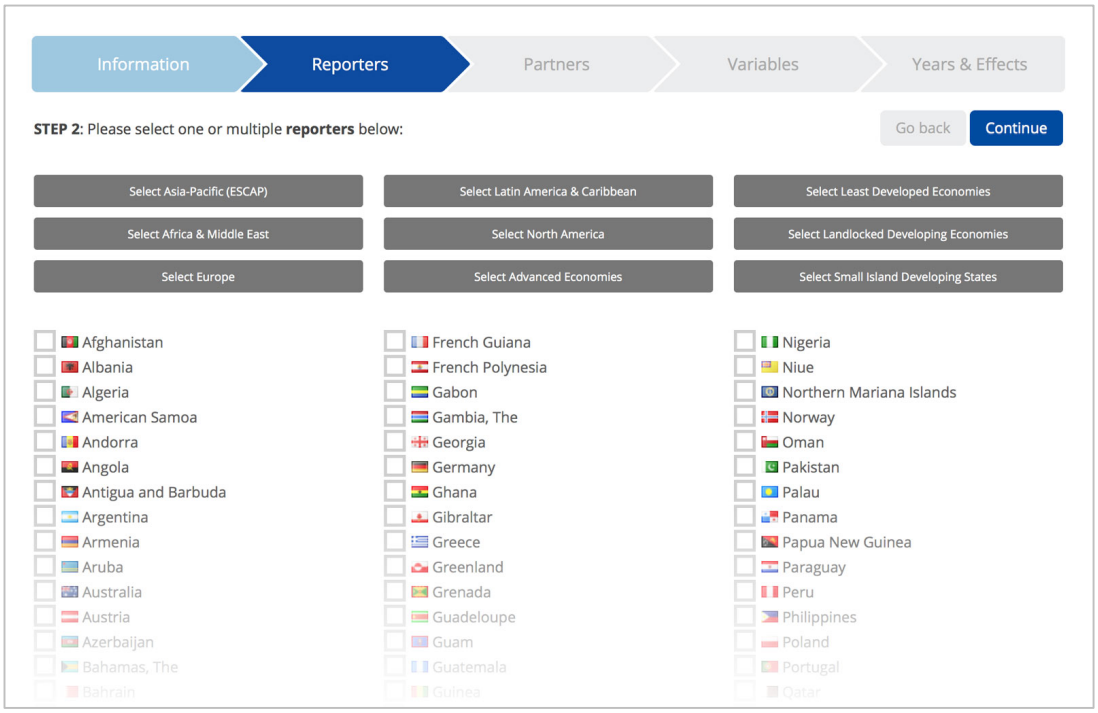
Policymakers may examine their research questions from another perspective: policy questions may change from how to increase trade flows to how to reduce trade costs between countries and which policy factors or infrastructural-related issues significantly affect

trade costs. Trade costs from Arvis et al. (2013)[2], which is derived from the gravity equation of Anderson and van Wincoop (2004), is the measure of trade hurdles in **Trade Costs Model**. With a similar econometric setup, the difference between **Comprehensive Gravity Model of Trade** and **Trade Costs Model** is a set of dependent variables. While the Gravity Model of Trade uses trade flows (either export, import or trade) as dependent variable, the Trade Cost Model uses comprehensive trade costs (either include or exclude tariff costs) as dependent variables.

SETTING YOUR PREFERENCES

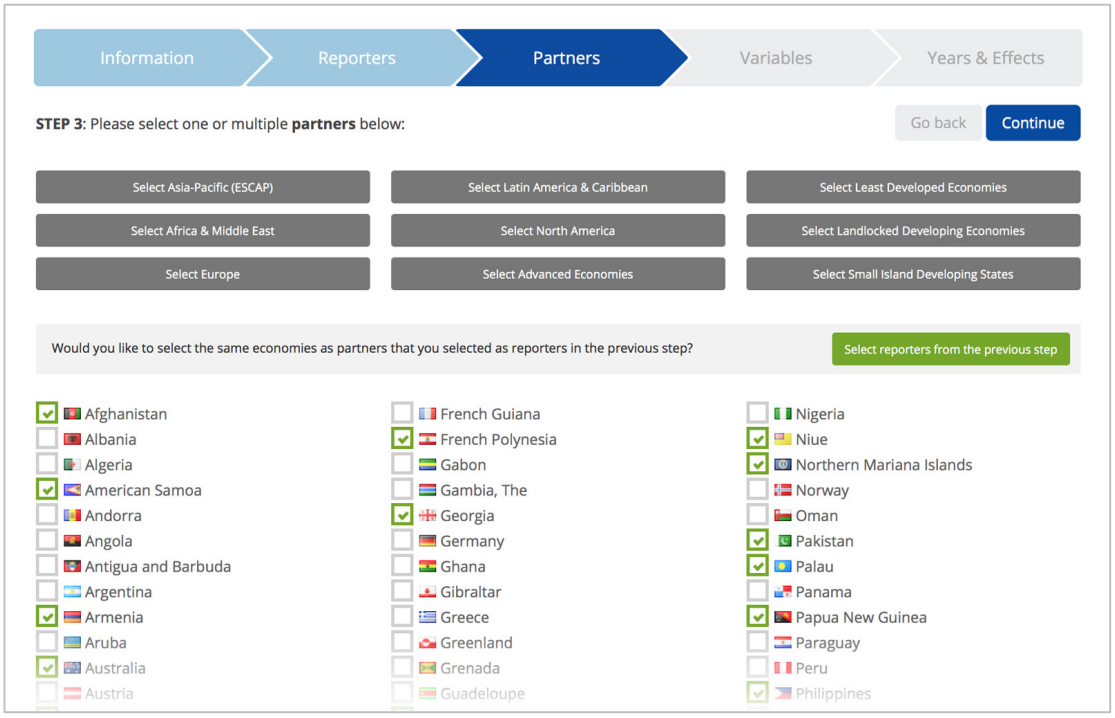
To illustrate how to use these three databases, the **Basic Gravity Model of Trade Database** is used as an illustrative example on how to use the ESCAP Trade Analytics Portal. *Screen 2* and *3* shows the list of reporting and trading partner economies, respectively, available in the dataset. A user can manually click on the box in front of an economy's name or click once on pre-defined groups of economies (e.g., Asia-Pacific (ESCAP)) in grey boxes to set their preferences. To de-select the pre-defined set of countries, click once again on grey box of corresponding pre-defined group. Once the user has finished choosing reporting economies, clicking "continue" will move the page from *Screen 2* to *Screen 3* to choose trading partners. *Screen 3* offers an additional choice if users would like to apply the same set of reporting economies as trading partners. This facilitates the study of policy effect within a group of economies a user is interested in. The database limits the selection up to 100 countries for both reporters and partners. Asia-Pacific (ESCAP) as reporting economies as well as trading partners are used in this example.

Screen 2: Selecting reporter economies



[2] The measure suggests that the more the trade between two countries are, the lower the trade frictions, and as a result, the lower the measure is. As trade cost measure are all inclusive i.e. it covers all factors that affect differences between domestic and international prices such as geographical, quality of connectivity, behind-the-border trade facilitation factors, decomposition of trade costs is needed to identify which factors affecting trade costs most.

Screen 3: Selecting partner economies



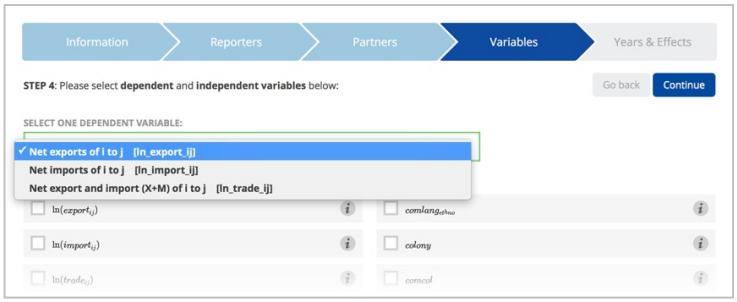
Screen 4 and *5* shows the list of dependent and independent variables as described in *Table 1*. The ESCAP Trade Analytics Portal allows one dependent variable and up to 30 independent variables for the model of interest. In this example, the gravity model is checking on the effect of economic size, distance, common colonizer and tariff on trade with control on reporter, partner and year fixed effects.

Equation 1: Basic setup of the gravity model

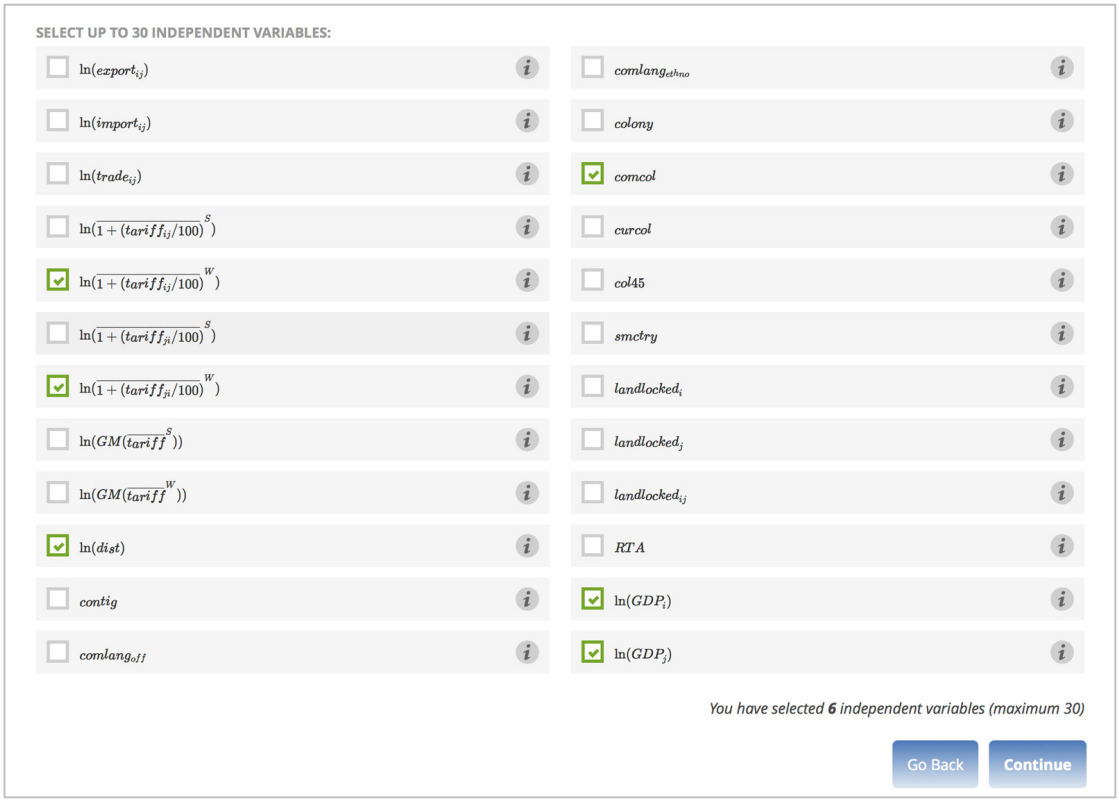
$$\log(x_{ijt}) = \beta_0 + \beta_1 \log(GDP_{it}) + \beta_2 \log(GDP_{jt}) + \beta_3 \log(dist_{ij}) + \beta_4(comcol_{ij}) + \beta_5 \log(tariff_{ijt}) + \beta_6 \log(tariff_{jit}) + \gamma_i + \gamma_j + \gamma_t + \varepsilon_{ijt}$$

Screen 5 also shows the selection of all variables in the model based on the basic setup above. Clicking the information icon behind a variable will open a modal window explaining the respective variable and listing its source. After clicking the “Continue” button and arriving on the last selection page (see *Screen 6)*, the user has the option to choose years as well as fixed effects (reporter, partner and year) in their model. In this example, all years and all control on all types of fixed effects are chosen. Then the user can click the blue “Run regression” button to obtain the empirical results.

Screen 4: Selecting a dependent variable



Screen 5: Selection of all variables in gravity model's basic setup



Screen 6: Selecting years and optionally fixed effects

INTERPRETING RESULTS

Screen 7 shows the results based on the gravity model's basic setup as shown in *Equation 1*. The number that is adjacent to each bar represents the beta coefficient of the model. At a glance, the model concludes that geographical distance and weighted average tariffs have negative effects to exports. Looking into details, all coefficients are significant. Basic interpretation based on coefficients in the regression parameter table is as follows:

Distance:

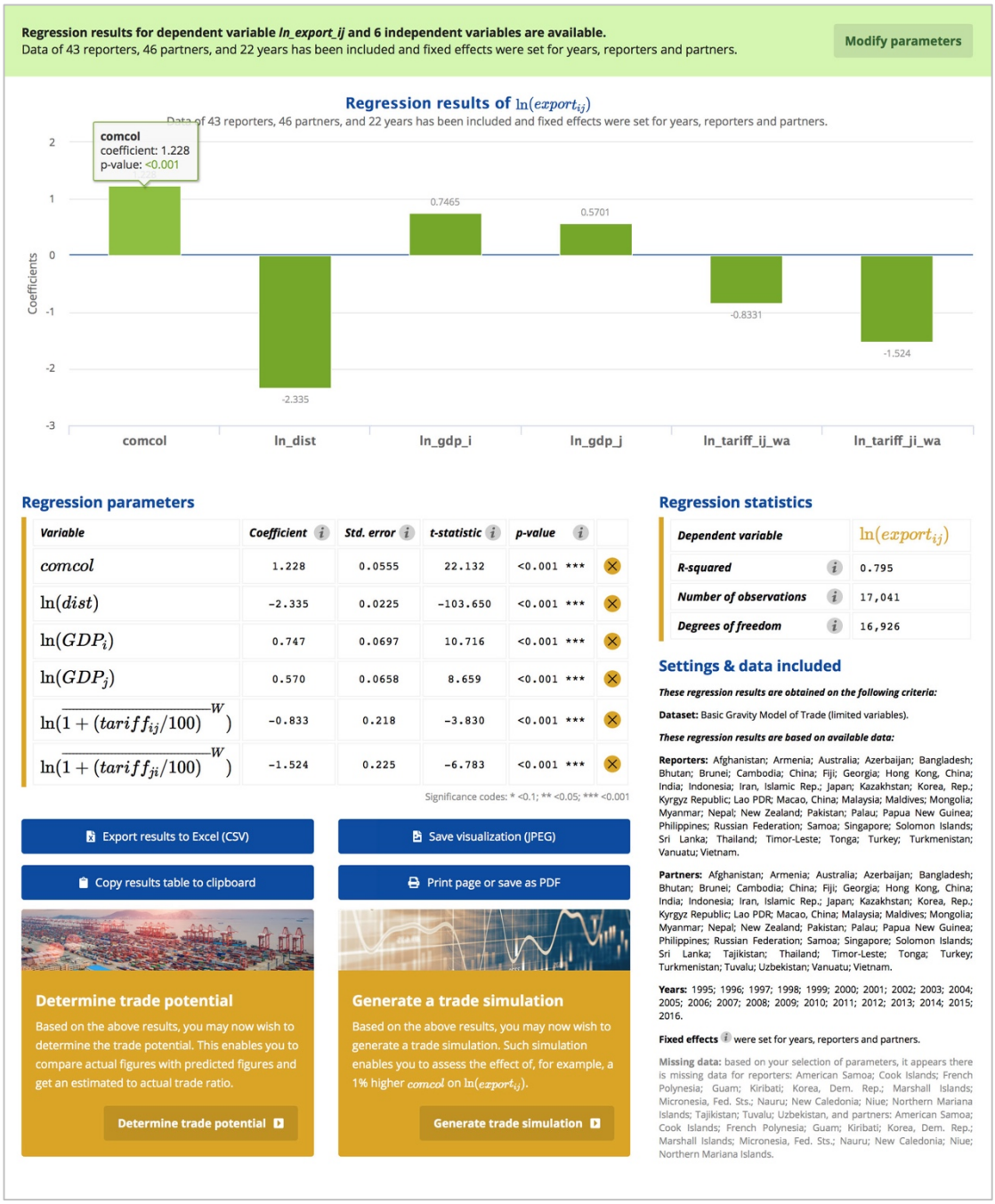
1% change in distance in km leads to 2.34% reduction in exports

***Common colonizer**:*
when two economies used to be under the same colonial power (e.g., Malaysia and India under British colonization), it leads to $(e^{\beta} - 1) * 100\%$ = $(e^{1.228} - 1) * 100\%$ = *(3.3381-1)*100% = 233.81% increase in exports*

Tariff(ji): Trade-weighted average tariff of country j charging to export of i
1% change in tariff (ji) leads to 1.52% reduction in exports

Tariff(ij): Trade-weighted average tariff of country i charging to export of j
1% change in tariff (ij) leads to 0.83% reduction in exports

Screen 7: Sample empirical results



The regression statistics table, containing R-squared, number of observation as well as degree of freedom of the model, is presented on the right side of regression parameter table. The dataset name, available reporters and trading partners that are included in the selection in the models are also displayed below regression statistics table, along with years, fixed effects, and missing countries (due to missing values).

The ESCAP Trade Analytics Portal also offers several options to save the result of the model, including: (1) exporting the results to excel (CSV), (2) copying the results table to clipboard, (3) saving the visualization (JPEG) and, (4) printing the page or saving it as PDF. Buttons for these options are positioned below the regression parameters table. Users can change the setup of the model by clicking "Modify parameters" at the top right on *Screen 7*.

TRADE POTENTIAL & TRADE SIMULATION

Two important features of the ESCAP Trade Analytics Portal are the post-estimation options on trade potential and trade simulation. Recall that trade potential determines how much the estimated trade is more or less than the actual one, which determines which trading partners an economy may have room for trade improvement/growth.

Equation 2: Trade potential

$$TP_{ij} = \frac{estimated\ trade_{ij}}{actual\ trade_{ij}}$$

where $TP_{ij} > 1$: potential for trade expansion

$TP_{ij} < 1$: exceeding trade potential

Users can generate trade potentials based on their setup by clicking "Generate trade potential" below the regression parameters table. *Screen 8* and *9* illustrate how to find trade potential of Lao PDR with all trading partners in 2015. Results in *Screen 9* show that while exports of Lao PDR to Australia, China, and India have exceeded its potentials, there is lots of room for improvement for exports to Hong Kong and Indonesia.

Users can obtain trade potentials of other economies in other years by clicking the "back to the form" or "modify conditions" buttons to go back to *Screen 8* to choose the other economies and years of interest.

Apart from trade potentials, users can also generate a trade simulation, using the same regression result, by clicking on the "Generate trade simulation" button next to "Generate trade potential" button, as displayed on *Screen 7*.

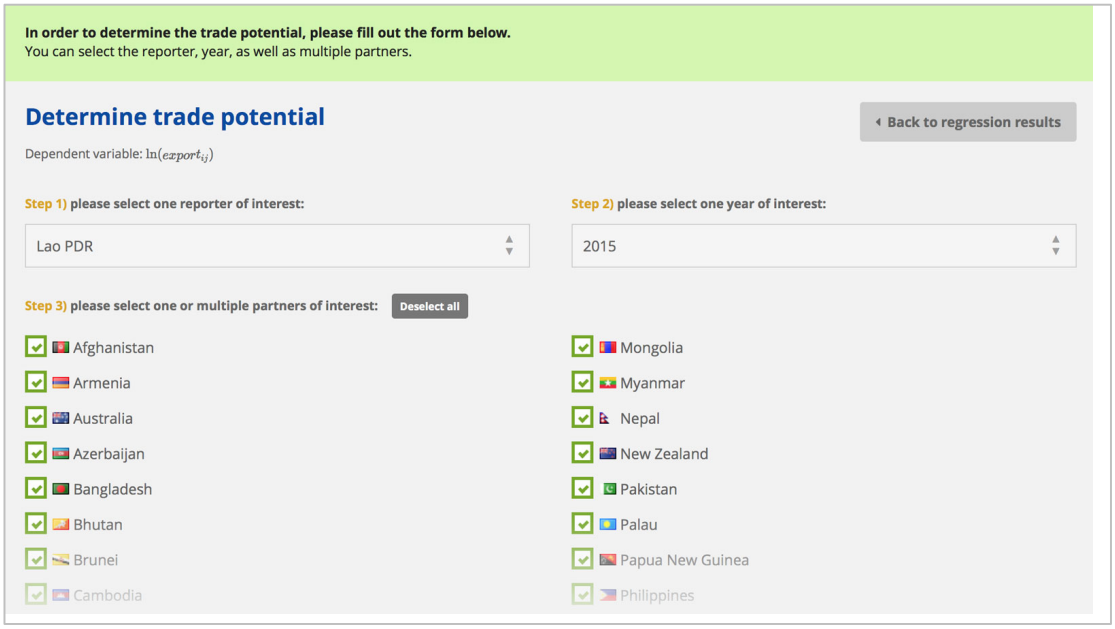
Screen 10 and *11* illustrate a trade simulation or "what if" scenario to the trade model. Suppose *tariff(ji)*, which represent tariffs of Lao PDR's trading partners, was reduced by 5%, what would happen to exports of Lao PDR in 2015?

Recall:

$$\log(x_2) - \log(x_1) = \log\left(\frac{x_2}{x_1}\right) \approx \left(\frac{x_2}{x_1}\right) - 1$$

From the example we can see that the reduction in weighted average tariff of Cambodia and China increases Lao PDR's exports by 0.1% and 0.2%, respectively. Again, users have three options to save the results: (1) exporting the results to excel (CSV), (2) copying the results table to clipboard, and (3) printing page or saving the page as PDF. Users can obtain simulation of other economies and/or in other years by clicking "back to the form" or "modify conditions" to go back to *Screen 10* to choose the other economies and years of their interest

Screen 8: Exploring trade potential of Lao PDR with trading partners in 2015



Screen 9: Results of trade potential of Lao PDR and its trading partners in 2015