Use of GTAP data base and model at the World Bank 2020/2021

A. Global studies

Globalization not localization key to COVID-19 recovery and poverty alleviation

The global shocks of recent years, from trade tensions, protectionism, and high policy uncertainty to COVID-19, have been intensifying the debate around GVCs. The report addresses the questions of increased nationalism and protectionism, as well as studies the impacts of climate change mitigation policies on changing comparative advantages of countries. The analysis builds on a global dynamic computable general equilibrium model i.e. the MRIO version of Envisage, and the global microsimulation framework Global Income Distribution Dynamics (GIDD). The modeling demonstrates how steps to support trade will strengthen the recovery from the COVID-19 pandemic while restrictive trade measures to promote localization will weaken it. Developing and developed countries are better off in a globalized world both during and after a crisis. Steps towards a more "hostile" environment for GVCs, with a shift towards global reshoring to high income countries and China, could drive an additional 52 million people into extreme poverty. On the other hand, if developing countries adopt GVC - "friendly" policies, focused on trade facilitation and liberalizing imports of intermediate goods, they would experience substantial gains even if other countries choose to re-shore. GVC-friendly policies lead to an overall increase in real income in developing countries and could lift almost 22 million additional people out of extreme poverty by 2030 by raising the incomes of the bottom-40 percent. Emerging policy responses to climate change will make more imperative diversification of exports in fossil fuel exporters and countries that are heavily involved in carbon intensive GVCs. The shift away from carbon intensive GVCs will entail new opportunities in GVCs that are less carbon intensive.

The study is part of the "Reshaping Value Chains in Light of COVID-19: Implications for Trade and Poverty Reduction in Developing Countries" report to be released in September 2021.

B. Regional studies

Latin America and Caribbean

1. General equilibrium analysis of trade policy options in Colombia

Despite number of trade agreements signed by Colombia, the country remains relatively closed to trade. Tariffs remain high, particularly in some sectors such as agriculture, food, textiles and motor vehicles, and non-tariff measures have increased in the last years. This study analyzes the impact of different trade policies that Colombia could implement. It assesses unilateral trade policies, as well as the participation of Colombia on different trade negotiations, and presents some of the main challenges that Colombia faces in terms of trade policies. The assessment uses a global recursive dynamic computable general equilibrium (CGE) model, ENVISAGE, which has been applied at the World Bank for a number of studies. The model is initialized and calibrated to the GTAP Data Base, Version 10. The baseline runs from 2014 through 2035, and includes tariff reduction schedules of all trade agreements in force, from MacMaps, International Trade Center (ITC) database. The study shows that the unilateral elimination of non-tariff barriers to trade has a higher impact on growth and trade than any tariff reduction policy. The adoption of a uniform tariff scheme, which reduces tariff peaks and tariff dispersion, has a larger impact on GDP and trade than engaging in any trade agreement, besides being also easier to implement.

2. **General equilibrium analysis of service trade liberalization in Brazil**

According to the recently published Service Trade Restrictiveness Index (STRI) by the OECD, Brazil presents a higher value in the index in most services sectors when compared to average of OECD countries, and even when non-OECD countries such as China, India and Russia are considered. Liberalizing these restrictions may bring about a positive impact on trade, foreign direct investment, and growth, even more than liberalizing non-tariff measures on goods. Also, the liberalization of trade in services can contribute to productivity in other sectors of the economy, such as manufacturing. This note presents an analysis of unilateral service trade liberalization policies in Brazil, applying a general equilibrium model. The analyses focus on the impact of three distinctive policies: reduction of non-tariff measures on imports of services; reduction of barriers to FDI and productivity raises associated with increasing FDI inflows; and reduction of sales tax applied on domestic and import services. In order to analyze scenarios of service trade liberalization, a global recursive dynamic computable general equilibrium model, ENVISAGE, was used. The model is initialized and calibrated to the GTAP Data Base, Version 10.

3. **Brazil: Amazon Economic Memorandum (AEM) and Brazil 2040.**

We use the standard GTAP database and the ENVISAGE model to provide baseline world price changes and other global variables, which are then used in a single-country CGE for Brazil that includes several sub-regions to assess impacts on the Amazon. The same model is used to provide a baseline that will be used for the Brazil 2040 project. Both projects are ongoing.

Sub-Saharan Africa and Middle East North Africa

4. **Making the most of the African Continental Free Trade Area: Leveraging trade and foreign direct investment to boost growth and poverty reduction**

The creation of the African Continental Free Trade Area (AfCFTA) creates a unique opportunity to boost growth and poverty reduction by expanding regional and global value chains. It is likely to contribute to increased investment from within and outside Africa by creating a continent-wide market, which will enable greater trade, reduce investment hurdles, and foster greater competition. This report expands the analysis presented in the July 2020 World Bank report on "The African Continental Free Trade Area: Economic and Distributional Effects". The report includes new data and applies new methodological approaches to provide: i) An overview of the status of FDI covering recent bilateral and sectoral data on FDI flows in and out of the continent; ii) Comprehensive estimates of impacts of deep preferential trade agreements on FDI based on the database on deep trade agreements (Hofmann et. al. 2017) and structural gravity approach; iii) Estimates of potential country-specific intra and extra-African FDI flows conditional on the country coverage and depth of the commitments under AfCFTA; iv) Distributional impacts of AfCFTA through trade and FDI, distinguishing the impacts on poverty, as well as workers by skill and gender. The report will be released in September 2021.

5. **Estimating the Job Creation Potential of Clean Energy Transition in Sub-Saharan Africa.**

We are using the ENVISAGE model together with the GTAP-Power database to calibrate a CGE model that includes several electricity generation activities, including solar power in countries that did not have this activity in the base year (2014). The calibration involves soft linking ENVISAGE with the World Bank´s Electricity Planning Model (EPM) energy model, which provides total electricity supply, by source, net electricity trade and associated investments by electricity activity (including transmission and distribution). We are currently working with a more recent version of ENVISAGE that includes several power-specific modeling features, including phantom taxes to calibrate the energy supply over time. This model version has been developed at the GTAP Center and they are providing ongoing support to us. Work is still in progress.

6. Rwanda: Trade Competitiveness Diagnostic in a post-COVID World

The modeling work will focus on Computable General Equilibrium (CGE) and microeconomic analysis of the impact of COVID-19, GVCs and servicification of the Rwandan Economy. The CGE model is ideal to ex-ante simulate the impact of a shock, such as the disruptions due to COVID-19, on a wide range of variables. The analysis would design forward-looking scenarios to anticipate medium-term impacts of COVID-19 on: (i) income and trade, including GVCs at the global level; (ii) employment and wages by sector, skill level and gender; and (iii) poverty and income inequality. The analysis also would seek to answer related to regional export blockades and other distortive trade policies affecting the outcomes, especially for the poor, potential scenarios of recalibration of GVCs, servicification, and digitalization and their implication for Rwanda. The analysis will use a global CGE (ENVISAGE) calibrated to the version 10 of the GTAP database. The distributive analysis will rely on the latest household budget survey (2019) for Rwanda.

7. Kenya: Assessing the economic and distributional impacts of the end of AGOA and the US-KEN Free Trade Agreement

The paper will assess the economic and distributional effects of Kenyan recent trade policy options, particularly under the End of AGOA, the United States – Kenya Free Trade Agreement, and the Africa Continental Free Trade Area. A computable general equilibrium (CGE) model linked to a microsimulation in a top-down approach is employed to simulate the impact of the railway on different socioeconomic groups. It captures changes in comparative advantage and trade flows following trade cost reduction and shifts in demand as income rises. The analysis will provide long-term results on exports, output, sectoral reallocation of labor, income, wages by gender and skill, and poverty. Regional disaggregation and distributive analysis will be based on Kenyan Continuous Household Survey Project (2020). The CGE will use the version 10 of GTAP database and the ENVISAGE model. The analysis shows limited effect of End of AGOA and tariff reduction, but these effects increase with more ambitious version of the US-KEN FTA scenario lifting real income in 1.2%, reducing poverty (at $3.20/day) in 890K, and raising wages for skilled female in 0.58% in y.o.y., by 2035. The effects are largely driven by an increase in textile and wearing apparel employment in Nairobi and Mombasa.

8. Burundi: Assessing the economic impacts of recent trade policy options

The paper will assess the economic effects of Burundi's recent trade policy options, particularly under the the Africa Continental Free Trade Area and expansion of the coffee sector. A computable general equilibrium (CGE) model is employed to simulate the impact of trade policies on different economic indicators. The analysis will provide long-term results on exports, output, sectoral reallocation of labor, and income. A new Burundi Social Accounting Matrix has been prepared and submitted to the GTAP database. The CGE will use the version 10 of GTAP database and the ENVISAGE model. The results will be included in the upcoming World Bank Burundi Country Economic Memorandum.

9. Estimating the economic and distributional impacts of the Regional Comprehensive Economic Partnership (RCEP)

This paper analyzes the economic and distributional impacts of the Regional Comprehensive Economic Partnership (RCEP) in its members. It offers an insight into one of the most recent treaties that encompasses around 30% of the global GDP and 29% of the world population. It is used a top-down microsimulation model, in conjunction of a dynamic global computable general equilibrium model, ENVISAGE, that applies economy-wide changes throughout the income distribution which allow us to analyze the distributional impacts. The model was calibrated with the latest available data: GTAP database v.10; MacMap tariffs ("Market Access Map"); ad valorem equivalents (AVE) of non-tariff measures (NTM) (Kee and Nicita 2017) and Hoekman and Shepherd (2019) for services. The results show All participating countries benefit from RCEP, although the gains are not distributed equally. Vietnam and Malaysia are the countries that benefit the most under the full scenario. In Vietnam, real income increases almost 5% in the full scenario. In Japan, the country which gains less under this scenario, the real income increase is 0.5%. Interestingly for Japan, the impact of the four RCEP scenarios is similar, which suggests that most gains are associated to a fall in tariffs, contrarily to the rest of the countries, where the fall in tariffs reports very slight results, or even negative impact as is the case of Cambodia. In most countries, there is a significant impact when trade costs are reduced.

10. Estimating the Economic and Distributional Effects of the Belt and Road Initiative on the Lao's economy

The objective of the study is to analyze the economic and distributional implications effects of China's Belt and Road Initiative (BRI) on the Lao's economy. As part of the BRI, a railway will connect Lao PDR with not only China but also the entire BRI network. This paper examines the distributional impact of the BRI on Lao's economy, particularly the Laos-China Railway, using a simulation approach to inform policymakers. The Envisage model linked to a microsimulation in a top-down approach is employed to simulate the impact of the railway on different socioeconomic groups. It captures changes in comparative advantage and trade flows following trade cost reduction and shifts in demand as income rises. The results would inform policymakers how to capitalize on the railway while minimizing the adverse impact on certain groups. The report is based on the World Bank (2019) Belt and Road Economics: Opportunities and Risks of Transport Corridors. A new Social Accounting Matrix has been built and was submitted to the GTAP database (version 10). The distributional analysis relies on the recent household expenditure and consumption survey.

11. Mongolia: Mines and Minds report.

Used the standard GTAP database and the ENVISAGE model to run several scenarios regarding external shocks to the Mongolian Economy: China rebalancing and growth slowdown, changes in demand for coal, railway between both countries and the impact of Covid-19. Initial results of the model where used in the report (see references below), and we are currently preparing a working paper with more specific results.

World Bank, 2020. *Mines and Minds: Leveraging natural wealth to invest in people and institutions*. Mongolia Country Economic Memorandum, September.

12. EU Carbon Border Adjustment Analysis – impacts on Europe and Central Asia

The European Union is proposing to implement a carbon border adjustment tax (CBAM) to address carbon leakage and help its industries maintain trade competitiveness in the context of strong policy action to reduce carbon emissions in the EU. CBAM will impose a charge on imported goods based on the relative carbon content of their production. Countries with heavy reliance to the EU and high carbon-intensity in the production of their exports will be particularly exposed to CBAM, while countries exporting to the EU with low (or an ability to improve) the emissions-intensity of their exports will gain an advantage. WBG is carrying out a regional assessment of the potential impacts of the CBAM on output, value added, trade, and employment, as well as GHG emission, in the Europe and Central Asia region (with detailed country assessments in Turkey and Russia). The analysis will also consider the implications of countries taking policy action to reduce the carbon intensity of their exports. The assessment is being undertaken using the ENVISAGE CGE model based on GTAP 10 Power database. Work still in progress.

13. Circular Economy modelling

This study focuses on four Eastern European EU Member States – Poland, Romania, Bulgaria and Croatia –to explore the policies toward circular economy transition (within the broader EU context). While most of the existing literature has global coverage (e.g. Winning et al., 2017; McCarthy et al., 2018; Wiebe et al., 2019; Aguilar-Hernandez et al., 2020; OECD, 2020), future progress in the area of circular economy transition is likely depend on a country and even city level action (OECD, 2018). Thus, assessment of the regional/local measures, including identification of the potential economic implications and policy trade-offs of such transition is of a high importance for policy makers—including impacts on overall economic growth, the distribution of output and value added, imports and exports and impacts on household well-being. This study introduced additional sectoral splits to the GTAP 10 database, including explicit representation of the primary and secondary production activities for aluminum, copper, iron and steel, other metals processing, and rubber and plastic products. Recycling activity is also disaggregated in the newly constructed database. Such splits are introduced for all 141 regions of the GTAP 10 database. Using the ENVISAGE CGE model (van der Mensbrugghe, 2019), to develop a global baseline scenario of the material-use accounts with the specific focus on the four Eastern European EU Member States – Poland, Romania, Bulgaria and Croatia. Climate mitigation policy scenarios consistent with the Paris Agreement targets and the European Green Deal are further assessed in the context of their impacts on the material use patterns. Assumptions of the baseline scenario, including changes in material use efficiency, energy efficiency, etc., are harmonized/refined using inputs from other modelling teams and experts involved into the project, such as inputs from the material flow analysis (MFA) framework. Finally, develop a set of additional policy measures (e.g. environmental taxes, subsidies, etc.) geared towards more ambitious circular economy transition targets (consistent with the EU circular economy action plan (EC, 2020a)), and introduce these as alternatives to the baseline scenario and assess their impacts on a number of economic indicators such as output, trade, distributional consequences across households and impacts outside the region, notably developing countries. Work still in progress.