Trade impact 2.0:

FACILITATING TRADE THROUGH PUBLIC-PRIVATE PARTNERSHIPS

Trade Impact Assessment

White Paper on Impact Monitoring

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ABSTRACT

Country experiences and empirical studies show that private investment and integration into global markets for goods, services and labour go hand in hand and reinforce each other as engines of economic development. Finding ways to leverage private sector know-how, innovation, technology, services, and finance provision is fundamental in promoting sustainable development and prosperity for all.

Improving the efficiency of the movement of trade across borders and developing new trading routes is one area where the private sector can harness its capabilities for the benefit of all. Where such partnerships occur, it is essential to monitor their performances, evaluate their impacts on trade flows and other economic variables, and draw lessons from their experiences. Three main econometric techniques can be used to that end: the Gravity Model, the Synthetic Control Method, and the Difference-in-Difference approach; each of these techniques is well-grounded in both the theoretical and empirical literature, and the choice amongst them depends on a number of issues including data availability and timeliness.

Recent and current events, including the COVID-19 pandemic, supply chain bottlenecks, and military conflicts, are prompting countries and companies to rethink their trade and sourcing policies. Sustainability targets also add to the complexities of choices facing policymakers and businesses. Perhaps more than ever, ex-ante qualitative, quantitative and hybrid approaches that complement each other are needed to assess the potential environmental, social and economic impact of different options/strategies. Based on the assessment, stakeholders' consultations would follow and explore opportunities for private-public partnerships based on solid analysis.

A case in point is the World Logistic Passport or WLP, a new trade PPP initiative launched two years ago, just before the COVID pandemic's outbreak, to facilitate trade among its members. Pre-pandemic, ex-ante analysis of the initiative was undertaken, and now, two years into its operation, it is time to estimate its impact. However, this task is complicated given the need to focus on the different parties involved:

- the businesses that are active in the initiative
- the job opportunities they provide
- the growth impetus they generate

Current econometric techniques need to be adjusted to capture all of these aspects. This paper offers some ideas on how this upgrade can be undertaken.

DEFINITIONS

Gravity Model Method: A method used to analyze the impact of the trade agreement or the PPP on the countries' trade flows using the regression analysis based on the Gravity Model.

Synthetic Control Method: A method used to evaluate an intervention's effect (e.g. new trade agreement) in comparative case studies when the actual situation is compared with the "synthetic" one reflecting the situation of no intervention.

Difference in Differences Method: A method used to analyze the impact of the PPP in situations where certain groups are exposed to treatment and others are not.

The Elasticity Method: A method used to estimate the impact of the PPP on countries' trade that assesses the impact of costs and benefits a particular policy may impose on total trade values based on the concept of trade elasticities.

Members: Traders and freight forwarders who join the World Logistics Passport can access benefits and are monitored and upgraded/downgraded to different tier statuses based on their trade performance.

Partner/Benefit Providers: Entities providing benefits to the Members (e.g., Customs, ports, airports, etc.).

Hub: Region where the World Logistics Passport is deployed.

Benefits: Financial and non-financial incentives provided by Partners resulting in cost reductions and time efficiency improvements for the members.

Tier status: Categories (White, Silver, Gold and Platinum) in which WLP Members are placed based on trade growth achieved yearly.

Trade Value: The total value of imports and exports (including re-exports) directly attributed to the WLP Member is used to determine Tier eligibility in each Member's Performance Assessment. Trade value is measured in the national currency of the Hub.

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INTRODUCTION

NEW TRADE DISRUPTIONS – NEW MEASURES

This paper aims to set the methodological framework for analysing the impact of Public-Private Partnerships (PPP) on trade activities in the countries where such initiatives have been deployed, considering their stability and applicability in disruption situations. Econometric techniques can then be used to measure the incremental trade that such initiatives have prompted. This is an important undertaking that would allow a comparison between the cost of the initiative and its benefits, and, importantly, it can be used to draw lessons of experience and best practices.

The paper examines how the cost reduction and time efficiency gains translate to increases in the value of countries' external trade. We also analyse other factors leading to increased trade values across the countries that have adopted PPP initiatives. These may also include unlocking new trade routes and other trade facilitating initiatives. We present the relevant empirical techniques that analysts have used to quantify the impact of trade facilitation programs.

Chapter 1 will discuss the digitalisation trends in international trade and the necessity to establish trade rules to govern commerce in the digital age. Chapter 2 deals with possible methods of the PPP impact analysis, the rationale behind each of these methods and an indication of when each of these methods is best to use. In section 3, as a showcase of Public-Private Partnership, we will provide an overview of the World Logistics Passport, introduce the program's mechanics and demonstrate the application of discussed PPP impact analysis methods and new models. Finally, in Appendix, we will present the different data and resource requirements under these methodologies.

CHAPTER 1. REWIRING TRADE IMPACT: THE NEED FOR A NEW APPROACH

1.1. THE NEED FOR A NEW APPROACH

The advent of global value chains (GVCs) has dramatically altered the landscape of international trade.

With the exception, so far, of one aspect: a small number of firms, typically large multinational enterprises, continue to dominate the trade landscape, with the top 5% of exporters accounting for over 80% of exports[1]. However, digitisation and the rise of global platform-based marketplaces and online payment services have the potential to change this landscape radically and have started to do so. eBay data shows that in the US, 96% of eBay-enabled small businesses export compared to only 1% of traditional businesses, and these businesses export on average to 17 different countries[2]. Because these online exporters are so diversified across the global markets, their survival rates are much higher than traditional businesses. In short, digitisation is "democratising" international trade by empowering micro, small and medium-sized enterprises.

But global policies governing e-commerce remain lacking.

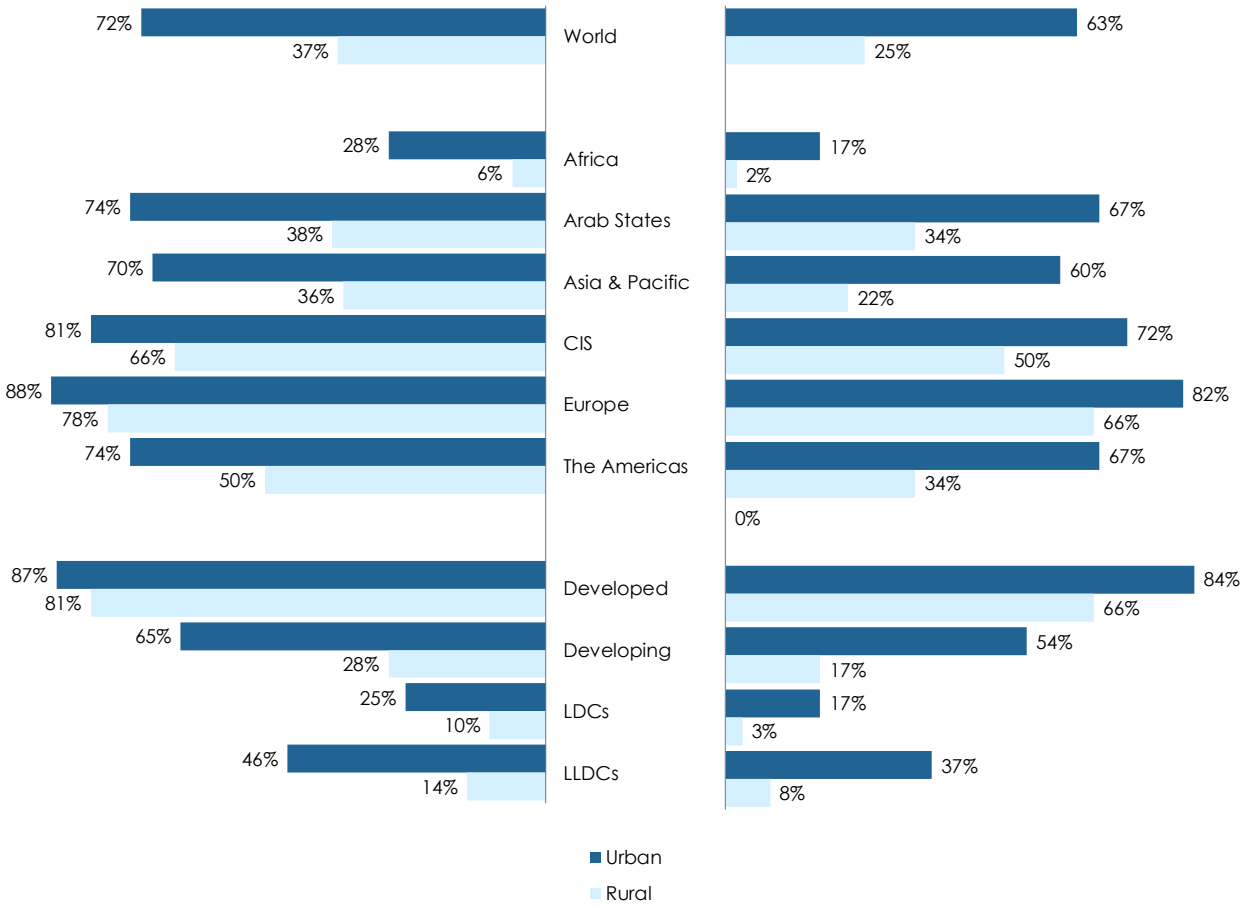
In 1998, WTO members at their Second Ministerial Conference adopted a Declaration on Global Electronic Commerce. The declaration mandated four WTO bodies to explore the relationship between existing WTO agreements and e-commerce: the Council for Trade in Goods, the Council for Trade in Services, the Council for Trade-Related Aspects of Intellectual Property Rights (TRIPS), and the Committee on Trade and Development. Ministers also formally agreed to continue their practice of not imposing customs duties on electronic transmissions in the "moratorium on electronic transmissions." More than 20 years later, no comprehensive agreement on e-commerce has emerged. However, members have reached a consensus on several issues, including online consumer protection, electronic signatures and authentication, unsolicited commercial electronic messages (spam), open government data, electronic contracts, transparency and paperless trading. The moratorium on electronic transmission has been renewed and is now expected to last until the next WTO Ministerial meeting in 2024.

Crafting global trade rules on e-commerce is no easy task. At issue is whether it will be appropriate to classify e-commerce as trade-in goods (in which case GATT rules apply) or trade-in services where GATS rule would then apply. Another challenging issue to resolve is whether the internet transactions in which the provider and recipient of a service are in different countries should be classified as cross-border trade or consumption abroad. Perhaps one of the major stumbling blocks preventing the successful conclusion of a multilateral agreement on e-commerce is developing countries' readiness to reap benefits. At issue is the "digital divide" that according to the OECD refers to "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (OECD, Understanding the Digital Divide). According to the International Telecommunication Union, at the end of 2019, 65% of urban households in developing countries had access to the internet compared with 87% in the developed world (Figure 1). Data for rural homes show an even more significant digital divide: 28% in developing countries versus 81% in developed countries.

[1] Freund and Pierola, Export Superstars (2013)

[2] eBay, United States Small Online Business Report (2021)

Figure 1 Percentage of households with computer and/or internet access at home, 2019, by region



Source: International Telecommunication Union, Facts & Figures 2020

While WTO trade negotiators have been working hard to develop and agree on new trade rules to govern e-commerce, many developments elsewhere have taken place and are worth noting.

A new multilateral organisation, the Digital Cooperation Organization or DCO, was launched following Saudi Arabia G20 Presidency in 2020 to enhance multilateral collaboration in the digital economy and contribute to bridging the digital divide. DCO membership includes seven founding member nations: Bahrain, Jordan, Kuwait, Nigeria, Oman, Pakistan and Saudi Arabia. DCO cooperation model is much like the OECD, where membership brings like-minded countries with shared values to set directions, address policy challenges and share good practices to ensure a human-centric digital transformation.

The DCO have core initiatives in place that are designed to promote online growth and build consumer trust. These include multi-stakeholder programs that enhance cross-border data flows, drive growth and expansion of small and medium-sized enterprises, nurture innovation through a common regulatory framework, increase workforce mobility, and develop new approaches to digital taxation. The DCO setup includes engagement with the private sector closest to the opportunities, challenges, and solutions to e-commerce development.

Another initiative creating new trade opportunities for all businesses, small, medium and large, is the World Logistics Passport. This first global multi-modal freight loyalty program aims to reinvent trade by promoting the development of trade corridors between Asia, Africa and Latin America while reducing costs and improving efficiency for all beneficiaries along the logistics value chain. HH Sheikh Mohammed launched the WLP in 2019 as part of the Dubai Silk Road strategy. It is a multi-stakeholder initiative led by the government of Dubai together with private and public entities such as DP World, Emirates Group, Ports Customs and Free Zone Corporation (PCFC), and DNATA, among others. WLP members that generate the highest growth in trade are rewarded with financial and non-

financial benefits, such as reduced landing costs or priority access through customs.

DCO and the WLP are two new initiatives advancing the connectivity and trade policy agenda beyond what is currently achievable at the multilateral level. Partnership networks among like-minded countries and businesses with shared values can be a powerful tool for enhancing digital connectivity, facilitating trade, and promoting inclusiveness. The global policy agenda is overloaded with challenging developmental and climate change issues, especially in the wake of the covid-19 pandemic. Partnership networks among businesses and between businesses and governments can potentially play a decisive role in resolving many of these challenges through research and development partnerships, technology and skills sharing, and infrastructure investment. Doing good while doing business is not just an adage; it is necessary.

CHAPTER 2. THE CURRENT TRADE IMPACT: GOOD… BUT NOT GOOD ENOUGH

2.1 INTRODUCTION TO TRADE MODELLING

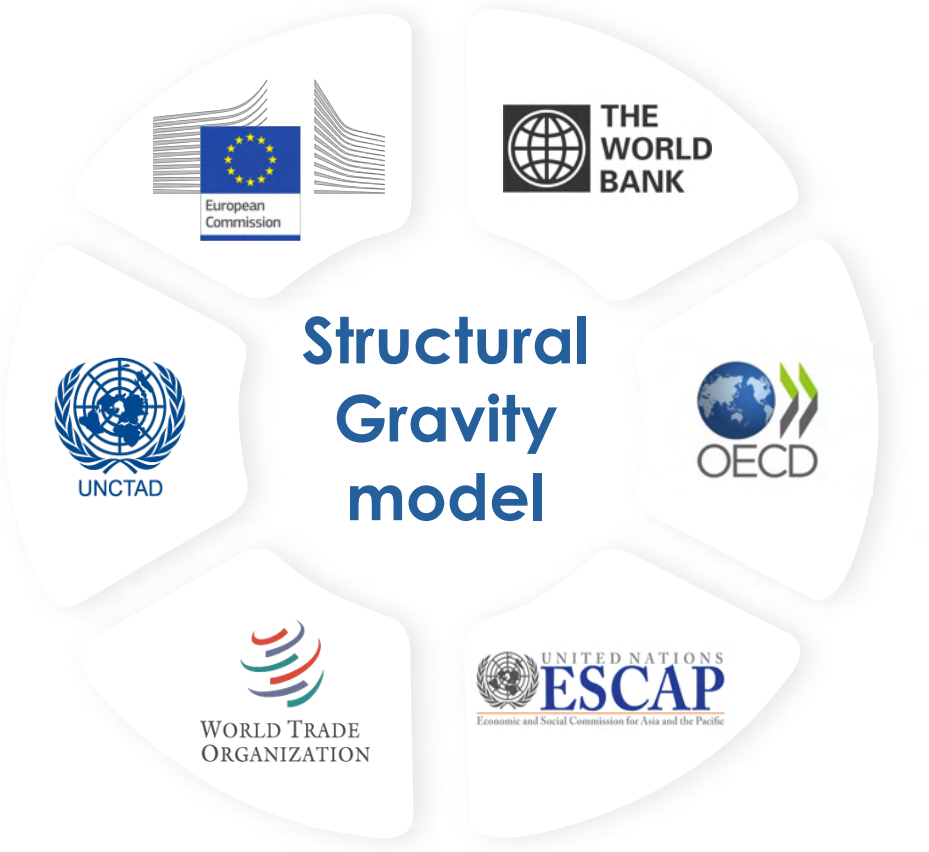
2.1.1 INTERNATIONAL TRADE ANALYSIS: FROM COMPARATIVE ADVANTAGE TO GRAVITY MODELS

Foreign trade analysis began in the 18th century with the theory of absolute and comparative advantages.
Trade theory originated in the 18th century with Adam Smith's theory on absolute advantage, stipulating that countries would specialise in producing and exporting goods that they can produce more efficiently than other countries. Subsequently, in 1817, David Ricardo developed his model of comparative advantage. Countries would focus on the production of goods they could produce at lower marginal costs relative to other countries. The Ricardian theory is based on opportunity cost and especially emphasizes technology differences: countries could produce certain goods at a lower cost than others. This model provided the basis for many others after, in a school of thought known as "traditional trade theory". Most notably, the Heckscher-Ohlin (H-O) factor endowments model was developed in 1919. The H-O model assumes that comparative advantages were not the result of technology differences but are rooted in differences in factor endowments and the factor intensity of goods. For example, countries with abundant capital would produce capital-intensive goods, and labour-abundant countries would produce labour-intensive ones. While this became a dominant trade theory paradigm for many studies, supporting empirical evidence remained weak.

Since Traditional Trade Theory left many unanswered questions about trade flows, it gave way to the "New Trade Theory". A significant problem with the theory of comparative advantage was that it predicted that countries with similar factor endowments would have no incentive to trade with each other. However, the rapid growth of intra-industry trade between rich countries disproves this notion. In response, "New Trade Theory" developed in the late 1970s especially following the notable contributions of Paul Krugman (1979, 1980), who received the Nobel Prize in Economic Sciences in 2008. New Trade Theory points out that trade is due to increasing returns to scale and increasing consumer utility accrued from various goods. Countries leverage economies of scale by producing large quantities of certain products and concentrating production in one location, whereas consumers purchase across all firms' varieties. This gives rise to two-way trade, where trade volume increases with countries' size similarity. Thus, New Trade Theory provides the theoretical foundation for the "gravity equation", where the trade volume between two countries is proportional to their sizes and inversely proportional to the geographic distance that separates them.

Today, empirical trade analysis is built on this gravity equation, with gravity models being the most successful and popular tools for trade analysis. The model is widely used by different international organisations, including WTO, UNCTAD, World Bank, European Commission, OECD, and many others (Figure 2). The WTO characterises them as "the workhorse of applied international trade analysis" (WTO and UNCTAD, 2016).

Figure 2 Organizations using the gravity model in the foreign trade analysis



Source: Whiteshield

2.1.2 FOREIGN TRADE ANALYSIS IN RECENT ECONOMIC LITERATURE

Countries' foreign trade policies have provided material for assessing the effects of trade agreements for over 60 years. More than 500 multilateral and bilateral regional trade agreements have been conducted since the 1950s[3] . A vast amount of research exists on assessing the effects of these agreements on international trade flows to not only analyse the evolution of trade policies but also to "predict" the effects of planned policies on trade.

Very different methodologies can be applied for the trade policy impact estimation. It can be descriptive statistics or modelling, ex-ante (projective) or ex-post (retrospective), econometric regression or simulation, or partial or

[3] Mario Larch's Regional Trade Agreements Database (2019)

general equilibrium (WTO and UNCTAD, 2012). The methodology is always chosen accordingly to the question asked. The gravity model and the computable general equilibrium (CGE) model are most often used in the impact assessment of regional trade agreements using foreign trade analysis.

Gravity models can be used as a retrospective analysis (ex-post), and CGE models are normally used for quantifying the future effects of a policy change through simulations (ex-ante). CGE models are powerful, complex tools that represent the whole economy across economic activities and behavioral responses of agents – consumers, firms and government. They are useful in understanding complex and in some cases unexpected interactions in an economy. In trade policy, CGE models estimate changes in trade and income effects, unilaterally or in the context of regional or multilateral trade agreements. CGE models account for all the interactions between sectors/industries and resources such as labour, capital and natural resources. They consist of equations describing model variables and a detailed database consistent with these model equations. The database usually includes the input-output table or Social Accounting Matrix (SAM) of an economy which distinguishes the sectors and provides elasticities that capture behavioral responses to changes. CGE "seems to be the most appropriate methodology for an ex-ante assessment of the effect of proposals tabled as part of multilateral market access negotiations" (WTO and UNCTAD, 2012). For example, Yaghoob Jafari and Wolfgang Britz, 2020, used a CGE model to assess the (potential) impact of Brexit on the UK economy, including in the case the UK loses its preferential access to the EU market of goods and services. Shujiro Urata and Kozo Kiyota, 2005, investigated the impact of an East Asian free trade agreement on foreign trade in Asia using the multisector CGE model. Examples of general equilibrium modelling of NAFTA are Kehoe and Kehoe (1995), Brown, Deardorff, and Stern (1995), Cox (1995), Sobarzo (1995), and studies surveyed in Baldwin and Venables (1995). One of the essential advantages of the CGE models is that they work under the caeteris paribus assumption, i.e., the simulation is carried out in isolation of other things happening in the real economy simultaneously, for example, COVID-19.

However, severe restrictions limit the suitability of CGE models for the PPP impact assessment. As stated above, CGE models are complex to build and require a large amount of cross-sectional and historical data. There are a number of such models in the market, such as the Global Trade Analysis Project or GTAP. However, critical data points are either outdated or just estimated. For example, the latest UAE input-output table in the GTAP comes from 2014, and later years' data are estimates. This means that the model cannot capture the changes in the structure of the country's economy that has occurred since then. Unlike CGE models, gravity models have fewer data requirements. However, they don't analyse the overall countries' economies across all the sectors and often focus only on the effects of changes in trade policy on trade values.

Gravity models show high stability and power to explain bilateral trade flows and require less time and data input for the foreign trade analysis than the CGE.

Gravity models were first introduced by Tinbergen (1962) and Pöyhönen (1963). They were based on the findings that the size of bilateral trade flows between any two countries is similar to the gravitational interaction: "as planets are mutually attracted in proportion to their sizes and proximity, countries trade in proportion to their respective GDPs and proximity" (WTO and UNCTAD, 2012).

Initially, the gravity models did not have any theoretical foundation. They were thought of as empirically stable relationships between the trade of economies and their sizes and the distance that separates them. But the high quality and the strong predictive power of the gravity models have led to the search for the theoretical foundations behind them. The first attempt to provide the theoretical support for these models was made by Linnermann (1966). Linnermann's work was criticized as using ad-hoc hypotheses to obtain reduced forms. Later Anderson (1979) used the "Armington assumption" (product differentiation by origin country) and the corresponding demand preferences to explain the presence of income variables in the gravity equation. According to the model, a country consumes at least some of every good from every country, and the national income is the sum of home and foreign demand for the unique good that each country produces. Thus, larger countries import and export more.

Trade costs are modelled as "iceberg" costs where only a fraction of the goods arrive at the destination, which is why transport costs reduce trade flows. Later it was shown that the gravity models can be formulated from different theoretical bases. For example, Bergstrand (1989) provided foundations for the gravity model in a monopolistic competition model of New Trade Theory, where the approach of the differentiation of products by origin country is replaced by product differentiation among companies. Firm location is endogenously determined, and countries are specialized in the production of different sets of goods. This approach helped to differ from the "Armington assumption" that goods are differentiated by the location of production by assumption.

The theoretical background helped to reveal the factors to be considered in the gravity model to obtain unbiased estimates. The WTO's and UNCTAD's "Practical Guide to trade policy analysis" (2012) highlighted that behind the theoretical foundation for the gravity equation lies "the importance of deriving the specifications and variables to draw the proper inferences from estimations using the gravity equation". It is important to mention "border effects", which are the source of the difference in goods prices among countries. Anderson considered these effects, and van Wincoop (2003), who have considered the endogeneity of trade costs and showed that the trade between two countries is affected not only by distance, borders, languages etc. but also the relative trade costs, i.e. "the propensity of country j to import from country i is determined by country j's trade cost toward i relative to its overall "resistance" to imports (weighted average of trade costs) and the average "resistance" facing exporters in country i". These "multilateral trade resistance" (MTR) terms should be considered in empirical research to avoid a biased estimation of the model parameters.
In addition to the MTR, different authors have proposed to use different types of fixed effects (e.g. exporter and importer fixed effects, time effects, exporter-time and importer-time fixed effects, country-pair fixed effects) to capture all the unobserved factors' endogeneity. Namely, using exporter-time and importer-time effects can help capture the MTR, which is difficult to calculate (Baier and Bergstrand, 2007). In models specified for assessing regional trade agreements, Baier and Bergstrand (2007) suggested using country-pair fixed effects to overcome the endogeneity problem and obtain unbiased estimates. The models that use exporter and importer fixed effects are specified as structural gravity models.

Gravity models show high stability and power to explain bilateral trade flows and require less time and data input for the foreign trade analysis than the CGE.
The WTO and UNCTAD's in their Advanced Guide (WTO and UNCTAD, 2016), highlighted the predictive power of gravity models as one of their main advantages: "Empirical gravity equations of trade flows consistently deliver a remarkable fit of between 60 and 90 per cent with aggregate data as well as with sectoral data for both goods and Services

Synthetic Control Method is another model that is used for impact assessment of trade policies. This technique can be described as a counterfactual retrospective analysis in which, the "treated" country that has introduced a change in its trade policy is compared with its "synthetic" version in the counterfactual where no policy change has taken place.

The SCM was introduced and expanded upon by Abadie and Gadeazabal (2003), and Abadie et al. (2010, 2015). According to the authors, the SCM method is a "way to bridge the quantitative/qualitative divide in comparative politics''. It provides a systematic way to choose comparison units in comparative case studies. This systematization "opens the door to precise quantitative inference in small-sample comparative studies, without precluding the application of qualitative approaches".

Even though the SCM does not rest on a theoretical foundation, this non-econometric approach is popular in both micro and macro comparative studies, including those evaluating outcomes from foreign trade policies (Grant, G. and K.A. Boys, 2018), (Hannan, 2016). For example, Kim et al. (2010) studied firm-level responses to trade liberalization in NAFTA. In 2012, Hosny investigated the Algerian trade with its GAFTA trade partners using the SCM. Hannan (2016) and Hannan (2017) tested the impact on the trade between country pairs who were both signatories of a given significant trade agreement, and both parties to a Latin America trade agreement. Demko and Jaenicke (2017) used the SCM to estimate the trade impact in the U.S. and the EU of an agreement establishing

bilateral equivalence of organic standards. Grant, G. and K.A. Boys (2018) assessed of the counterfactual case of international agri-food trade in an international economy where economic nationalism gains momentum or countries retreat from upholding their WTO commitments. Adam Adarov (2018) investigated the Eurasian economic integration impact at aggregate and industry levels using both the gravity model of trade and the synthetic control method.

Compared to the gravity model, the synthetic control method is much less used in studies. For example, SCM has not been used to assess the WTO effect on trade. At the same time, these models are often "built" based on the gravity model. The factors included in the gravity models are often used as criteria for building a synthetic country.

Difference-in-difference method is the easiest to construct but is used less often for trade agreement impact analysis. Another method to estimate the trade policy effects is the difference-in-difference method (DiD). Although it does not have a theoretical foundation, this method is one of the oldest tools to estimate the impact of policy measures, given that its simplest specification requires minimum data. UNICEF characterized the DiD method as "a good approach to calculating a quantitative impact estimate." For example, its modified version was used to measure the economic effect of WTO Accession Commitments (Chemutai, V and Escaith, H., 2017). Demko, I. and E.C. Jaenicke, 2015, applied this method to test the hypothesis that a 2012 organic certification equivalency agreement between the European Union and the United States positively influenced U.S. trade of organic agricultural commodities. Roberto Alvarez and Ricardo Lopez, 2008, used the DiD method and found that trade liberalizations do not decrease the number of firms nor increase the average size of firms. However, markups appear to decline during the three years after the liberalisation.

The fact that freshly introduced public-private partnerships need some time for the process of entering into force and require impact estimations in the short term, and given the ongoing COVID-19 pandemic, there are limitations on the choice of method for assessing the effectiveness of the PPP in the shorter term. Section 2.2 presents the rationale of what methods will be used and when. Section 2.3 explains the gravity model, section 2.4 gives a similar explanation for the SCM, and section 2.5 includes the DiD explanation. Lastly, section 2.6 describes the essence of the Trade Elasticity method; an additional measurement method proposed to predict the effect of the PPP on international trade. Section 2.7 will discuss the issue of measuring Trade in Services.

2.2 OVERVIEW OF KEY METHODOLOGIES

The gravity model should be the primary method for the PPP impact assessment. To analyze the impact of the PPP, the Structural Gravity Model (SGM, a variation of the gravity models with fixed effects) is chosen as the main method for assessing the impact of PPP on foreign trade due to the set of comprehensive benefits:

- SGM can easily be adapted and applied to the PPP;
- Many international organizations, including the UNCTAD, OECD, World Bank, and the European Commission, use one form or another of the SGM to estimate the trade impact of policy changes;
- The SGM has strong predictive power, a critical feature in assessing WLP impact. The model consistently delivers a remarkable fit of between 60% and 90% (WTO and UNCTAD, 2016);

- It has theoretical foundations, which is an important consideration in terms of obtaining robust results;
- It has relatively simple data requirements;
- The results of this model are easy to interpret;
- The SGM has strong predictive power, which can help to forecast future PPP impact. Its equations of trade flows consistently deliver a remarkable fit of between 60% and 90% (WTO and UNCTAD, 2016).

Despite its substantial advantages, the structural gravity model is challenging to apply in the immediate term due to data time lags and sensitivity to the COVID-19 shock.
Structural gravity models require intra-national trade data that is usually published with a 3-year lag. The solution to this problem can only be using predictions of the intra-national trade, although this approach harms the quality of the results. Another solution is to use the "standard" specification of the gravity models, which, while atheoretical and needed for additional data like GDO and proxies of the trade costs, doesn't require intra-national trade data. The results of this "standard" approach can be biased because they do not consider the multilateral resistance (MTR), but this problem can be fixed by estimating the MTR. The COVID-19 pandemic has significantly affected trade, coinciding with the PPP implementation. Thus, the effect of the pandemic is hard to distinguish from the impact of the PPP program using regression modelling. Therefore, until the end of the pandemic, estimation of the effects of the PPP program should be based on another technique that can be modelled to consider external shocks. These models can be:

- Synthetic Control Method (SCM);
- Difference-in-Differences Method (DiD).

Both the SCM and the DiD techniques can produce robust results that neutralize the effects of COVID-19 and thus can be applied in the shorter term. In comparison to the SGM, the synthetic control method offers three advantages:
- It can be applied with the specification which is asymptotically robust to time-varying unobserved determinants, namely, vital to the COVID-19 impact, which is one of the complications in the application of the SGM;
- The pool of countries used to construct the synthetic country ("control group") can be shortened to make country comparisons more appropriate. This restriction has a positive consequence that the data for a smaller number of countries would be enough;
- Unlike the SGM, SCM allows for a separate estimation of the effect of joining the PPP for each PPP country pair (exporter-importer).

The SCM model requires more data than the SGM and the DiD and can be applied approximately one year after the start of PPP. In the case of the SCM, there is more required data than the SGM for specific criteria as certain specifications of the SGM use fixed effects instead of variables. Thus, obtaining data covering the post-implementation period is possible to use the SCM method for a minimum of 6-12 months after the PPP implementation. It is also appropriate to consider several disadvantages of the SCM compared to the SGM approach, described in section 2.4, and the possibility of not getting an appropriate good synthetic country counterfactual. In this case, the alternative approach (DiD) is needed.

The DiD, on the contrary, requires minimum data and thus can be utilized for impact assessment in the short term. The DiD method is relatively simple, requires only trade data and can be utilized for the impact assessment in the short term. It is appropriate to utilize the DiD methodology within one year until the data needed for the SCM are available. Similar to the SCM, it can be modelled to account for the COVID-19 shock and is suitable for country and company-level analysis. At the same time, it has a substantial limitation in that it assumes treatment and the control group should follow the same trajectory over time; thus, it may not be applied to all countries or companies under scrutiny (see section 2.5). Despite this, it can be used even after one year as the "fast-result" analysis monitored by applying the synthetic control method and the structural gravity model for validation.

The specifications of the models suggested in this document represent the framework of the PPP analysis. They can be changed and adjusted in the future according to the data requirements and features to generate higher quality results. Table 1 gives the summary for each method described.

Table 1 Overview of the different methodologies

	Structural gravity	Synthetic control	Difference-in-Difference
Description	Analysis of the impact of the PPP on the countries' bilateral trade flows using regression analysis based on the Gravity Model.	Creation of a synthetic country similar to the original country as if it never joined the PPP. Comparison of the real foreign trade values with the "synthetic" trade values.	Comparison of the trade growth rate change of PPP countries after joining the PPP with the growth rate changes of companies/countries which did not join the PPP.
Monitoring target	Country level	Country level	Country or company level
Data requirements	Non-oil bilateral trade, GDP, intra-national trade, time-invariant proxies of trade costs	Non-oil bilateral trade and gravity covariates	Companies or country's non-oil trade data
Sensitivity to COVID-19 effect	Sensitive until the end of the pandemic effect on trade	Can be modelled in the robust manner	Can be modelled in the robust manner
When applied	Long-term (min 2 years since the PPP implementation)	Shorter-term (1-2 years since the PPP implementation)	Short-term (within 1 year since the PPP implementation)

Source: Whiteshield

2.3 STRUCTURAL GRAVITY METHOD IN BRIEF: HIGH QUALITY AND THEORETICALLY SOPHISTICATED

Gravity models have their foundation in a formula known as the gravity equation. Gravity models are based on the finding that the size of bilateral trade flows between any two countries is similar to the gravitational interaction. The basic model for trade (F) between two countries (i and j) can be formulated as:

$F_{ij}=G*(M_i M_j)/D_{ij}$,

where M_i is the exporter-specific factor, such as the exporter's GDP, that represents the willingness of exporters to supply; M_j is the importer-specific factor, such as the importer's GDP, describing the importer's demand; D_{ij} is the trade cost that can be characterized as the distance between countries; and G is the constant, e.g., the level of world liberalisation. The equation is usually used in its logarithmic form for econometric analysis of the determinants of bilateral trade flows and to test the effectiveness of trade agreements and organizations. The Structural Gravity Model is the most theoretically sophisticated specification of the gravity models, and it is suggested here as the main instrument for the PPP impact assessment.

The analysis of the impact of the PPP on the Hub's trade flows can be provided using the structural gravity method per the WTO's and UNCTAD's Guide.

The WTO and UNCTAD published the "Practical Guide to Trade Policy Analysis" in 2012 and "An

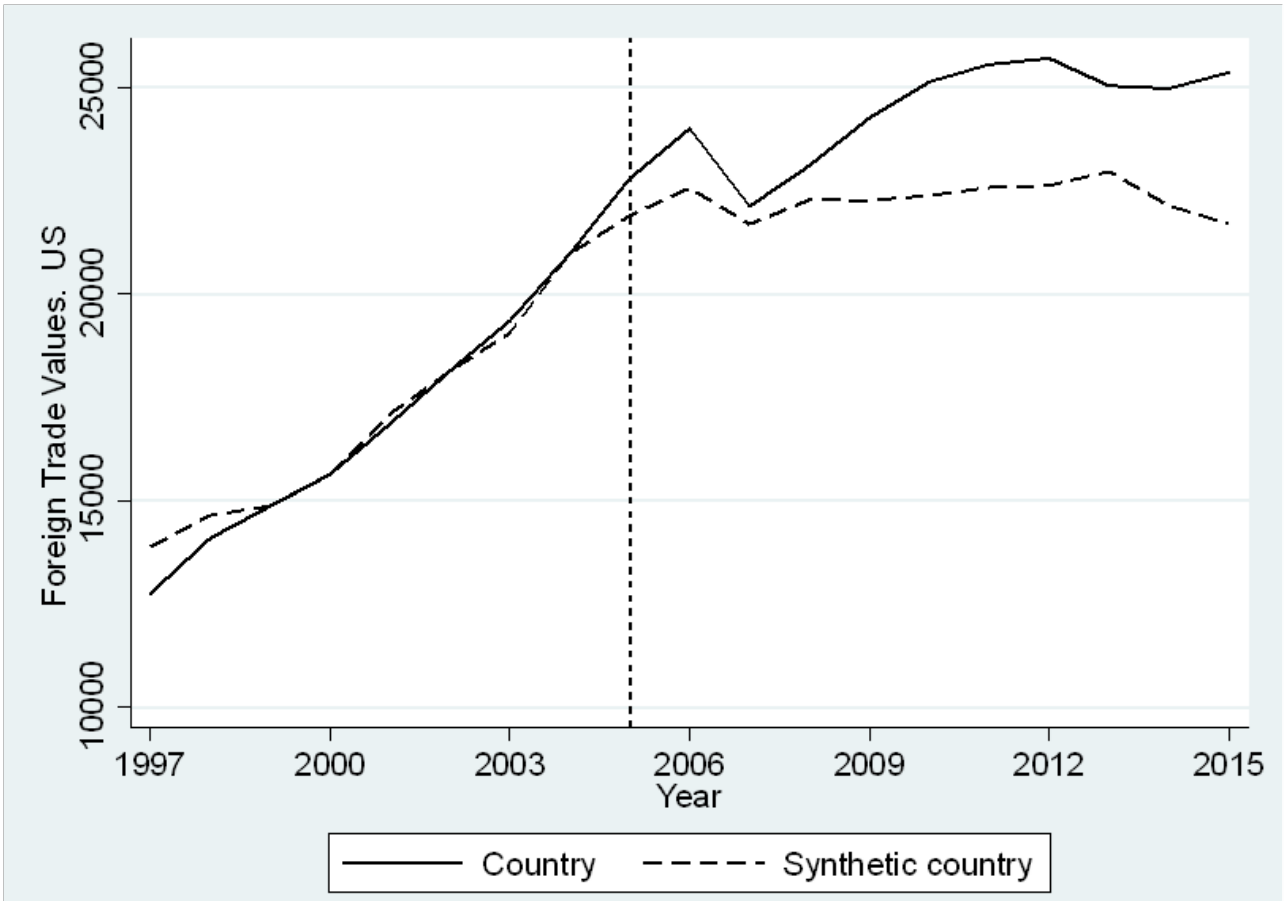
Advanced Guide to Trade Policy Analysis: The Structural Gravity Model" in 2016 (Advanced Guide), which are based on the gravity model. Specifically, the Advanced Guide explains analytical techniques, reviews the data necessary for the analysis, includes illustrative applications and exercises and offers the STATA codes needed for the corresponding econometrics. Not only does it include a chapter describing the method to estimate the impact of regional trade agreements and trade policies, but it also offers solutions to some of the most important issues of the gravity models, such as the challenges of estimation of multilateral resistance and trade costs, zero trade flows, heteroscedasticity and endogeneity. Thus, the method described in the Advanced Guide suits the PPP impact assessment purposes. Its methods can be easily adjusted to estimate the impact of the PPP on trade flows without distorting its theoretical framework.

The method proposed by the WTO should be modified to correspond to the realities and the PPP nature. Some changes should be made in modelling the impact of the PPP since, unlike Regional Trade Agreements (RTAs) in the Advanced Guide, the PPP may not be modelled as a bilateral dummy variable only. In the next section, we propose the specification of the model based on which the overall effects of the PPP can be estimated in addition to the effect of individual PPP participants

2.4 SYNTHETIC CONTROL METHOD IN BRIEF: CREATING A COUNTERFACTUAL

The Synthetic Control Method allows us to evaluate the effect of a given policy by constructing a synthetic non-PPP country. This synthetic country is, in effect, a counterfactual, describing the country under investigation but in a scenario in which it did not implement the policy, i.e. the PPP program. It is created as a weighted average of the data from third countries ("control group") which did not implement this policy. This weighted average should be close to the actual country's data before the policy implementation. After the implementation, the synthetic country can then be compared to the real country, and the estimated difference in trade between the synthetic and actual country measures the effect of the policy. Since both countries have experienced COVID-19, the COVID-19 impact will not significantly bias the results. Figure 3 below shows an example of the resulting graph.

Figure 3 Synthetic Control Method results for policy decision effect on GDP per capita, 1997-2015



Source: Whiteshield

Note: The Figure reports an example of the SCM test. The vertical line indicates the year when the policy decision was adopted by the country, the outcome variable for the treated unit (solid line), and the synthetic control unit (dashed line).

The values of the parameters of the synthetic country are determined by calculating the weighted average values of the corresponding parameters of the countries included in the "control group" and choosing weights that minimize the distance between the parameters of the control country and the fundamental parameters of the studied country.

2.5 DIFFERENCE-IN-DIFFERENCE METHOD IN BRIEF: SIMPLE METHOD FOR SHORT TERM ANALYSIS

The difference-in-differences (DiD) is the counterfactual method with which we can compare the trade of a group which adopted the trade policy with those of a group which did not adopt the policy.

The DiD method is used by comparing different outcomes of two groups: a treatment group for which the policy measure was applied and a control group for which a policy measure was not applied. These groups should be mutually exclusive. It is relevant for the analysis considering that the PPP is being rolled out in different countries, at different times, and with diverse groups of companies. Thus, it can be applied to analyze the impact of PPP across countries or companies in the same PPP Hub. At the same time, it should be noted that while the method has been widely used to assess the impact of policy measures, its application in evaluating the impact of trade promotion and facilitation programs is limited.

2.6 THE ELASTICITY METHOD

The Elasticity Method is based on the concept of trade elasticity and assesses the impact of costs and benefits a specific policy may impose on total trade values. Generally, the relationship between countries' traded volumes of goods and services with exogenous price changes could be used to evaluate countries' external performance. Trade elasticity of exports is connected to the resilience of exporters facing unexpected shocks, while the elasticity of imports reflects competition between foreign and domestic producers resulting in demand adjustments. A trade elasticity is a reduced form estimate that is relevant to policy - and ultimately to calibration choices.

Box 1 Theoretical concepts behind the Elasticity Method

The basic specification of trade elasticity equation for international trade estimation suggests that

$$\ln M_{it} = \alpha_{0i} + \alpha_{1i} \ln \frac{PM_{it}}{WPI_{it}} + u_{it}$$

where M_{it} is country i total imports, PM_{it} is an index of import prices, and WPI_{it} is the wholesale price index in country i. The price elasticity of imports is given by α_{1i}. Respectively for exports, the estimations is following:

$$\ln X_{it} = \beta_{0i} + \beta_{1i} \ln \frac{PX_{it}}{PXW_{it}} + v_{it}$$

where X_{it} denotes country i total exports, PX_{it} is an index of export prices, and PXW_{it} is a world index of export prices. The parameter of interest is β_{1i} .

Conceptually price elasticity measures the responsiveness of the quantity demanded or supplied of a good to a change in its price. It is computed as the percentage change in quantity demanded (or supplied) divided by the percentage change in price. Elasticity can be described as elastic (or very responsive, that quantity demanded or supplied respond to price changes in a greater than proportional manner), inelastic (contrary, a given percentage change in price will cause a smaller percentage change in quantity demanded or supplied), and unit elastic (percentage change in price leads to an equal percentage change in quantity).

$$Price\ Elasticity\ of\ Demand = \frac{\%\ change\ in\ quantity}{\%\ change\ in\ price}$$

$$\%\ change\ in\ quantity = \frac{Q_2 - Q_1}{\left(\frac{Q_2 + Q_1}{2}\right)} * 100$$

$$\%\ change\ in\ price = \frac{P_2 - P_1}{\left(\frac{P_2 + P_1}{2}\right)} * 100$$

Trade elasticity method is a suitable way of estimation of PPP impact on international trade flows. Depending on its design, PPP may impact international trade unilaterally and bilaterally, providing different types of benefits to its participants: starting from direct cost-savings and ending with trade general facilitation that converges into time savings.

The trade elasticity-based evaluation method of PPP's impact on international trade starts with estimating the aggregate savings effect that introducing PPP has on its members. The direct price-related and indirect effects of PPP are combined to estimate the total virtual discount imposed on PPP members. The impact of that discount on export and import is then estimated through pre-evaluated price elasticities for each unit of the analysis, providing the total impact of PPP introduction on the economy.

Thereby, Elasticity Method provides an analysis of the impact of PPP on countries' trade flows using estimation of savings gained by PPP members and trade gains through elasticity. This also allows for direct cost saving and indirectly generated additionality, allowing to forecast for future periods of economic activity. Proper implementation analysis requires monitoring on various levels, including country, company, and traded commodity levels, taking into account macroeconomic indicators such as international trade activity, countries' GDP and exchange rates[4], and trade data of PPP members. Because of the required data structure, the Elasticity Method has a low time lag allowing estimation directly after reporting period but is sensitive to the COVID-19 effect.

2.7 MEASURING TRADE IN SERVICES

Services account for more than two-thirds of global GDP and over half employment in industrialized countries . However, measuring trade in services is challenging due to various factors, namely, the lack of data on services by country and company. The United Nations Statistical Commission adopted the first Manual on Statistics of International Trade in Services (MSITS) to provide guidelines on measuring trade in services. There are two methods by which trade in services can be measured:

1. The Balance of Payments (BOP) and Foreign Affiliates Trade Statistics (FATS) approach
2. Calculating services by each Mode of Supply as defined under the WTO General Agreement on Trade in Services (GATS).

The GATS four modes of supply of services are:

- Mode 1: Cross-border supply, where both the supplier and the consumer remain in their respective territories
- Mode 2: Consumption abroad, where the consumer consumes the service outside his or her home territory
- Mode 3: Commercial presence, where service suppliers establish (or acquire) an affiliate, branch, or representative office in another territory through which the supplier provides their services
- Mode 4: Presence of natural persons where individuals are present abroad to supply a service

Both approaches face challenges when estimating trade in services. Whilst BOP and FATS can be collected using various databases, and reliable data is often only found in developed

[4] World Trade Organization, 2019. World Trade Report 2019: The future of services trade.

economies. This is especially true for FATS which measures the commercial presence and is usually available only for OECD countries. Moreover, the BOP approach does not separate between modes of supply, as BOP focuses on transactions between residents and non-residents regardless of location or method of delivery.

When measuring by the GATS Modes of Supply, the USA's Bureau for Economic Analysis (BEA) and the U.K.'s Office for National Statistics (ONS) have used survey instruments to ask companies to report the percentage of services supplied through each mode. The main advantage of measuring by each method of supply is that it identifies barriers to each mode of service transaction and consequently enhances multilateral trade negotiations on services.
However, even between the USA and the U.K., different methodological practices regarding survey design and estimation approaches provide challenges for comparability. A more critical disadvantage with measuring trade in services by each GATS Modes of Supply is that data availability is poorer and less credible than the IMF BOP approach. The IMF publishes a BOP manual to guide on collecting detailed data on trade in services continuously revised and updated.

To analyze the impact of PPP on trade in services, the IMF BOP approach would be chosen as the main method due to the following:

- The Extended Balance of Payments Statistics (EBOPs) developed by the OECD, Eurostat and IMF is a framework recognised internationally for estimating trade in services, with data available from the United Nations Conference on Trade and Development (UNCTAD) covering up to 12 types of services from 2005 to 2019
- The UNCTAD Trade in Services database shows each country's annual exports and imports of complete services. The BOP approach shows each country's trade flow with the world and covers up to 12 types of services as defined in the 6th edition of the BOP manual.
- The BOP approach allows for comparison to other macroeconomic indicators such as services export-to-GDP ratio which can be accounted for in regressions.

Furthermore, to understand how the PPP can affect trade in services liberalisation for targeted countries, the World Bank Services Trade Restrictions Index (STRI) can be accounted for in the regression. The World Bank STRI produced in cooperation with the WTO Secretariat is a measure of the restrictiveness of an economy's regulatory and policy framework with respect to trade in services. The STRI is available for 103 economies across five services (telecommunications, finance, transportation, retail and professional services). The STRI provides comparable information on services trade policies under three out of the four modes of supply in the GATS, namely cross-border supply (mode 1), commercial presence (mode 3) and presence of natural persons (mode 4).

CHAPTER 3. TRADE IMPACT 2.0: MAKING PPP HAPPEN

3.1 A PPP CASE: THE WORLD LOGISTICS PASSPORT

The World Logistics Passport is a trade catalyser aimed at unlocking trade potential in the Global South. The World Logistics Passport (WLP) is the first global multi-modal freight loyalty program which aims to reinvent trade by promoting the development of trade corridors between Asia, Africa and Latin America while reducing costs and improving efficiency for all beneficiaries along the logistics value chain. WLP members that generate the highest growth in trade are rewarded with financial and non-financial benefits, such as reduced landing costs or priority access through customs.

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai launched The World Logistics Passport in 2019 as part of the Dubai Silk Road strategy. It is a multi-stakeholder initiative led by the government of Dubai together with private and public entities such as DP World, Emirates Group, Ports Customs and Free Zone Corporation (PCFC), and DNATA, among other

3.1.1 WORLD LOGISTICS PASSPORT'S ROLE IN INCREASING TRADE

The WLP program has two key over-arching objectives, designed to optimize and grow trade across key established and emerging South-South trade Hubs.

Build South-South trade routes.

During the last four decades, emerging economies' share of global output has risen from 31% in 1995 to 46% in 2020, while their share in Global trade has increased from 16% to 30% during the same time (Figure 4).

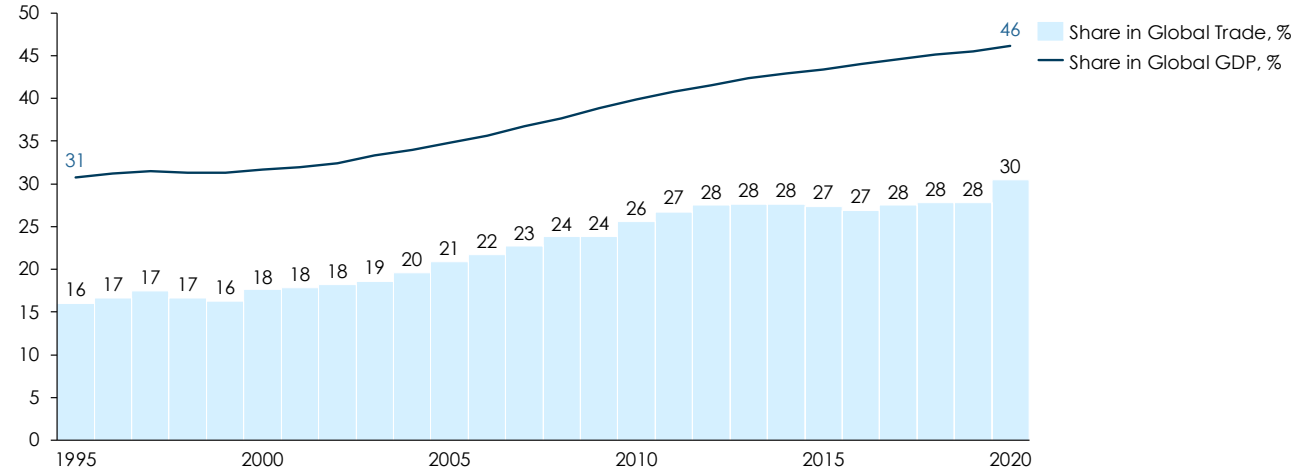
This change in global economic dynamics has redirected global trade contribution towards the South. The WLP aims to unlock trade value between these countries by providing increased access to underutilized trade routes and strengthening links between Asia, Africa and Latin America

Develop trade mega-Hubs.

The WLP focuses on developing key trade mega Hubs in selected regions through the WLP network. Hubs are chosen based on solid trade potential in high-value, low-weight goods, attractive business environments and strategic geographical positioning.

Hubs have the potential to consolidate trade in their wider area and become strategic nodes in a developing trade network

Figure 4 Share of emerging markets in Global GDP



Source: IMF – World Economic Outlook Database (2020)

3.1.2 LOYALTY PROGRAM MODEL: FOUR TIERS OFFERING INCREASING BENEFITS

World Logistics Passport holders can move across four tier levels based on trade performance. The WLP loyalty program is based on a partnership between traders, freight forwarders and local entities to provide additional trade in exchange for direct benefits. It is structured as a four-Tier loyalty scheme: White, Silver, Gold and Platinum, with different levels of incentives. Every year, Tier status is re-evaluated based on trade performance, and WLP Members can be downgraded or upgraded by up to one Tier each time

Figure 5 WLP Tiers and Timeframe

Source: Whiteshield

3.1.3 EXAMPLES OF BENEFITS

The World Logistics Passport enables traders and freight forwarders to increase their trade activities through key Hubs by offering financial and non-financial benefits. The program was piloted in Dubai, where a package of benefits was offered to optimise traders' journeys, leading to significant cost reductions and efficiency gains for sea-to-air traders. The benefits associated with sea-to-air import for re-export were shown to reduce costs by up to 50% and streamline the process by eliminating up to 24 hours from the trading journey.

As an example of a non-financial benefit, WLP members in Dubai were provided access to roads connecting Jebel Ali port to Dubai International airport during ban hours (Figure 6), which increased trade efficiency by 8 hours. This benefit reduced the average delivery time from Jebel Ali port to 30 minutes, and some of the participating companies increased the number of daily deliveries by 10% of delivery from Jebel Ali port to 30 minutes and some of the participating companies increased the number of daily deliveries by 10%[5].

Partners also benefit from the program through increased trade activity through their entity. Partners can capitalise on increased trade from members to generate higher revenues, which are expected to outweigh the impact of the financial benefits they provide. Partners generally only provide Benefits based on incremental trade increases, creating a win-win positive feedback loop for both the Hub and the traders.

Figure 6 WLP Sea to Air Journey in Dubai

Source: Whiteshield, Directional

[5] Whiteshield. World Logistics Passport 2019 Dubai Pilot survey results

3.2 TRADE MODELLING APPLICATIONS ON PPP

3.2.1 STRUCTURAL GRAVITY METHOD IN DETAIL: ADJUSTING THE SGM FOR WLP ASSESSMENT

The Structural Gravity model is used by the WTO and UNCTAD for the impact analysis of regional trade agreements. One of the classical empirical gravity model specifications, which estimates the impact of the regional trade agreements, looks as follows (WTO, 2016):

$$lnX_{ij,t} = \pi_{i,t} + \chi_{j,t} + \beta_1 lnDIST_{ij} + \beta_2 CNTG_{ij} + \beta_3 LANG_{ij} + \beta_4 CLNY_{ij} + \beta_5 RTA_{ij,t} + \varepsilon_{ij,t}$$

where $X_{ij,t}$ is the trade flow from country *i* to country *j* in the *t* period (only international trade flows); $\pi_{i,t}$ is the exporter-time fixed effect and $\chi_{j,t}$ the importer-time fixed effect which absorb all the observable and unobservable country-specific characteristics, including their sizes (GDPs) and multilateral resistances; $DIST_{ij}$ is the distance between the countries; $CNTG_{ij}$ captures the presence of contiguous borders between countries *i* and *j*; $LANG_{ij}$ and $CLNY_{ij}$ are dummies that take the value of 1 for common official language and for the presence of colonial ties correspondingly, and 0 otherwise; and $RTA_{ij,t}$ is the dummy variable which takes 1 if there is a regional trade agreement between country *i* and country *j* at the moment *t*, and 0 otherwise, $\varepsilon_{ij,t}$ is the error.

The Advanced Guide recommends using the multiplicative form of this equation and applying the Poisson Pseudo-Maximum Likelihood (PPML) estimator instead of the Ordinary Least Squares (OLS). Moreover, it offers several additional steps to overcome the classical issues of gravity models, namely, biased downward estimates because of the absence of intra-national trade flows in the dataset, and potential endogeneity and reversed causality concerns. The authors made several adjustments to the original model. In particular, they included intra-national trade in the database as trade of country i with country i. The final specification of the model offered by the Advanced Guide is:

$$X_{ij,t} = exp\left[\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_5 RTA_{ij,t}\right] \times \varepsilon_{ij,t}$$

where μ_{ij} is the pair fixed effect which captures all the described above bilateral factors like common language and borders, the colonial past and the distance as well as unobserved pair factors; and $X_{ij,t}$ includes not only international trade but also intra-national trade, which can be calculated as the difference between a country's production and exports.

The possibility of reverse causality and potential non-linear and phasing-in effects of RTAs are also tested. The Advanced Guide analysis points to strong phasing-in effects of RTAs, which is consistent with findings from existing literature, notably that RTAs affect foreign trade non-monotonically.

However, the SGM model needs to be modified to successfully capture the impact of the WLP and the COVID-19 crisis. The suggested specification of the structural gravity model can be used to estimate the impact of the WLP on trade with several adjustments:

- Firstly, the WLP program cannot be uniquely identified as bilateral like RTAs in the Advanced Guide, i.e. applied for trade between country i and country j only if they are both in the WLP. The loyalty program, as well as 2Tn program under the WLP, are not bilateral but unilateral or non-discriminatory,

i.e. they affect all the trade flows of the countries that adopt the WLP. The Advanced Guide provides a specific exercise for evaluating the impact of non-discriminatory trade policies such as "most-favored-nations" tariffs. This method is taken as a guide for the adjustment of the equation described above. Specifically, two "unilateral" indicators characterizing the joining of countries i and j to the WLP (〖WLP〗_(i,t) and 〖WLP〗_(j,t)) are included in the model instead of "bilateral" 〖RTA〗_(ij,t) . They are multiplied by the dummy variable 〖INTL〗_(i,j) which limits their effect only to international trade (not intra-national) in order to eliminate their absorption by the country-time fixed effects. Their combination 〖WLP〗_(i,t)* 〖WLP〗_(j,t) is bilateral by nature and reflects not only the synergy effect when both an exporter and an importer are in the WLP but also the effect of the "bilateral" new routes program.

- Secondly, the analysis is provided at the country-pair level. However, a problem emerges that in each WLP Hub, the WLP program may only be joined by some Partners. If the WLP program is adopted only by the Partners with a small share of foreign trade, we cannot expect a high impact of the WLP on country-level trade. Thus, if the trade data by partner is obtained, it is suggested to replace the agreement-related dummies used in the Advanced Guide by shares of trade by Partners registered to the WLP relative to the overall country's trade. If the trade data by partner is unavailable, the agreement-related dummies will remain.
- Third, one potential and serious problem not yet covered by the Advanced Guide is the effect of worldwide external shocks like the COVID-19 pandemic on foreign trade. The slowdown and suspension of international trade due to the quarantines, decreased production, cancelled flights, and increased foreign trade costs resulted in a significant fall in international and intra-national trade. Since these effects occur during the period in which the WLP program is being operationalized in the Hubs, assessment may show a false negative impact of the WLP program on international trade if we do not adjust the regression. While the π_(i,t) and χ_(j,t) will capture the loss of the production, the μ_ij is time-invariant and thus cannot reflect the change in trade costs. Thus, a COVID-related dummy variable changing the trade costs is suggested to include in the model.

Therefore, the following change of the Advanced Guide's specification is proposed:

$$X_{ij,t} = \exp\left[\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 COVID_{ij,t} * \mu_{ij} + \beta_2 WLP_{i,t} * INTL_{ij} + \beta_3 WLP_{j,t} * INTL_{ij} + \beta_4 WLP_{i,t} * WLP_{j,t} * INTL_{ij}\right] \times \varepsilon_{ij,t}$$

where $COVID_t$ is a variable which equals to the average of either absolute or relative (per 1000 people) number of countries' active COVID-19 cases at time *t*. $WLP_{i,t}$ is the share of exporter *i*'s trade made by members participating in the WLP at moment *t*. In the case of no available data on the share of trade by WLP partners, the $WLP_{i,t}$ is a dummy which equals to 1 if country *i* has joined to the WLP and 0 otherwise. Correspondingly, $WLP_{j,t}$ is the share of importer *j*'s trade made through members participating in the WLP at moment *t*. In the case of no available data on the share of trade by WLP partners, the $WLP_{j,t}$ is a dummy which equals to 1 if country *j* has joined to the WLP and 0 otherwise. As mentioned above, $WLP_{i,t} * WLP_{j,t}$ captures the effect of bilateral WLP programs and potentially captures the synergy effect when both countries *i* and *j* are in the WLP. $INTL_{ij}$ is a dummy variable which equals 1 for international trade flows and 0 for intra-national trade flows.

An illustrative example of the interpretation of the regression results is presented in Box 2.

Box 2 Example of the interpretation of the SGM results

The estimations of the coefficients got by running the regressions should be interpreted using the formula $(e^{\beta} - 1) \times 100\%$, where β is the coefficient estimated through the regression. For example, if the $WLP_{j,t}$ is the share of importer j's trade made through partners participating in the WLP and the coefficient before corresponding variable (see coefficient β_3 in the formula above) equals to 0.055, then the increase in the WLP participation share by 1pp will increase the import to this importer by $(e^{0.055} - 1) \times 100\% = 5.65\%$.

Source: Whiteshield, Directional

The model allows us to estimate the effect of different elements of the WLP Program. In addition to the loyalty program, the WLP also endeavours to develop new trade routes between WLP Hubs and includes other trade-enhancing initiatives (referred to as 2Tn program). In this regard, another more detailed specification of the model can be developed as well. The WLP assessment aims not only to estimate the WLP impact overall but also to reveal which elements of the WLP have the most substantial effect. For this purpose, the WLP parameters in the formula above can be decomposed into five variables describing the shares of the trade of partners participating in the separate WLP programs or the corresponding programs' dummies (variables describing the 2Tn program in UAE are explained differently):

$$X_{ij,t} = \exp[\pi_{i,t} + \chi_{j,t} + \mu_{ij} + \beta_1 COVID_{ij,t} * \mu_{ij} + \beta_2 WLPL_{i,t} * INTL_{ij} + \beta_3 WLPL_{j,t} * INTL_{ij} + \beta_4 WLPL_{i,t} * WLPL_{j,t} * INTL_{ij} + \beta_5 WLPR_{ij,t} + \beta_6 WLP2_{Dj,t} + \beta_7 WLP2_{iD,t}] \times \varepsilon_{ij,t}$$

where $WLPL_{i,t}$ – the WLP loyalty program in country *i*; $WLPL_{j,t}$ – the WLP loyalty program in country *j*, $WLPR_{ij,t}$ – the WLP new routes program between countries *i* and *j*; $WLP2_{Dj,t}$ share of trade with UAE (exporter) adopted 2Tn program or the dummy which equals to 1 if the exporter is UAE (in the case that other WLP-related parameters are dummies); and $WLP2_{iD,t}$ share of trade with UAE (importer) adopted 2Tn program or the dummy if the importer is UAE.

The model can be applied to specific sectors. The Advanced Guide confirms that the analysis can be provided for particular product sectors similarly and using the same formulas for aggregated trade flows. As the WLP doesn't cover petrochemical sectors, it may be reasonable to exclude the trade values of petrochemicals from the overall trade values.

The model can be further adjusted in the future to meet better quality and new requests. The proposed model specifications constitute a framework for this analysis and can be adjusted and changed based on data availability and additional parameters that may become necessary to consider when analysing in the future. Such parameters can characterize, for example, non-WLP regional trade agreements $(RTA_{ij,t})$, as was suggested by the Advanced Guide for the unilateral trade policies, mutual and other unilateral trade policies, or external shocks. In addition, it may be necessary for the future to adjust the already proposed indicators for the model to obtain more accurate results. For example, it may be necessary to remove the pair fixed effect in favour of the standard approximation of trade costs, especially in the case of unilateral WLP programs. This possible "standard" specification of the gravity equation for the WLP impact assessment can be specified as follows:

$$X_{ij,t} = \exp[\beta_1 GDP_{i,t} + \beta_2 GDP_{j,t} + \beta_3 lnDIST_{ij} + \beta_4 CNTG_{ij} + \beta_5 LANG_{ij} + \beta_6 CLNY_{ij} + \beta_7 COVID_{ij,t} + \beta_8 WLPL_{i,t} + \beta_9 WLPL_{j,t} + \beta_{10} WLPR_{ij,t} + \beta_{11} WLP2_{Dj,t} + \beta_{12} WLP2_{iD,t}] \times \varepsilon_{ij,t}$$

where $GDP_{i,t}$ – the GDP of the country *i*; $GDP_{j,t}$ – the GDP of the country *j*. Although this specification requires more data, in fact it can be more available in the shorter term because it doesn't require the intra-national trade values

which is usually published in official statistics with a serious time lag. All the trade costs' approximates are publicly available, the GDP data is usually published with a relatively little time lag. It is assumed that this approach can be applied in 1 year after the WLP implementation.

It is recommended not to use consecutive years of data in the model to improve the quality of the impact assessment. The Advanced Guide also advises not to apply the gravity model using consecutive years of data due to the critique that the adjustment of trade flows in response to trade policy changes is not instantaneous, and dependent and independent variables cannot fully adjust in a single year's time. Instead, it is recommended to use panel data with intervals for the analysis. If this approach is adopted, it requires the trade data for a significant time after the implementation of the WLP to allow its effect on trade to become more pronounced. In the future, implementing this recommendation can make the assessment of the program's effectiveness more accurate. However, this does not prohibit the use of this method in the short-term utilizing consecutive years.

There are limitations to the use of this model in the short run. Despite our efforts to consider the impact of the COVID-19 pandemic on foreign trade, until an estimated 2 years have passed since the end of the pandemic and the available datasets include enough to separate the COVID-19 effect and the WLP effect. This is because they both simultaneously impact the same factors of foreign trade, and the pandemic's effect is significant to distinguish in the model accurately. Therefore, this model is recommended to be used for future analysis of the WLP impact, namely in approximately two years. In the short term, there is a need to utilize other methods: the synthetic control method or the difference-in-differences method.

3.2.2 SYNTHETIC CONTROL METHOD IN DETAIL: THE DEVELOPMENT OF A SYNTHETIC COUNTRY

A pool of $J+1$ countries is considered and a synthetic control country is built for the 1st country. The time period is denoted as t, $t = 1, \dots T$. The decision, in this case joining the WLP, was adopted by the first country in year $T_0 + 1$ $(1 \le T_0 \le T)$ and is valid until the end of the study period. Other countries in the "control group" never joined the WLP in the period under analysis.

Let us assume that the dependent variable is the foreign trade value of a country. Y_{it}^N is the trade value of country *i* in the case of not joining the WLP, and - Y_{it}^I is in the case of joining. The assumption is made that $t = 1, \dots T_0, Y_{it}^N = Y_{it}^I$, i.e. before the joining the program, does not affect the country's foreign trade. It is also assumed that the decision to join the WLP made by one country does not affect the foreign trade values in other countries, thus externalities of joining the program are ignored.

The result of the decision of country 1 to join is denoted as α_{1t}, $\alpha_{1t} = Y_{1t}^I - Y_{1t}^N$, and is the goal of the SCM. $Y_{1t}^I = Y_{1t}$ is the observed indicator in the country, and Y_{1t}^N are unobservable hypothetical trade values that can be represented in the form of a factor model:

$$Y_{it}^N = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \epsilon_{it},$$

where δ_t is a factor common for countries (for example, the level of world oil prices); $\boldsymbol{Z_i}$ is the vector of observed parameters (criteria) on the basis of which the synthetic country is built; $\boldsymbol{\theta_t}$ is the vector of their coefficients; $\boldsymbol{\lambda_t}$ is the vector of unobservable latent factors; and $\boldsymbol{\mu_i}$ are their factor loads. This model can be represented as:

$$\sum_j w_j Y_{it}^N = \delta_t + \theta_t \sum_j w_j Z_i + \lambda_t \sum_j w_j \mu_i + \sum_j w_j \epsilon_{it},$$

where w_j is the *j*-th value of the weight vector $\boldsymbol{W} = (w_2 \dots, w_{J+1}), \sum_j w_j = 1$. Actually, the SCM method is to select a given vector $\widetilde{\boldsymbol{W}}$, so that for $t \le T_0$:

$$\sum_j \widetilde{w}_j Y_{jt} = Y_{1t}$$

The model is calibrated so that the synthetic and real country coincide before the WLP implementation. That is, before joining WLP, the weights do not affect the trade values, and $\sum_j \widetilde{w}_j \boldsymbol{Z_{jt}} = \boldsymbol{Z_1}$ or the selected parameters accurately model the country parameters. Thus, the effectiveness of making a decision to join can be assessed using the following parameter for for $t > T_0$:

$$\hat{\alpha}_{1t} = Y_{1t} - \sum_j \widetilde{w}_j Y_{jt}.$$

Weights $\boldsymbol{W}$ can be automatically calculated using special programs. For example, the commands "*synth*" in STATA includes the algorithm for the selection of these weights. The Illustrative Stata code is presented in Box 3.

The application of this method is justified, particularly in the short term. The SCM can be used within the first two years following the WLP since it is expected that the problems with applying the structural gravity model are most evident during this period. Therefore, data availability for the Z parameters (criteria) is essential. This data should be available not only for the countries which host WLP Hubs but also for several non-WLP countries. It is recommended to use the classic gravity covariates as the criteria, the time-variant of which should be quarterly and even monthly. To make the SCM robust to the pandemic shocks, the COVID-19 prevalence (absolute or relative number of COVID-19 active cases) variable should also be mentioned in the criteria set.

The unit of the analysis can be either the country as in the example above or the country pair of the trade flow of which is investigated. The model is then calibrated in such a way that the synthetic unit is very close to the analysed unit before the WLP implementation (T_0). The list of criteria is neither binding nor limiting. The final set of criteria cannot be determined ex-ante and is always chosen during the model testing. The model can be applied at the company level as well but in this case the data requirements for the criteria are much higher, e.g. the size of companies will be required. In the case of the absence of this data is it easier to use either some a specification of the SGM or the DiD.

The construction of a synthetic unit requires balanced data. Let's assume that the unit of analysis is a country. In this case, the application of the SCM has a crucial methodological feature: if at least one of the listed parameters is absent for a certain period of time for a particular control country, the corresponding observation, characterised by this country and time period, is excluded from the calculation of the weights for the control country. Thus, country weights become very sensitive to missing criteria values. To reduce this sensitivity, a "smoothing" procedure is carried out: the missing values of vital parameters (e.g. values of international trade) are "filled" using different techniques. The model results obtained after applying this procedure are usually much more resistant to changes in the model parameters than before the process.

Box 3 Illustrative example of the Stata code for the SCM

```
synth Trade  Trade(2000) Trade(2002) Trade (2004) GDP_per_capita ///
Exchange_rate FDI BoP, trunit("Country") trperiod(2005)  ///
unitnames(Country) figure
/*Trade is the dependent variable
- Trade(2000) Trade(2002) Trade (2004) GDP_per_capita
  Exchange_rate FDI BoP are the criteria
- Criteria with the year in the parenthesis
  make the real and synthetic values coincide in the chosen years
- 2005 is the year of policy implementation */
```

Source: Whiteshield

The SCM allows a more "detailed" impact assessment than the SGM as it can be applied for specific countries and country pairs. Apart from the resistance to the COVID-19 effect, it allows the analysis to separately estimate the WLP effect on any WLP country's trade or on the trade flow between any pair of the countries. For example, Hannan (2016) analyzed the impact of trade agreements on certain bilateral trade flows while Grant and Boys (2018) investigated the impact of the WTO membership on the overall Chinese trade.

At the same time, the SCM method has several significant disadvantages which should be addressed. Firstly, SCM has been criticised for its inability to assess the significance of results and to use a probabilistic sampling strategy to construct the sample units (Abadie et al., 2015).Abadie et al. (2010) recommended using placebo tests which compare the magnitude of the estimated effect on the treated case with the "random" case where the treatment is randomly assigned to any country pair. Secondly, the inference is less formal than other econometric methods and is based on weaker assumptions. Fourth, the SCM assumes that the intervention should affect outcomes only in the WLP countries, which may not correspond to the expected trade diversion effect. Thus, the control group should include only the countries and trade flows that the WLP does not influence; otherwise, the impact could be potentially underestimated (Hannan, 2016).

3.2.2.1 Difference-in-Difference Method in Detail: Treatment vs control

In the case of the WLP impact assessment, the DiD method compares the changes in the trade values over time between treatment and control groups. To apply the DiD method, it is needed to choose those companies or countries that satisfy the 'parallel trends assumption', i.e., the trend in trade values in treatment and control groups was similar before the WLP implementation. To estimate the effect of the WLP, the following simple formula can be used:

$$Y_t = (p_t - q_t) - (p_0 - q_0)$$

where Y_t is the contribution of the increase in trade attributed to the WLP in time period *t*; p_t is the percentage growth in trade in period *t* experienced by WLP participants; q_t is the percentage growth in trade in period *t* experienced by non-WLP participants; p_0 is the percentage growth in trade in base period *0* (before the WLP implementation) experienced by WLP participants; and q_0 is the percentage growth in trade in base period *0* experienced by non-WLP participants. The base period is selected as latest pre-WLP period. Growth rates are taken for the same time period: if monthly performance is investigated, monthly percentage growths are used. As mentioned above, the DiD method is robust to the COVID-19 effect and requires minimum data.

However, this method has a severe limitation: it is based on the 'parallel trends assumption' and requires no interference between groups, i.e., that the trade flows of the treatment and the control group follow the same trajectory over time, which may not apply in the case of countries and companies. For unbiased results, it can be necessary to select countries or companies in the control and treatment groups whose trade dynamics were similar before the WLP. In this case, not all participants of the program will be analyzed. This raises a question about representativeness which must be considered. Over the medium term, this risk will be reduced as when applying this method at a company level, participation in the WLP program will be open for all companies, thus reducing 'selection bias' for both control and treatment groups.

SUTVA can increase the model quality. In order not to achieve downward biased results it is also reasonable to apply Stable Unit Treatment Value Assumptions (SUTVA). This means that a country joining the WLP in the treatment group should not affect trade in the control group. This requirement, however, is contradictory to the essence of the WLP program, which is mostly non-discriminatory. This problem can be solved by applying a stricter selection to the countries or companies in the control group: they would not benefit from WLP one way or another. Another

assumption under SUTVA is that it is needed to clearly identify what "joining the WLP" means, as no different forms or versions of the treatment are allowed.

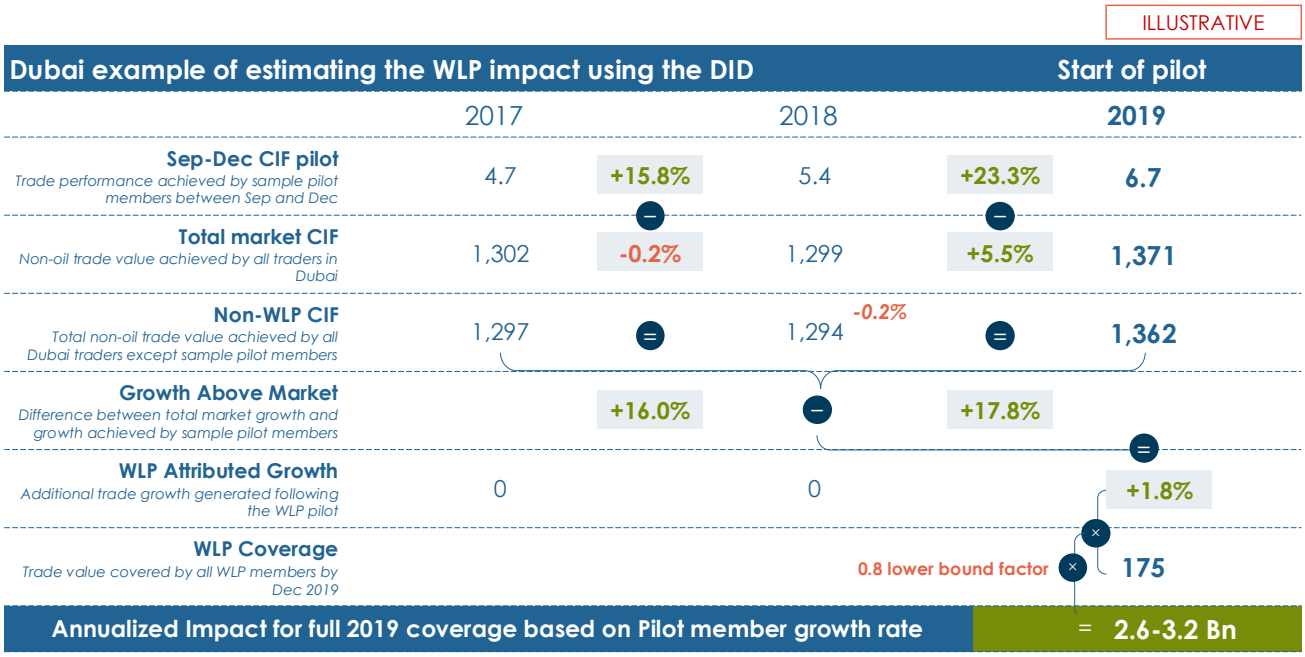
Despite its limitations, the DiD method provides good insights into the impact of the WLP program.

It was provisionally adopted based on the data provided by Dubai Customs for the pilot phase of the program. As the program is rolled out in more hubs, the tangible impact of the program will be monitored by applying the synthetic control method and the structural gravity model for validation.

3.2.2.2 Application of the Difference-in-Difference Method: The case of Dubai

The DiD method was adopted to quantify the impact of the WLP on trade in Dubai during the pilot phase, which was launched between September and December of 2019. This analysis was performed by comparing the group of WLP members who joined for the pilot phase (treatment group) to the remaining companies trading through Dubai (control group). The results of this analysis were validated through a survey for pilot members to report their satisfaction (score from 1 to 10) with the impact of the WLP program on their trade performance. Trade growth showed a positive correlation (0.7) with the survey results. From the above equation, the WLP positively impacted trade during the pilot phase. The example of DiD application to the Dubai case is represented in Box 4

Box 4 The example of DiD application to the Dubai case



Note: CIF value refers to CIF direct trade as defined by Customs (Import + Export + Re-Export). Small discrepancies may exist on displayed percentages due to rounding, pilot companies refer to 30 trade licenses corresponding to the invited pilot members to join the program

Source: Whiteshield, : Dubai Customs, Dubai Statistics, Directional

3.3 OUR PROPOSED NEW MODELS

The Advanced Guide suggests the methodology for estimating the effect of the PPP implementation on countries' GDP and trade flows based on the Structural Gravity Model described above. This methodology calculated the impact on GDP ex-post, using the already available information on trade and GDP dynamics. Besides trade policies, the gravity model assesses other policies like changing the VAT, duty rates and additional tariffs. However, policymakers and practitioners might have more detailed questions about the effect of a PPP. Specifically, it is essential to look at the detailed micro- and macroeconomic changes a trade intervention creates in the country: Does the intervention decrease or increase the value-added of a specific sector? Does it impact employment or productivity in this sector? How does it change wealth distribution? Does it allow or prohibit concentration on high-tech or high-value-added sectors? What about the effect on small, medium, or large enterprises?
One of the possible solutions to assess the effect of PPP is to use Agent-Based Modelling (ABM). ABMs model the effects of trade interventions on economic details such as employment by sector, value added by sector or standard of living indicators.

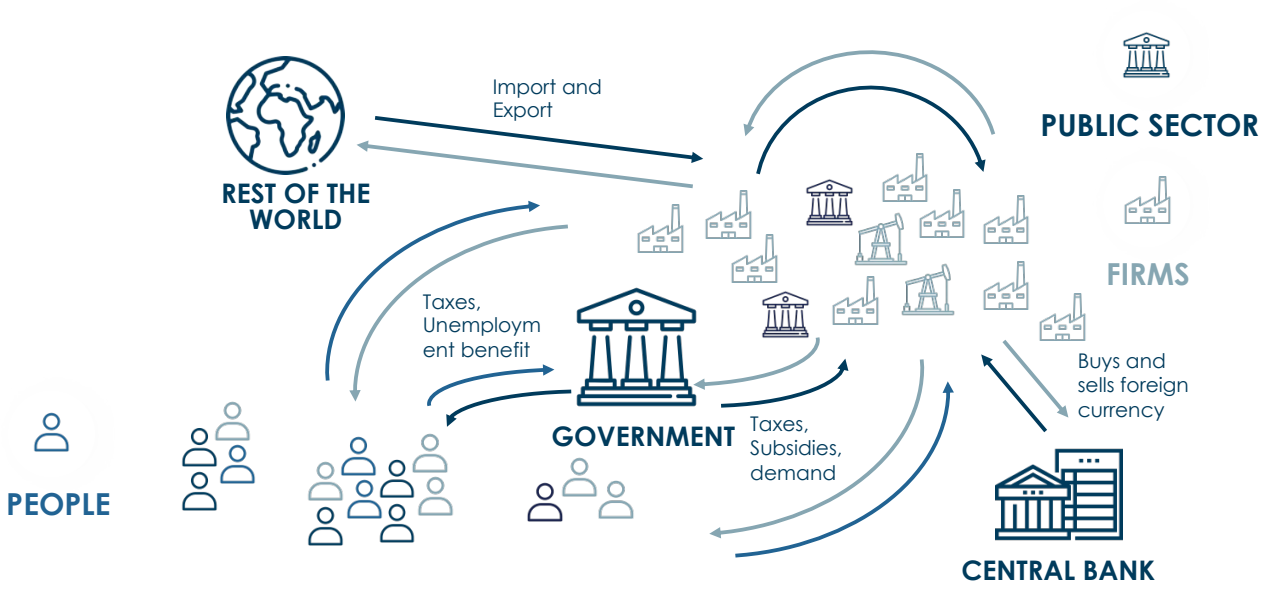
3.3.1 AGENT-BASED METHOD OVERVIEW: FIRM-BY-FIRM SIMULATION OF THE REAL ECONOMY

To answer these questions, we need a detailed model that simulates at least each economic sector. However, we propose Agent-Based Models, which are even more explicit in that they model the country firm-by-firm and, in some cases, even citizen by citizen.

The ABM model simulates all the economic participants and markets. To measure these effects, we deploy an agent-based simulation. In economic agent-based simulations (ABS), all individual firms and citizens of a country are represented as participants in the economy. In the simulation, these agents go about their daily business: firms buy, employ, produce and sell; people buy, consume, look for work and go to work. Significant for this topic are import, export and re-export firms. Firms and consumers use different goods and services for production and consumption.

The ABS simulates the economy on a day-by-day basis. People, firms, and other institutions trade (domestic and foreign) produce, work, and consume daily. In this simulation, we can then decrease trade barriers or introduce trade incentives. These changed terms of trade change the supply of goods and services in the country as well as the demand for goods and services for export. As the simulation encompasses the entire economy, these changes in supply and demand then affect the prices, production priorities, employment, and, in the end, GDP and employment in the country.

Figure 7 Representation of subjects and flows of an Agent-Based Method model



Source: Whiteshield

In short—beyond trade—the agent-based simulation lets us predict the change in the standard of living measured in GDP and unemployment after the PPP programs implementation.
The analysis can give us detailed insights into the induced change in the economy. Changes in terms of trade have an impact on the production and employment of different sectors. Given the available data from the input-output tables, the firms are usually separated in 10 to 40 (36 in case of OECD countries) sectors. Firms in each sector use a different combination of input goods. Therefore, they rely to a different degree on imports. Further, their export share of output varies. If we now assume a synchronous or asynchronous change in import or export prices (or costs), we can see the effects of this change on sectors and sector composition

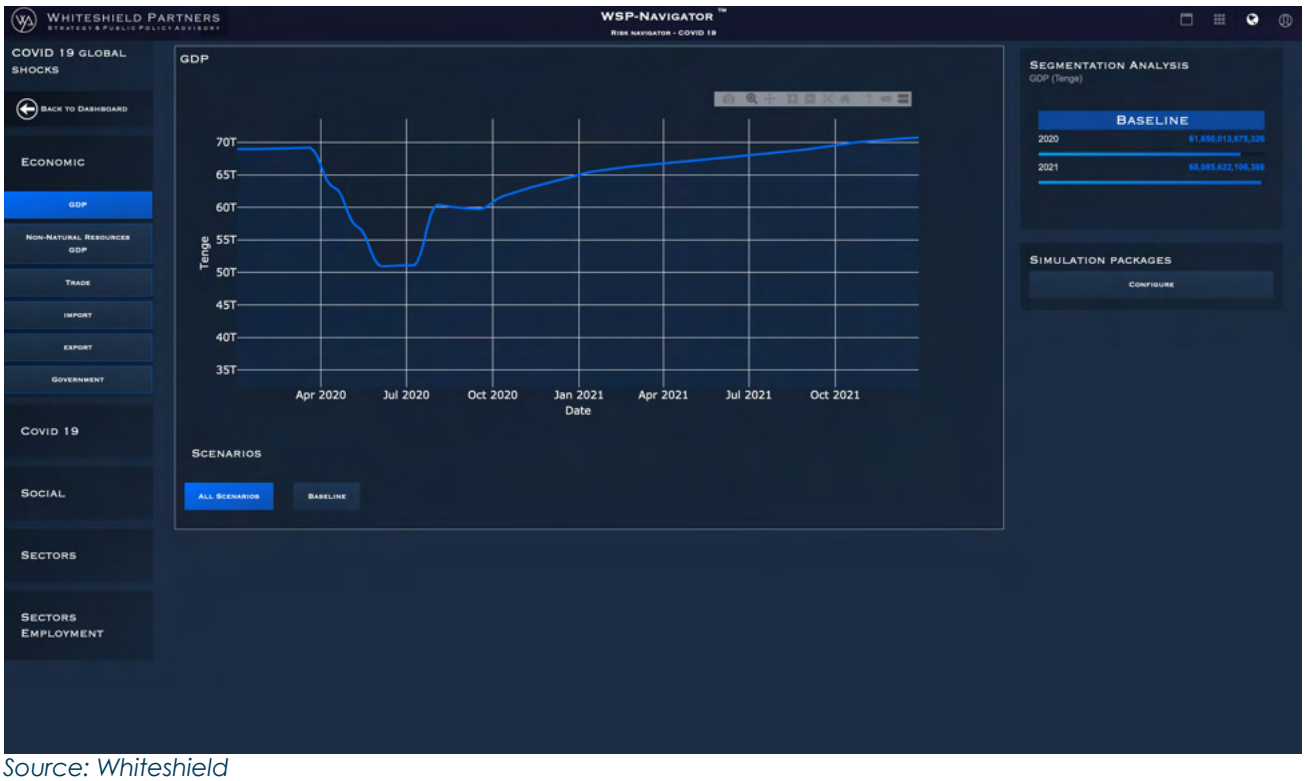
3.3.2 APPLICATION OF THE AGENT-BASED MODEL: THE FUTURE OF COUNTRY NAVIGATOR, WHITESHIELD'S ABM

Whiteshield's Future of Country Navigator (FOCN) is an agent-based model that is calibrated on firm size distribution, input-output matrixes, and other economic and administrative data. The optional trade module combines the detailed model of a country's economy with international trade, using UN Comtrade data or administrative trade data for calibration. Over the past years, the Future of Country Navigator has been used for tax simulations, simulation of post-Covid recovery policies, and greenhouse-gas emission modelling.

Figure 8 Future of Country Navigator web-interface. Example of an economy disrupted by epidemic shock.

Source: Whiteshield

Figure 9 Future of Country Navigator simulation board

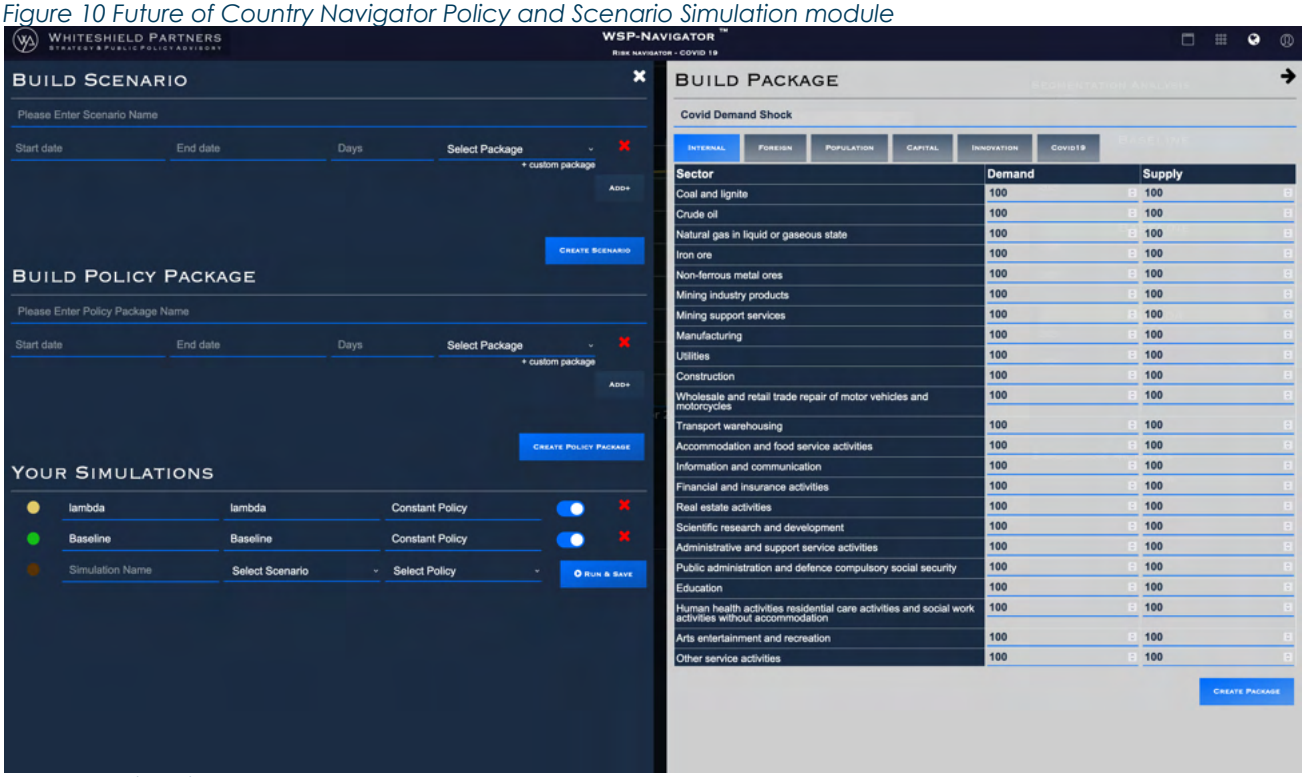


Source: Whiteshield

In real life economy its subjects may be exposed to various shocks and disruptions at different levels. For example, population can be exposed to health, epidemiologic or migration shocks, firms can suffer from capital destruction or innovation shocks, while in general countries'

economies and world in general can face resource price fluctuations, demand raises and shortages, or supply chain breakdowns. Likewise, FOCN has flexible instruments for adjusting and assessing the impact of broad scenarios.

Figure 10 Future of Country Navigator Policy and Scenario Simulation module



Source: Whiteshield

FOCN allows policymakers to enter scenarios and policies and observe economic results. For example, one could choose a tsunami model and simulate its economic impact. Subsequently, one could run the simulation with different policy responses and see which policy responds mitigates the economic effect of a tsunami most effectively. One could, for example, weigh the benefits of a loans-based approach over a purely fiscal spending approach to revitalising the economy.

USING FUTURE OF COUNTRY NAVIGATOR AS A TOOL APPLYING AGENT-BASED MODELING IS A WAY TO ASSESS THE IMPACT OF PPP IMPLEMENTATION AND PREDICT ITS EFFECTIVENESS. IT ALSO ALLOWS ACCOUNTING FOR THE SUSTAINABILITY OF PUBLIC INITIATIVES AGAINST A BROAD SCOPE OF POTENTIAL FUTURE DISRUPTIONS. Conclusion: Embedding New Analysis in The Trade Community

Recent years have shown that disruptions force countries and firms to step aside from traditional and established trade algorithms. The same relates to ways of estimating economic activities, particularly the effects of PPP such as the WLP on trade and the world community.

The gravity model, especially its structural specification, has substantial advantages over other methods given its theoretical foundations, empirical successes, and the relative ease with which its results can be interpreted. It can be adapted to the PPP assessment considering that these programs can be both unilateral and bilateral. Despite this, the structural gravity model is challenging to apply in the immediate term: some of the required data are usually published with a significant time lag. Moreover, global disruptions like the COVID-19 pandemic have considerably impacted trade. Its beginning coincided with the PPP implementation, making it hard to distinguish the effect of the PPP from that of the pandemic until enough time had passed. In the shorter term, estimating the impact of the PPP or any change in trade policy instruments may be conducted using the synthetic control and the difference-in-difference methods, which have relatively fewer data requirements and can produce results in

isolation of the COVID-19 effects. However, these methods also have several limitations.

Thereby there is a need to introduce a new way of calculating for the private sector that would consider potential disruptions and allow to account for multiple potentially changing attributes implementing PPP. Such disruptions could have different natures: health, economic, social, or political, but in either context, there is a need to look at PPP cases like WLP in detail. The new model should focus on firms, citizens, and entities in its close-up scope, allowing to account for multi-factor adjustments and tailor the PPP assessment, embedding more advanced practices into the general trade community.

APPENDICES

DATA REQUIREMENTS AND SOURCES

The models described above require several country-specific and bilateral data. This section is aimed to review the main data sources and the data limitations.

As mentioned above, the SGM is assumed as the main model for the WLP impact analysis despite the problems of its usage in the short term. One of the main advantages of using the suggested structural gravity equation is that it requires relatively little data compared to "classical" regression and gravity models. This is because all exporter-specific and importer-specific parameters, and even the parameters of the trade costs, are absorbed by the exporter-time, importer-time, and pair fixed effects. Thus, this section mainly focuses on variable data for the bilateral trade flows. Nevertheless, the table below shows the list of indicators that may be needed for all the suggested methods.

Table 2 Data needed for the models, their sources and time lags.

Type of data	Data source	Data availability lag
	SGM	
Bilateral international trade	Short term: local customs Long term: IMF, UN Comtrade and related data providers	2-3 months 10 months
GDP	Short term: IMF projections, local statistics Long term: IMF, World Bank	- 1 year
Intra-national trade	Estimated based on the national gross production data Short term: projections based on the UNIDO Long term: UNIDO	- 3 years
COVID-19	Dummy version: A dummy variable which equals to 1 in 2020 and 2021, and 0 otherwise Alternative version: Share of active cases in population from open sources, e.g. Worldometer	- -
PPP	Dummy version: A set of dummy variables which equals to 1 if an exporter or an importer (or both) has joined the PPP, and 0 otherwise Alternative version: Share of trade generated by PPP members in total trade of the country, sourced by local customs or companies' reports	- 2-3 months
INTL	A dummy variable which equals 1 for international trade and 0 for intra-national trade	-

Type of data	Data source	Data availability lag
Trade policies	Mario Larch's Regional Trade Agreement Database	1 year
	SCM	
Bilateral international trade	Short term: local customs Long term: IMF, UNComtrade	2-3 months 10 months
GDP	Short term: IMF projections, local statistics Long term: IMF, World Bank	- 1 year
Distance between countries	Time-invariant: WTO database, BACI	-
Common language	Time-invariant: WTO database, BACI	-
Common borders	Time-invariant: WTO database, BACI	-
Colonial ties	Time-invariant: WTO database, BACI	-
	DID	
International trade of companies and countries	Short term: local customs, local statistics authorities	2-3 months

Source: Whiteshield Partners

Traditionally, gravity estimations have been performed with aggregate data. To carry out the proposed analysis, official statistics are needed for the maximum possible number of countries for the last 5-10 years. In the first years after the start of the program, the impact assessment can be based on monthly or quarterly data. In subsequent years, annual data will be used for the analysis, which will help avoid seasonality and inaccuracy in the data.

Sources: Bilateral trade flows data should include export, import and reexport and can be collected using these sources:

1. International Monetary Fund (IMF)'s Direction of Trade Statistics (DOTS). This dataset includes the aggregated (country-level) bilateral trade data, covers 184 countries and has quarterly and monthly data since 1960. The reported currency is US dollars. However, this source has significant time lag of up to 10 months. Another problem is that this source does not include a breakdown by product, which will make it difficult to use if we need to exclude particular products from the trade flows (e.g., petrochemical products) or analyze the trade of certain products.

2. UN COMTRADE is a well-known source of disaggregated trade data by commodity. Data of trade flows is presented in US dollars and volumes, available for 160 countries and includes monthly data since 2010. This source offers different levels of disaggregation up to HS 6 digit. The problem is that data in this source can be inconsistent in terms of mirroring exports and imports. Moreover, UN COMTRADE data is also publicized with significant time lag.

3. BACI data is the UN COMTRADE data cleaned from inconsistencies excluding re-exports. Like UN COMTRADE, this source offers different levels of disaggregation up to HS 6 digit, but it has an even higher time lag (1-2 years) than UN COMTRADE.

4. Trade data shared by local customs or other Partner Benefit Providers is the fastest available source, but it has a series of challenges. First, this data may contain inaccuracies and errors, e.g., mirror data on exports and imports

may not match. Second, for the analysis it is desirable to have trade data for all possible countries, not only for the PPP partners, but the customs of other countries don't have incentives to share trade information. This challenge, however, could be temporarily addressed using the import from WLP countries as the "mirror" for export. This is an incomplete solution as only part of the non-PPP trade will be seen in this way. Despite the obvious shortcomings of this source and solution, its use may be necessary in the near future, until alternative sources begin to provide data for the period after the start of the PPP.

Import data can be used as the "mirror" of export. It is often advisable to use import data to construct the primary dependent variable in gravity regressions. This is mainly due to the reliability of import data. Import data can also be used as the "mirror" data for export. However, we must be careful because sometimes high tariffs and weak monitoring capabilities at customs can lead to underestimated import data. Thus, in the analysis, it is recommended to use trade data from BACI if this data is available after the implementation of the PPP.

Some products not affected by PPP are recommended to be excluded from trade data. For example, since the WLP does not cover petrochemical trading, the analysis of the program's impact should be done on petrochemical-free trade data. This is recommended because the petrochemicals trade occupies a special place within international trade, and its dynamics may not correspond to the world dynamics of foreign trade overal

Intra-national trade flows data need to be included in the SGM model but can only be estimated as the difference between production and exports. The problem is that production is often measured as value added. That is why we need to use production databases (e.g., UNIDO Industrial Statistics) based on sectoral data (SIC) and usually cover goods only for which value added and gross values are available and reported. The problem is that the UNIDO database has a significant data lag (approx. three years). This means that the production data will not be available for the PPP impact analysis in the first years after WLP implementation. The temporary decision may be in the projection of the production levels. But this adaptation has to be cancelled as soon as the gross production data is available for 2021 and onwards.

The model can include a proxy for bilateral trade costs when applying the SCM and SGM. That is why, in the gravity model, analysts usually use proxies, which are the set of observable data that determine trade costs and can include the distance between countries' commerce centers, contiguous borders, common language, colonial past, common history, etc. The CEPII's GeoDist and gravity databases report data on such time-invariant gravity variables for more than 200 countries. The suggested structural gravity model specification replaces the trade cost data by pair fixed effects.

As was noted above, **we might need to add control variables which describe different agreements between countries.** The Mario Larch's Regional Trade Agreement Database provides the data of all existing multilateral and bilateral regional trade agreements as notified to the World Trade Organization from 1950 onwards. This database can be easily incorporated into the model.

Yearly GDP data can be taken from the World Bank database. Getting the monthly and quarterly data on GDP can be much more complex and can require the usage of local statistics. For the PPP analysis, using GDP projections is also possible in the early stages after the start of the PPP.

The DiD analysis requires only trade data by countries and/or companies. When this method is provided in the short term, the only applicable data source is local customs authorities in every PPP hub.

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