AN EMPIRICAL ANALYSIS OF THE SWISS GENERALIZED SYSTEM OF PREFERENCES

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1 Introduction

1.1 Background

> Overcoming poverty is not a gesture of charity. It is an act of justice. It is the protection of a fundamental human right, the right to dignity and a decent life. While poverty persists, there is no true freedom. (Nelson Mandela, President of South Africa from 1994 to 1999, British Broadcasting Corporation News, 2005)

The Human Development Report (The United Nations Development Programme, 1999) stated that "Today, global inequalities in income and living standard have reached grotesque proportions. The gap between per capita income (GNP) between the countries with the richest fifth of the world's people and those with the poorest fifth widened from 30 to 1 in 1960 to 60 to 1 in 1990 to 74 to 1 in 1995. The marginalization of the least developed countries continues [...]." This quotation refers to steadily increasing disparities in income and related living standard between the global North and South. However, a lot has changed since the beginning of the new millennium. For instance, The Economist (2013) published an article with the headline 'Africa rising: A hopeful continent'. The magazine pointed out that "Over the past decade, six of the world's ten fastest-growing countries were in Africa. In eight of the past ten years, Africa has grown faster than East-Asia." The current Human Development Report (The United Nations Development Programme, 2015b) underlines good news from the media. In particular, the influence on the world economy of emerging economies such as China, India and Brazil is rising. Industrialized economies' share of global gross domestic product (GDP) expressed in purchasing power parity dollars fell from 54 percent in 2004 to 43 percent in 2014. Since the beginning of the new millennium some developing countries (DCs) and least developed countries (LDCs) have shown strong economic growth. However, people do not have equitable benefits from this progress, human capabilities and opportunities do not always flourish, human security is at stake, human rights and freedoms are not always protected, gender inequalities remain a challenge, and future generations' choices do not get the attention they deserve (The United Nations Development Programme, 2015b).

Nevertheless, the economic success of some DCs and LDCs cannot be disregarded. According to the World Trade Organization (2000) and The World Bank (2013a), trade in particular plays an important role in the rising economic success of the world's poorest countries. The connection between (free) trade and reducing poverty as well as reducing discrepancies and

polarities in income and wealth among countries of the global North and South was already realized in 1964 when the United Nations Conference on Trade and Development (UNCTAD) was held. The UNCTAD considered possible ways to promote preferential market access for underdeveloped countries to markets of industrialized countries. In 1968, it recommended the creation of the Generalized System of (Tariff) Preferences (GSP) under which industrialized countries grant on a voluntary and non-reciprocal basis tariff preferences to underdeveloped countries (Panagariya, 2002). At first, the voluntary and non-reciprocal preferential treatment of DCs and LDCs contradicted the most-favored-nation (MFN) clause of the WTO's General Agreement on Tariffs and Trade (GATT). However, preferential treatment was given legal effect within the GATT by means of a 1971 waiver of the MFN obligation in Article I of the GATT. The system of tariff preferences was made permanent by the 1979 Enabling Clause. The Enabling Clause also contains a waiver to grant additional preferences exclusively to LDCs (Bartels and Häberli, 2010).

Since March 1st 1972, Switzerland as well as the USA, EU and Japan, has granted preferential market access under the GSP to DCs and LDCs for industrial and agricultural products on a voluntary and non-reciprocal basis. This means that – depending on the product – DCs and LDCs pay no or lower tariffs for their exports into Switzerland. The legal basis for granting preferential market access is the 'Verordnung über die Präferenzzollansätze zugunsten der Entwicklungsländer' (Zollpräferenzverordnung, March 16th 2007). The Swiss GSP can essentially be classified into two schemes: The first scheme applies to around 80 DCs. For instance, during 2002 and 2011 the product coverage rate[1] for DCs has not changed systematically. On average 35 percent of DCs' agro-food exports were eligible for trade preferences under the GSP. The second scheme is geared to around 50 LDCs and can be compared with the EU's 'everything but arms' (EBA) initiative. Since 1 April 2007, the LDCs have been granted duty- and quota-free market access (DFQFMA) as part of the second GSP scheme for all tariff lines with the exception of weapons. Moreover, LDCs are not linked to seasonal restrictions (Häberli, 2008). The Swiss 2007 DFQFMA for LDCs and countries currently in the process of debt relief was gradually introduced in 2001 with a 10-50 percent tariff reduction and in 2004 with a 55-75 percent tariff reduction compared to the most-favored-nation (MFN) tariff. In addition, there was a phasing in until September 2009 for broken rice, animal feed, cane and beet sugar and chemically pure sucrose in solid form, with progressive tariff cuts. Since this transition period, there is a 100 percent DFQFMA for LDCs (The United Nations Conference on Trade and Development, 2012).

[1]The product coverage rate is the percentage of products eligible for a given tariff arrangement (GSP, FTA or MFN) out of the total number of dutiable products (The United Nations Conference on Trade and Development, 1999).

1.2 Non-reciprocal trade preferences: Theory and empirical evidence

1.2.1 Theory

According to Grethe (2005), preferential trade agreements (PTAs) can be considered as a deviation from the MFN principle. A distinction is made between reciprocal customs unions or (bilateral) free trade agreements (FTAs) on the one hand, and non-reciprocal trade preferences such as the GSP, exclusively granted to DCs or LDCs, on the other hand. In principle, the GSP allows products to be exported at a reduced rate of duty (GSP<MFN) or completely free of duty (GSP=0). This causes a difference between the price under the normal rate (MFN tariff) and the price under the preferential tariff rate (GSP tariff). This difference (tariff reduction) represents the preference margin. The decision whether or not to utilize the GSP system is made by the exporter. It may be expected that this decision depends mainly on the preference margin. Furthermore, the preference margin has to be considered as a competitive advantage towards competitors exporting under the multilateral WTO regime (provided that quoted export prices are nearly equal).

Besides exporting under (preferential) GSP tariffs, DCs and LDCs also have the possibility to export under alternative tariff regimes (e.g., MFN tariff). Therefore, in practice, PTAs like the GSP or (bilateral) FTAs are rarely utilized fully due to bureaucratic obstacles in the form of export certificates (e.g., certificate of origin). To comply with the rules of origin (RoO), the product in question must have been manufactured wholly in a GSP-benefiting country, or sufficient working or processing must have taken place in said country. In the Swiss GSP regional cumulation[2] is permitted to the Association of Southeast Asian Nations (The United Nations Conference on Trade and Development, 2013a; Swiss Customs Administration, 2013). It is easier to provide the certificate of origin for less-highly processed products than for more-highly processed ones because the constituent parts of the latter may originate in different countries. In addition, it is possible for individual processing steps to be outsourced to different countries on the basis of comparative cost advantages (Hakobyan, 2012). Therefore, non-reciprocal PTAs are in general associated with costs of compliance. In this context, it is to be assumed that the level of the compliance costs influences the degree of utilization of PTAs. A rationally behaved (profit-maximizing) exporter chooses to utilize trade preferences only if the preference margin (at least) compensates for the costs of compliance associated with the GSP (see e.g., Bureau

[2]"Materials originating in one country of the regional group which are further worked on or processed in another beneficiary country of the same group are considered to originate in the latter country, provides that (a) the value added there is greater than the highest customs value of the materials used originating in any one of the other countries of the regional group; and (b) the working or processing carried out there is more than 'insufficient working or processing' (The United Nations Conference on Trade and Development, 2013a)."

et al., 2007; Keck and Lendle, 2012). Furthermore, these costs could be seen as Non-Tariff Barriers to Trade (NTBs). Especially exporters in DCs and LDCs consider NTBs in the form of additional trade documents (e.g., certificate of origin and certificate of direct shipment) as a major trade barrier (The United Nations Conference on Trade and Development, 2013b). Bureaucratic obstacles, particularly the restrictive RoO, are a significant obstacle for the utilization of the GSP. According to Wijayasiri (2007) and Häberli (2008), the opportunities offered by the GSP are largely unknown in most of the responsible state institutions and among the exporters of the DCs and LDCs. The same, however, applies for the importers in the respective industrial nations.

1.2.2 Empirical evidence

Descriptive evidence on the utilization[3] of the GSP (and of bilateral FTAs) indicates that PTAs are rarely utilized fully by the exporters (for early assessments of non-reciprocal PTAs see e.g., Brenton and Manchin, 2003; The United Nations Conference on Trade and Development, 2003; Candau et al., 2004; OECD, 2005). The European Commission (2011) provides a comprehensive overview of the utilization of the ordinary GSP, the GSP+[4] and the EBA initiative granted by the EU in the agro-food sector and the textile sector between 2006 to 2009. In the agro-food sector (textile sector) the ordinary GSP was utilized by on average 51 percent (44 percent), the GSP+ by on average 81 percent (65 percent) and the EBA initiative by on average 39 percent (71 percent). According to OECD (2007) only a few economically large DCs show high utilization rates, the utilization is concentrated on a few products, and the percentage of preferential trade on total trade is rather low. For instance, Bureau et al. (2007) estimate the transaction costs for the EU's GSP at 2 to 6 percent of the overall value of the goods.

Actually, there are two strands in the literature on ex-post evaluation of PTAs. First, studies based on the gravity approach, which used either aggregated trade data in combination with trade arrangement specific dichotomous dummy variables or disaggregated trade data in combination with preference margins estimating the effects on DCs' or LDCs' exports. Estimated effects on DCs' and LDCs' exports (total value of trade) range from positive to negative (see e.g., Herz and Wagner, 2007; Herz and Wagner, 2011; Aiello et al., 2010; Aiello and Cardamone, 2011). Second, studies which refer to the concept of the preferential tariff rent focus rather on distributional effects than on the value of trade (see e.g., Özden and Sharma, 2006;

[3]The utilization of PTAs is usually depicted by the utilization rate which represents the percentage share of trade flows introduced under preferential conditions on trade flows eligible for trade preferences. The value of the utilization rate ranges between 0 and 100 percent (The United Nations Conference on Trade and Development, 1999).

[4]The GSP+ covers the same products as the ordinary GSP. In contrast, additional tariff reductions are granted to countries which ratify and implement core international conventions on human and labor rights, environment and good governance (European Commission, 2016b).

Olarreaga and Özden, 2005; Cirera, 2014). The preference margin first of all represents the preferential tariff rent of the importer. If the exporter raises the price of a particular product, its share of the preferential rent also increases. The enforceability of a price increase, however, depends on the market power of the importer and the bargaining power of the exporter. Related studies find that exporters located in a DC or LDC captured between 20 to 60 percent of the preferential tariff rent.

This work differs from the broad body of existing literature on empirically evaluating the effectiveness of unilateral PTAs such as the GSP in the following aspects: First, none of the existing studies select Switzerland as the country of investigation. Second, only a few studies emphasizing the institutional quality of a GSP-benefiting country affecting the level of the utilization rate positively[5]. Third, only a few studies take the exogenous nature of the DFQFMA for LDCs into account. By obtaining criteria for inclusion, respectively graduation from the LDC status, we consider the DFQFMA as a quasi-experiment. We are therefore able to obtain unbiased effects of gradually introduced trade preferences on beneficiaries' exports. Fourth, using modern methods of causal inference, namely synthetic control method in combination with difference-in-differences (DiD) analysis, respectively, in combination with interrupted time series analysis (ITSA). And finally, none of the existing studies explicitly investigate the switch from non-reciprocal to reciprocal trade preferences using econometric matching techniques.

1.3 Structure, research questions and applied methods

The present cumulative dissertation addresses the question of whether the Swiss GSP is suitable to integrate DCs and LDCs better into world markets to achieve the development policy goals of economic growth, poverty reduction and sustainable development. The research project is segmented into six working packages, each of which represents an article for a peer-reviewed research journal. While four articles focus on the agro-food (and fishery) sector under HS chapters 01-24, one article exclusively refers to the textile and clothing sector under HS chapters 50-67, and one article refers to all sectors under HS chapters 01-97 (whereby the respective analysis considers a further segmentation into agro-food sector and textile and clothing sector). Swiss foreign trade statistics are available from the Swiss Customs Administration (2015).

Article no. 1 determines factors which influence the level of the utilization rate of the Swiss GSP for DCs and LDCs in the agro-food sector under HS chapters 01-24 between 2002 to 2011. As mentioned above, utilizing the GSP is linked to bureaucratic obstacles (NTBs), which are associated with costs of compliance. Because the (trade related) institutional quality of a given DC or LDC is indispensable in overcoming NTBs, we assume that the institutional quality of a

[5]Note: There are several studies analyzing the connection between trade and institutional quality (see e.g., Anderson and Marcouiller, 2002; de Groot et al., 2004).

nation – separately depicted by three good governance indicators – has a positive impact on the level of the utilization rate. To identify this connection, we use panel data regression techniques which are able to take zero values into account, namely, the Poisson Pseudo Maximum Likelihood (PPML) method (Silva and Tenreyro, 2006) and the Heckman (1979) selection model with product and time fixed effects (Wooldridge, 2012). Wihtin a reduced economic gravity model, we consider the aspect of the RoO, by including the following variables: preference margin, regional cumulation, processing stage of a given product (low, medium and high processed) and value of trade flows eligible for the GSP. With respect to the bureaucratic obstacles of the Swiss GSP, we can assume that the GSP is utilized at higher levels of the preference margin, and therefore, acts as the main incentive for exporting under preferential conditions. In this context, to comply with the RoO we assume that permitting regional cumulation as well as low and medium processed products reveals positive effects on the level of utilization.

Article no. 2 addresses the following research question: "Preferential tariffs for developing and least-developed countries: Did they foster agricultural exports to Switzerland?" To test the effectiveness of the Swiss GSP, we consider agro-food exports under HS chapters 01-24, which de facto enter Switzerland under the GSP, respectively are eligible for the GSP during 2002 to 2011. This is due to the fact that the effect of the preference margin on preferential exports solely can be obtained when using trade flows which are at least eligible for the GSP (but in some cases not utilized or a low level). Because we hypothesize that the preference margin acts as the main incentive for exporting under the GSP and has a significant positive impact on the value of preferential exports. Therefore, the main goal of this article is to test this hypothesis. For this purpose we use panel data regression techniques with product and time fixed effects. The following empirical strategy refers to the estimation of the overall effectiveness of the GSP for LDCs and DCs. Within two model variations (baseline model and a reduced gravity model extended by the HDI), we first test the probability of GSP utilization by means of logistic regression. Second, we restrict the sample (using the same framework), to trade flows where the GSP is utilized using Ordinary-Least Squares (OLS) regression. Variables are estimated in logs, therefore, OLS is limited suitable because the natural logarithm of zero is not defined. Therefore, third, we use the PPML method and fill up the trade matrix with missing zero values. This causes the data set to increase substantially. Subsequently, we exclusively investigate the effect of the 100 percent DFQFMA for LDCs in 2007 (using the reduced gravity model). For this purpose, we restrict the sample to preferential exports of the LDCs. First, we test the relation between the preference margin and preferential agro-food exports, by obtaining a structural shift caused by the complete 2007 DFQFMA performing a Chow test (Chow, 1960). Second, we test the effect of the 2007 DFQFMA by using a model that includes a time related dummy variable for the time period from 2007 to 2011 interacting this time related variable with each of the predictor variables (McDaniel, 2016).

Two articles (no. 3 and 4) are dedicated to the Swiss DFQFMA for LDCs, applying methods of causal inference. Article no. 3 investigates the 100 percent tariff cut in 2007 using trade data for the years 2002 to 2011. The study deals with the following research question: "How would preferential agro-food exports under HS chapters 01-24 of the LDCs have developed if Switzerland had *not* granted DFQFMA?" To answer this question, which is based on the counterfactual state, we initially apply the synthetic control method (Abadie and Gardeazabal, 2003; Abadie et al., 2010). Hereby, a synthetic LDC is constructed based on GSP-benefiting DCs, using United Nations LDC status criteria (The United Nations Committee for Development Policy, 2014). Subsequent, we perform DiD analysis to quantify the causal effect (Wooldridge, 2012). To obtain an unbiased causal effect we (i) need to ensure that the core assumptions of causal inference, namely, the stable unit treatment value assumption (SUTVA) and the common trend assumption (CTA) are met (see e.g., Meyer, 1995; Morgan and Winship, 2007) and (ii) we need to consider the DFQFMA as a quasi-experiment where the allocation of the exogenous treatment is based on observed conditions (LDC status criteria). Based on the counterfactual state we assume that LDCs' preferential agro-food exports remain constant in the absence of the complete tariff cut in 2007.

Article no. 4 can be seen as an extension of article no. 3 by considering the progressive tariff cuts in 2004 (55-75 percent) and 2007 (100 percent). In a comparative case study we investigate how Bangladesh's preferential textile and clothing exports would have developed under HS chapters 50-67, if Switzerland has *not* granted the progressively introduced DFQFMA in 2004 and in 2007. Likewise, this case study based on the concept of the counterfactual state, ensuring that (i) and (ii) are met. Methodologically we first apply an ITSA (interrupted time series in 2004 and 2007) matching on covariates (Linden, 2015; Angrist and Pischke, 2009) and second, perform the synthetic control method in combination with ITSA. We are thus able to observe if preferential exports (trade flows) react according to progressive tariff cuts in 2004 and 2007. In this context we expect a rather modest increase in preferential exports due to the first tariff cut in 2004 (55-75 percent) and a steeper increase due to the second tariff cut in 2007 (100 percent).

Article no. 5 investigates the 2005 switch from given non-reciprocal trade preferences under the GSP to negotiated reciprocal trade preferences under an FTA in a case study of Tunisia's exports to Switzerland. The study addresses the following research question: "How would Tunisian exports to Switzerland have developed if Tunisia had *not* switched from non-reciprocal to reciprocal trade preferences in 2005?" Obviously, this case study is likewise based on the concept of the counterfactual state. We construct the counterfactual state applying Propensity-Score Matching (PSM) with the nearest-neighbor algorithm (Leuven and Sianesi, 2003) and Nearest-Neighbor Matching (nnmatch) (Abadie et al.,2004) based on matching covariates (basic variables of the economic gravity equation extended by the Human Development Index). For

this purpose we construct the counterfactual Tunisia out of a pool consisting of GSP-benefiting DCs. However, in contrast to articles no. 3 and 4, countries select themselves into FTAs, and a cutback of tariff barriers on trade in the framework of bilateral and multilateral FTAs is not randomized. Consequently, evaluations of bilateral FTAs are plagued by selection bias. We are aware of this issue, but in our view, compared to ordinary regression techniques (e.g., by means of the economic gravity model), matching econometrics is able to construct a counterfactual state. Based on observed socioeconomic conditions (gravity variables and the HDI), we can identify an average treatment effect on the treated (ATT) unit Tunisia. Because Tunisia was able to negotiate trade concessions which are more tailored to its export structure (especially in the agro-food and textile sectors), we expect a positive effect of switching form given non-reciprocal to reciprocal trade preferences.

A final article (no. 6) addresses the question "Who benefits from the high-price segment in commodity markets?". Descriptive evidence on Swiss import prices (prices per kilogram at the border including cost, insurance, freight and without tariffs) for four raw vegetable oils (palm, sunflower, peanut and coconut oil) indicates a large and systematic discrepancy between prices under the MFN scheme (high prices) and prices under the GSP scheme (low prices). Raw vegetable oils have to be considered as agricultural commodities, which may be assumed to have marginal differences in quality. In this context, the additional question arises: "Do commodities have a price segment?" To shed some light on these issues, we choose the example of Swiss raw coconut oil imports, combing quantitative (estimating a price function) and qualitative (objective hermeneutics) research methods (see e.g., Mann and Schweiger, 2009; Wagner et al., 2010) using import data for the years 2011 to 2013. Based on observed large discrepancies in import prices, we expect that this phenomenon can be explained by differences in quality. Furthermore, we expect that in particular re-exporting countries (e.g., Austria or France) receive higher import prices compared to GSP-benefiting LDCs.

2 Summary

Article no. 1 addresses the question: "Which determinants influence the utilization of the Swiss GSP for DCs and LDCs in the agro-food sector?" For this purpose we estimate a reduced gravity model. The dependent variable, the utilization rate for a given product, year and country, is calculated as the share of actual trade flows introduced under the GSP divided by GSP-eligible trade flows. Since utilizing trade preferences is associated with bureaucratic obstacles in the form of proof of origin, proof of direct shipment and other non-tariff barriers to trade, inclusive institutions are indispensable. In this context, we include the following three indicators separately in the regression models which depict the institutional quality of a nation: the Worldwide Governance Indicators (WGI), the Index of Economic Freedom (IEF) and the Human Development Index (HDI). Because the utilization rate can be equal to zero, we estimate our model using Poisson Pseudo Maximum Likelihood (PPML) with pooled panel data as a baseline estimation. As an additional robustness check, we apply the Heckman (1979) selection model. The first step is to estimate the probability of preference eligibility and utilization, using a probit estimator. In a second step the Heckman two-step procedure estimates an Ordinary Least-Squares (OLS) model by means of the inverse Mill's ratio, where the sample is restricted to export flows which are eligible for the GSP and where the GSP is utilized.

Both model variations (PPML and Heckman selection model) indicate that the institutional quality (separately depicted by the WGI, IEF and HDI) exerts a consistent positive influence on the level of utilization of trade preferences. Furthermore, we include the preference margin (the difference between the MFN-tariff and the GSP-tariff) into our model. The variables 'preference margin' and 'preference eligible trade' also focus on the aspect of transaction costs (costs of compliance) which are associated with the utilization of the GSP by proof of origin and proof of direct transport. An exporter's decision of whether or not to utilize the GSP depends on the level of the 'preference margin' as well as on the absolute value of the trade flows actually introduced under GSP conditions. A 10 percent increase in the 'preference margin' leads to an increase in the utilization rate by on average 2 percentage points in the case of DCs and by on average 4 percent in the case of LDCs. In general, adding product fixed effects to the model intensifies the positive effect of the 'preference margin' for all model variations. Likewise, a 10 percent increase of 'GSP-eligible trade' leads to an increase in the 'utilization rate' by on average 0.3 percentage points in the case of DCs and by on average 0.8 percent points in the case of LDCs. Here again, adding product fixed effects to the model intensifies this effect. Therefore, trade

preferences are utilized in cases where the GSP-eligible trade flow and the 'preference margin' are high. Furthermore, results unequivocally indicate that the GSP is utilized even more in cases of medium and highly processed products.

Article no. 2 is devoted to an analysis of the Swiss import structure of the agro-food sector under HS chapters 01 to 24 from DCs and LDCs which benefit from the Swiss GSP. The empirical analysis is dedicated to the following research question: "Did preferential tariffs for DCs and LDCs foster agro-food exports?" In this context, we additionally analyze the 2007 DFQFMA for LDCs by using simple regression techniques. The descriptive analysis indicates that in total 74 percent of DCs' agro-food exports were imported under a tariff lower than the tariff granted to all WTO members or equal to zero during 2002 to 2011. In contrast, 100 percent of LDCs' agro-food exports entered Switzerland under reduced tariffs (e.g., 'GSP reduced') or tariffs equal to zero (e.g., 'MFN=0' or 'GSP=0'). For the estimates we use logistic regression, OLS and PPML. In contrast to OLS, PPML is able to include zero values (dependent variable) and account for heteroscedasticity, which are both common in trade data (Silva and Tenreyro, 2006).

Because countries did not select themselves into the status of an LDC or DC, the decision whether a country is included in the LDCs, or graduates from the Swiss GSP, is based on three threshold-based inclusion criteria that are defined by the United Nations Committee for Development Policy (UN-CDP). Using the Human Development Index (HDI) as a proxy for United Nation (UN) LDC status criteria, we are able to provide an unbiased estimate of the preference margin on LDCs' preferential agro-food exports. Here, we find (i) that a one percent increase in the preference margin increases the probability that the GSP for LDCs is utilized by on average five percentage points and (ii) that a one percent increase in the preference margin increases LDCs' preferential agro-food exports by between 0.25 and 0.45 percentage points. The exercise of estimating the (unbiased) effect of the 2007 DFQFMA for LDCs shows how difficult it is to evaluate such a policy change within the framework of simple regressions. Although here again, we identify a positive effect of the preference margin on LDCs' preferential agro-food exports, adding product fixed effects turns the effect negative (but statistically non-significant). However, this is also due to the fact that after the complete tariff cut in 2007 the preference margin for a given product no longer varied over time and products. Nevertheless, this exercise clearly shows that methods of causal inference are more appropriate to evaluate an exogenous policy change in the form of the 2007 DFQFMA for LDCs.

The present cumulative dissertation focuses primarily on the DFQFMA for LDCs (articles no. 3 and 4). Here, we apply the idea of causal inference which is based on the concept of the counterfactual state. We therefore focus on the question "How would preferential exports of the LDCs have developed if Switzerland had not granted the DFQFMA?" Because the counterfactual state can never be observed, we analyze the difference in preferential exports between the

treatment unit consisting of LDCs and the control unit consisting of DCs. As mentioned above, we analyze a quasi-experimental setting. However, the allocation of the treatment is clearly not random, but we observe the conditions on which the treatment is allocated. Thus, we argue that conditional on those observed conditions the treatment is as good as random. This approach eliminates selection bias. The decision whether a country is included in, or has graduated from the GSP for DCs and LDCs, respectively, is based on three threshold-based inclusion criteria which are defined by the UN-CDP. These criteria are: Gross National Income (GNI) per capita, the Human Assets Index (HAI) and the Economic Vulnerability Index (EVI). For article no. 3 we use these three criteria to construct a suitable control unit. Article no. 3 focusses on estimating the effects of the 100 percent tariff cut in 2007 for the average LDC on agro-food exports under HS chapters 01-24 using the synthetic control method (Abadie and Gardeazabal, 2003; Abadie et al., 2010) in combination with DiD analysis. We find that the average causal treatment effect on preferential agro-food exports under HS chapters 01 to 24 ranges between CHF 0.4 and 0.8 million, which corresponds to an increase in preferential agro-food exports of between 80 and 160 percent. Variations concerning the average annual causal treatment effect mainly occur due to data limitations and/or to choice of matching-covariates which in turn has an influence on the compilation of the treatment and control units. In contrast, article no. 4 quantifies the causal effect of the progressively introduced Swiss DFQFMA in 2004 (10-50 percent tariff reduction) and in 2007 (100 percent tariff reduction) in a comparative case study of Bangladesh's preferential textile and clothing exports under HS chapters 50 to 67 using ITSA for a single unit, multiple units and multiple interventions (Linden, 2015). In article no. 4 we use Gross Domestic Product (GDP) per capita and the HDI which can be considered as a proxy for UN LDC status criteria. Here, we compare Bangladesh's preferential textile and clothing exports with those of its main competitors from Asia, namely Malaysia, Vietnam, Pakistan, India, Sri Lanka, Thailand, China, Philippines and Indonesia. Bangladesh's Asian competitors are all GSP-benefiting DCs which can be considered as counterfactual control units. We identify one GSP-benefiting DC, namely Pakistan, as Bangladesh's counterfactual state. In the absence of the treatments in 2004 and 2007, Bangladesh's preferential textile and clothing exports would have developed like those of Pakistan. Consequently, if Switzerland had not granted DFQFMA to Bangladesh, its preferential textile and clothing exports would have been lower by on average 16 percent between 2004 to 2006, respectively by on average 57 percent between 2007 to 2011.

Article no. 5 is devoted to Tunisia's 2005 switch from given non-reciprocal trade preferences to negotiated reciprocal trade preferences under an FTA with Switzerland. Because trade preferences under the Swiss GSP are offered to the country group of DCs as a whole, non-reciprocal trade preferences are not tailored to the export structure of a particular DC. Consequently, by switching from non-reciprocal to negotiated reciprocal trade preferences, DCs such as Tunisia expect to negotiate terms which are tailored to their export structure and better conditions than

competitors from countries which are still beneficiaries of the GSP (Joerchel, 2006). From an economic development viewpoint, we investigate if, and to what extent, Tunisia's 2005 switch from non-reciprocal to reciprocal trade preferences creates trade, and more generally, if bilateral FTAs are more beneficial to poor countries than non-reciprocal trade preferences.

In this case study we investigate the potential benefits of Tunisia's 2005 switch from unilateral (non-reciprocal) GSP preferences granted by Switzerland to bilateral (and reciprocal) FTA preferences under the European Free Trade Agreement (EFTA). We analyze Tunisia's exports to Switzerland under HS chapters 01 to 97, during 2000 to 2011. In particular, we conduct an analysis of agro-food exports (including fishery) under HS chapters 01 to 24 and textile exports under HS chapters 50 to 67.

Similar to articles nos. 3 and 4, the Tunisian case study is likewise based on the concept of the counterfactual state with the corresponding research question: "How would preferential exports of Tunisia have developed, if Tunisia had not switched from non-reciprocal to reciprocal trade preferences in 2005?" To shed some light on this issue we apply Propensity-Score Matching (PSM) based on Leuven and Sianesi (2003) and, as an additional robustness check, Nearest-Neighbor Matching (nnmatch) based on Abadie et al. (2004) to estimate the annual average treatment effect on the treated (ATT). Corresponding matching covariates are chosen based on the theoretically founded economic gravity equation (Shepherd, 2013). Furthermore, to depict the institutional quality of a nation and the resulting stage of human development, we use the HDI as an additional matching covariate.

We find a positive annual ATT of switching from non-reciprocal to reciprocal trade preferences. Overall, preferential exports increase by 125 percent after the entry into force of the FTA in 2005. Preferential agro-food and textile exports likewise increase by 100 percent. However, a detailed analysis on HS 2 digits level shows that a significant proportion of PSM estimators were close to zero. Selectively we obtain positive annual ATTs of switching from non-reciprocal to reciprocal trade preferences. This implies that switching from non-reciprocal to reciprocal trade preferences yields advantages in export sectors where Tunisia has comparative cost advantages. This is especially true for the textile sector and partly so for the agro-food sector. Based on the switch from non-reciprocal to reciprocal trade preferences, Tunisia gains trade benefits compared to counterfactual countries still benefiting from the GSP. Accordingly, if Tunisia had not switched in 2005, the volume of preferential exports in particular would have been lower.

Article no. 6, which addresses the question "Who benefits from the high-price segment in commodity markets?", is not directly related to the empirical analysis of the Swiss GSP. However, large discrepancies in import prices (unit values per kilogram) for four raw cooking oils (palm, peanut, sunflower and coconut oil) between industrialized countries (high prices) and LDCs (low prices) have convinced us to investigate the causes for the observed large discrepancies in import prices. We choose raw coconut oil as the objective of investigation, because

large discrepancies in import prices are most visible. Combining quantitative (estimating a price function) and qualitative (objective hermeneutics) research methods, we find that prices depend on the quantity imported, the country of origin and the quality (conventional vs. organic). Furthermore, entrepreneurs attempt to create new niche markets for eco-conscious consumers, whereas actors in the conventional bulk markets tend to ignore these niches. Consequently, the empirical evidence answers the question whether commodities have a high-price segment unequivocally with 'yes'.

3 Zusammenfassung

Artikel Nr. 1 geht der Frage nach: Welche Determinanten beeinflussen die Ausnutzung des Allgemeinen Zollpräferenzsystems (APS) der Schweiz für Entwicklungsländer (englisch developing countries, kurz DCs) und für die am wenigsten entwickelten Länder der Welt (LDCs) im Agrar- und Lebensmittelsektor? Um diese Frage zu beantworten, schätzen wir ein reduziertes Gravitationsmodell. Die abhängige Variable 'Ausnutzungsrate' wird als Anteil der Handelsströme berechnet, die tatsächlich unter dem APS eingeführt werden, dividiert durch Handelsströme, die für das APS berechtigt sind. Dabei wird die Ausnutzungsrate in Abhängigkeit des jeweiligen Produkts, Jahrs und Landes gebildet. Da die Ausnutzung von Handelspräferenzen mit der Überwindung bürokratischer Hürden wie dem Ursprungszertifikat, dem Zertifikat des direkten Versandes und anderer nicht-tarifärer Handelshemmnisse verbunden ist, sind integrative staatliche Institutionen unerlässlich. In diesem Zusammenhang beziehen wir die folgenden drei Indikatoren, die die institutionelle Qualität eines Landes abbilden, jeweils separat in die Regressionsmodelle ein: Worldwide Governance Indicators (WGI), Index of Economic Freedom (IEF) und Human Development Index (HDI). Da die Ausnutzungsrate den Wert Null annehmen kann, schätzen wir das Ausgangsmodell (baseline model) mit Hilfe der Poisson Pseudo Maximum Likelihood (PPML) Methode basierend auf gepoolten Pandeldaten. Als eine zusätzliche Robustheitsüberprüfung der Ergebnisse verwenden wir das von Heckman (1979) vorgeschlagene Selektionsmodell. In einem ersten Schritt wird die Wahrscheinlichkeit der Präferenzberechtigung und -ausnutzung mit Hilfe eines Probit-Modells geschätzt. In einem zweiten Schritt verwendet das zweistufige Heckman'sche Selektionsmodell die Methode der kleinsten Quadrate (englisch Ordinary Least-Squares, kurz OLS) mit Hilfe des inversen Mills-Verhältnis, wobei das Sample auf Beobachtungen reduziert wird, bei denen die Ausnutzungsrate grösser Null ist.

Beide Modellvarianten (PPML und Heckman's Selektionsmodell) weisen darauf hin, dass die institutionelle Qualität eines Landes (separat abgebildet durch die WGI, den IEF und den HDI) einen konsistent positiven Einfluss auf die Höhe der Ausnutzungsrate hat. Des Weiteren wird die 'Präferenzmarge' (die Differenz zwischen WTO-Zollansatz und APS-Zollansatz) in unser Modell mit einbezogen. Die Variablen 'Präferenzmarge' und 'Höhe des APS-berechtigten Handelsstroms' beziehen sich ebenfalls auf den Aspekt der Transaktionskosten (Kosten für die Überwindung nicht-tarifärer Handelshemmnisse), welche mit der Überwindung der bürokratischen Hürden (Ursprungszertifikat und Zertifikat des direkten Versandes) des APS verbunden

sind. Die Entscheidung eines Exporteurs, das APS zu nutzen, oder nicht, hängt von der Höhe der Präferenzmarge sowie von der Höhe der APS-berechtigen Handelsströme ab. Eine zehnprozentige Erhöhung der Präferenzmarge führt zu einer Erhöhung der Ausnutzungsrate um zwei Prozentpunkte bei den DCs und zu einer Erhöhung um vier Prozentpunkte bei den LDCs. Grundsätzlich lässt sich feststellen, dass das Hinzufügen von 'product fixed effects' zum Modell den positiven Effekt der Präferenzmarge bei allen Modellvarianten intensiviert. Ebenfalls führt eine zehnprozentige Erhöhung der Variable 'Höhe des APS-berechtigten Handelsstroms' zu einer durchschnittlichen Erhöhung der Ausnutzungsrate um 0,3 Prozentpunkte im Fall der DCs und zu einer durchschnittlichen Erhöhung um 0,8 Prozentpunkte im Fall der LDCs. Auch hier führt das Hinzufügen von 'product fixed effects' zum Modell zu einer Intensivierung dieses Effekts. Dementsprechend werden Handelspräferenzen seitens des Exporteurs dann in Anspruch genommen, wenn die Präferenzmarge und die APS-berechtigten Handelsströme hoch sind. Des Weiteren weisen unsere Ergebnisse eindeutig darauf hin, dass das APS bei mittel- und hochverarbeiteten Produkten mehr ausgenutzt wird, als bei gering verarbeiten Produkten (Agrarrohstoffe).

Artikel Nr. 2 widmet sich der Analyse der Schweizer Importstruktur im Agrar- und Lebensmittelsektor (inklusive Fischerei) unter den Kapiteln 01 bis 24 des Harmonisierten Systems (HS) für DCs und LDCs, die vom APS der Schweiz begünstigt sind. Die empirische Analyse geht der folgenden Forschungsfrage nach: Haben die präferentiellen Zollansätze des APS die Agrar- und Lebensmittelexporte der DCs und LDCs gefördert? In diesem Zusammenhang analysieren wir zusätzlich den im Jahr 2007 eingeführten zoll- und quotenfreien Marktzugang (englisch duty-free and quota-free market access, kurz DFQFMA) für LDCs mit Hilfe einfacher Regressionstechniken. Die deskriptive Analyse deutet bereits darauf hin, dass zwischen 2002 und 2011 im Durchschnitt 74 Prozent der Agrar- und Lebensmittelexporte der DCs unter einem Zollansatz eingeführt wurden, der geringer ist als der Zollansatz, der allen Mitgliedern der Welthandelsorganisation (World Trade Organization, kurz WTO) gewährt wird, oder einem Zollansatz, der gleich Null ist. Im Gegensatz dazu, wurden 100 Prozent der Agrar- und Lebensmittelexporte der LDCs unter reduzierten Zöllen (z.B. reduzierter Zollansatz des APS), oder Zollansätzen die gleich Null sind (z.B. WTO=0 oder APS=0) eingeführt. Für die ökonometrischen Schätzungen wenden wir die logistische Regression, PPML und OLS an. Im Gegensatz zu OLS können bei PPML Nullbeobachtungen miteinbezogen werden. Zusätzlich kann mit PPML der Heteroskedastizität Rechnung getragen werden. Beides, Nullbeobachtungen und Heteroskedastizität, sind gemeinhin bekannte Probleme bei der Verwendung von Handelsdaten (Santos und Tenreyro, 2007).

Beide Ländergruppen (DCs und LDCs) selektionieren sich nicht selbst in ihren jeweiligen Status. Denn die Entscheidung, ob ein Land den LDC-Status erhält, oder diesen verliert, basiert auf drei schwellenwertbasierten Kriterien, die von der Kommission der Vereinten Nationen für

Entwicklungspolitik (englisch United Nations Committee for Development Policy, kurz UN-CDP) definiert werden. Durch die Verwendung des HDI als Proxy für LDC-Statuskriterien, ist es uns möglich, den Effekt der Präferenzmarge auf die Höhe der Agrar- und Lebensmittelexporte unverzerrt zu schätzen. Die Ergebnisse zeigen, dass (i) eine einprozentige Erhöhung der Präferenzmarge die Wahrscheinlichkeit für die LDCs um durchschnittlich fünf Prozentpunkte erhöht, dass das APS ausgenutzt wird, und, dass (ii) eine einprozentige Erhöhung der Präferenzmarge zu einer durchschnittlichen Erhöhung der Agrar- und Lebensmittelexporte der LDCs zwischen 0,25 und 0,45 Prozentpunkte führte. Die zusätzliche Übung der Schätzung des (unverzerrten) Effekts des 2007 eingeführten DFQFMA für LDCs zeigt eindeutig, wie schwer es ist, eine derartige Politikmassnahme im Rahmen einfacher Regressionstechniken zu evaluieren. Obwohl wir auch hier einen positiven Effekt der Präferenzmarge auf die Höhe der Agrar- und Lebensmittelexporte der LDCs feststellen können, führt das Hinzufügen von 'product fixed effects' zum Modell dazu, dass der Effekt der Präferenzmarge negativ wird (allerdings statistisch nicht signifikant). Dies ist vor allem dem Umstand geschuldet, dass die Präferenzmarge nach der kompletten Zollsenkung im Jahr 2007 weder über die Zeit, noch über die einzelnen Produkte variiert. Dennoch zeigt diese Übung, dass Methoden der kausalen Inferenz geeigneter sind, um eine exogen gegebene Politikmassnahme wie den DFQFMA für LDCs zu evaluieren.

Die vorliegende kumulative Dissertation fokussiert sich dementsprechend hauptsächlich auf den bereits erwähnten DFQFMA für LDCs (Artikel Nr. 3 und 4). In diesen Artikeln wenden wir die Methode der kausalen Inferenz, welche auf dem Konzept des kontrafaktischen Zustandes basiert, an. Dementsprechend fokussieren wir uns auf die Forschungsfrage: Wie hätten sich die präferentiellen Exporte der LDCs entwickelt, wenn die Schweiz den DFQFMA für LDCs im Jahr 2007 nicht gewährt hätte? Da der kontrafaktische Zustand nicht beobachtet werden kann, analysieren wir die Differenz der präferentiellen Exporte zwischen der Behandlungseinheit bestehend aus LDCs und der Kontrolleinheit bestehend aus DCs. Wie bereits weiter oben erwähnt, analysieren wir ein quasi-experimentelles Setting. Auch wenn die Allokation des Treatments nicht perfekt zufällig ist, so können wir die Bedingungen der Treatment-Allokation beobachten. Daher argumentieren wir, dass die Treatment-Allokation in Abhängigkeit von diesen beobachteten Bedingungen so gut wie zufällig ist. Dieser Ansatz eliminiert die Selektionsverzerrung. Die Entscheidung, ob ein Land den LDC-Status erhält oder verliert, basiert auf den folgenden drei schwellenwertenbasierten Kriterien, die vom UN-CDP definiert werden: Bruttonationaleinkommen (BNE) pro Kopf, Human Assets Index (HAI) und Economic Vulnerability Index (EVI). Für Artikel Nr. 3 verwenden wir diese drei Kriterien, um eine Kontrolleinheit bestehnd aus APS-begünstigten DCs zu konstruieren. Artikel Nr. 3 bezieht sich auf den Effekt der hundertprozentigen Zollsenkung in 2007 für das durchschnittliche LDC auf die Höhe der Agrar- und Lebensmittelexporte unter HS Kapitel 01 bis 24. Hierbei verwenden wir die synthetische Kontrollmethode (the synthetic control method) nach Abadie und Gardeazabal (2003)

sowie Abadie et al. (2010) in Kombination mit der Difference-in-Differences (DiD) Analyse. Wir stellen fest, dass sich der durchschnittliche Treatmenteffekt auf die Höhe der präferentiellen Agrar- und Lebensmittelexporte unter HS Kapiteln 01 bis 24 zwischen sFr. 0,4 und sFr. 0,8 Millionen bewegt, was einem Anstieg der präferentiellen Agrar- und Lebensmittelexporte zwischen 80 und 160 Prozent entspricht. Variationen bezüglich des durchschnittlichen Treatmenteffekts sind der begrenzten Datenverfügbarkeit sowie der Wahl der Matching-Kovariate geschuldet. Dies hat wiederum einen Einfluss auf die Zusammenstellung der Behandlungs- und Kontrolleinheit.

Im Gegensatz zu Artikel Nr. 3 quantifiziert Artikel Nr. 4 den kausalen Effekt des schrittweise eingeführten DFQFMA im Jahr 2004 (10 bis 50 Prozent Zollreduzierung) und im Jahr 2007 (100 Prozent Zollreduzierung) in einer komparativen Fallstudie von Bangladeschs präferentiellen Textil- und Bekleidungsexporten unter HS Kapiteln 50 bis 67, indem wir eine 'unterbrochene Zeitreihenanalyse' (englisch interrupted time series analysis, kurz ITSA) nach Linden (2015) anwenden. In Artikel Nr. 4 verwenden wir Bruttoinlandsprodukt (BIP) pro Kopf und den HDI, welcher als Proxy für LDC-Statuskriterien herangezogen werden kann, als Kontrollvariablen. In dieser Fallstudie vergleichen wir Bangladeschs präferentielle Textil- und Bekleidungsexporte mit denen seiner Hauptwettbewerber aus Asien (Malaysia, Vietnam, Pakistan, Indien, Sri Lanka, Thailand, China, Philippinen und Indonesien). Bangladeschs asiatische Wettbewerber sind vom APS der Schweiz begünstigte DCs, welche als kontrafaktische Kontrolleinheiten herangezogen werden können. Hierbei identifizieren wir Pakistan als ein vom APS der Schweiz begünstigtes DC, welches den kontrafaktischen Zustand Bangladeschs abbildet. Dies bedeutet, dass sich Bangladeschs präferentielle Textil- und Bekleidungsexporte in Abwesenheit der Treatments in den Jahren 2004 und 2007 so entwickelten hätten, wie die von Pakistan. Folglich wären die präferentiellen Textil- und Bekleidungsexporte im Durchschnitt um 16 Prozent zwischen 2004 und 2006 geringer gewesen, beziehungsweise im Durchschnitt um 57 Prozent geringer zwischen 2007 und 2011, wenn die Schweiz den DFQFMA für Bangladesch nicht gewährt hätte.

Artikel Nr. 5 widmet sich dem Wechsel von Tunesien im Jahr 2005 von unilateralen und nicht-reziproken Handelspräferenzen zu verhandelten und reziproken Handelspräferenzen unter einem bilateralen Freihandelsabkommen (FHA) mit der Schweiz. Da Handelspräferenzen unter dem APS der Schweiz der Gesamtheit an APS-begünstigten DCs angeboten werden, sind nicht-reziproke Handelspräferenzen nicht auf die Exportstruktur bestimmter DCs zugeschnitten. Folglich versprechen sich DCs, wie zum Beispiel Tunesien, durch den Wechsel von unilateralen zu bilateralen Handelspräferenzen die Verhandlung von Handelsbedingungen, die auf ihre Exportstruktur besser zugeschnitten sind, und, einen Vorteil gegenüber Wettbewerbern aus Ländern, die nach wie vor vom APS der Schweiz begünstigt sind (Joerchel, 2006). Ausgehend von einer entwicklungs ökonomischen Perspektive untersuchen wir, ob, und in welchem Ausmass Tune-

siens Wechsel von nicht-reziproken zu reziproken Handelspräferenzen Handelsvorteile schafft. Des Weiteren stellt sich die Frage, ob reziproke FHA für DCs vorteilhafter sind, als nicht-reziproke Handelspräferenzen. Dementsprechend untersuchen wir in dieser Fallstudie die potentiellen Vorteile, die sich aus dem Wechsel von Tunesien im Jahr 2005 von nicht-reziproken zu reziproken Handelspräferenzen unter der Europäischen Freihandelsassoziation (EFTA) ergeben können. Hierbei analysieren wir Tunesiens Exporte unter HS Kapiteln 01 bis 97 in den Jahren 2000 bis 2011. Zudem führen wir sektorale Analysen der Agrar- und Lebensmittelexporte (HS Kapitel 01 bis 24) sowie der Textil- und Bekleidungsexporte (HS Kapitel 50 bis 67) durch. Ähnlich wie bei den Artikeln Nr. 3 und 4 basiert diese Fallstudie auf dem Konzept des kontrafaktischen Zustandes mit der entsprechenden Forschungsfrage: Wie hätten sich Tunesiens (präferentielle) Exporte in die Schweiz entwickelt, wenn Tunesien nicht im Jahr 2005 von nicht-räeziproken zu reziproken Handelspräferenzen gewechselt wäre? Um diese Frage zu beantworten, wenden wir das 'Propensity-Score-Matching' (PSM) nach Leuven und Sianesi (2003) und als zusätzliche Robustheitsüberprüfung, 'Nearest-Neighbor Matching' (nnmatch) nach Abadie et al. (2004) an, um den (jährlichen) durchschnittlichen Treatmenteffekt der behandelten Einheit (englisch average treatment effect on the treated, kurz ATT) zu schätzen. Die entsprechenden Matching-Kovariate werden basierend auf der theoretisch fundierten ökonomischen Gravitationsgleichung ausgewählt (Shepherd, 2013). Um die institutionelle Qualität eines Landes und den daraus entstehenden Stand der menschlichen Entwicklung abzubilden, verwenden wir wiederum den HDI. Generell stellen wir einen positiven (jährlichen) ATT des Wechsels von nicht-reziproken zu reziproken Handelspräferenzen fest. Insgesamt steigen die präferentiellen Exporte Tunesiens unter HS Kapitel 01 bis 97 um 125 Prozent nur fünf nach Jahren dem Inkrafttreten des FHA in 2005 an. Die präferentiellen Agrar- und Lebensmittelexporte sowie die präferentiellen Textil- und Bekleidungsexporte steigen ebenfalls um 100 Prozent an. Jedoch zeigt eine detaillierte Analyse auf dem HS2-Stellenlevel, dass ein signifikanter Anteil der PSM-Schätzer nahe bei null ist. Punktuell beobachten wir jedoch positive (jährliche) ATTs des Wechsels von nicht-reziproken zu reziproken Handelspräferenzen. Dies impliziert, dass dieser Wechsel in Exportsektoren Vorteile mit sich bringt, in denen Tunesien komparative Kostenvorteile aufweist. Dies gilt vor allem für den Textil- und Bekleidungssektor und teilweise auch für den Agrar- und Lebensmittelsektor. Basierend auf dem Wechsel von nicht-reziproken zu reziproken Handelspräferenzen erwirbt Tunesien Handelsvorteile gegenüber Ländern, die nach wie vor vom APS der Schweiz profitierten.

Artikel Nr. 6, welcher der Frage nachgeht: „Wer profitiert vom Hochpreissegment in Agrarrohstoffmärkten?“, ist nicht direkt mit der empirischen Analyse des APS der Schweiz verbunden. Jedoch veranlassen uns grosse Unterschiede bei den Importpreisen (Stückpreis pro Kilogramm) für vier rohe Speiseöle (Palm-, Erdnuss-, Sonnenblumen- und Kokosnussöl) zwischen industrialisierten Ländern (hohe Preise) und LDCs (niedrige Preise) dazu, die Gründe für die

grossen Unterschiede bei den Importpreisen zu untersuchen. Wir wählen rohes Kokosnussöl für unsere Untersuchung aus, da die grossen Unterschiede bei den Importpreisen hier am deutlichsten sichtbar sind. Basierend auf einer Kombination aus quantitativen (Schätzung einer Preisfunktion) und qualitativen (Objektive Hermeneutik) Forschungsmethoden finden wir heraus, dass der Importpreis durch die gehandelte Menge, dem Ursprungsland und der Produktqualität (Bio vs. konventionell) abhängt. Des Weiteren versuchen Schweizer Importeure neue Nischenmärkte für umweltbewusste Konsumenten zu schaffen, wohingegen die Akteure in den konventionellen Massenmärkten diese Nischen ignorieren. Folglich kann die Frage, ob es in Agrarrohstoffmärkten auch Hochpreissegmente gibt, eindeutig mit 'Ja' beantwortet werden.

4 Good Governance and preferential trade: Evidence from the Swiss Generalized System of Preferences

Joint work with Andreas Kohler and Stefan Mann

4.1 Introduction[1]

Since 1 March 1972, along with the major trading powers USA, Australia, Canada, Japan and the EU, Switzerland has granted the developing countries (DCs) and the least-developed countries (LDCs) preferential tariff terms for industrial and agricultural products as part of the Generalized System of Preferences (GSP), on a voluntary and non-reciprocal basis. The unilateral preferential treatment of the DCs and LDCs initially contradicted the so-called 'most-favored nation' (MFN) principle of the World Trade Organization (WTO). In 1971, a waiver of the MFN principle in Art. 1 was established within the General Agreement on Tariffs and Trade (GATT) in order to provide a legal framework for the unilateral granting of tariff preferences to the DCs and LDCs (Bartels and Häberli, 2010). In this context, the present article concentrates exclusively on the agricultural and food products of the Harmonized System (HS), chapters 01 to 24.

Unlike the EU, Switzerland offers preferential market access for DCs and LDCs[2] exclusively via the GSP. Moreover, unlike in the EU, in Switzerland there is no GSP+, and no everything but arms initiative. The tariff lines entitled to preferential treatment also differ from one another in contents and scope. Consequently, Switzerland's GSP can essentially be classified into two schemes: The first scheme applies to the DCs, with preferential tariff rates being granted dependent on the prevailing product. Between 2002 and 2011, the coverage rate[3] for HS chapters 01 to 24 averaged 34 percent according to the World Trade Organization Integrated Database (World Trade Organization, 2014b). Of all tariff lines eligible for preferential

[1] A version of this article is published in International Journal of Social Economics, 2017, Vol. 45(2), pp. 445-462 (Emerald Group Publishing).

[2] The EU also offers preferential market access for 'countries of the western Balkans', Pakistan, and the Republic of Moldova (World Trade Organization, 2014b).

[3] The 'coverage rate' is the percentage of products eligible for preferential treatment out of the total number of dutiable products (The United Nations Conference on Trade and Development, 1999).

treatment, an average of around 50 percent was exempt from duty.

The second scheme is geared to the LDCs and can be compared with the EU's 'everything but arms' initiative. Since 1 April 2007, the LDCs have been granted duty- and quota-free market access as part of the second GSP scheme for all tariff lines with the exception of weapons. Moreover, the LDCs are not linked to seasonal restrictions (Häberli, 2008). Between 2002 and 2007, the product coverage rate for HS chapters 01 to 24 was 84 percent on average (World Trade Organization, 2014b), with an average of around 40 percent of the tariff lines being duty free.

As a small and rich economy, Switzerland is an interesting market for DCs and LDCs because it has higher producer and consumer prices for foods than its European neighbors Germany, France, Austria and Italy (Federal Office for Agriculture, 2013). Overall, Switzerland is only 60 percent self-sufficient in food production (Swiss Federal Statistical Office, 2014). The level of subsidy for ensuring the multifunctionality of Swiss agriculture (OECD, 2013) and the tariff protection level are high in international terms (Häberli, 2008). Here, the question arises how far Switzerland has actually facilitated market access to agricultural and food products for the DCs and LDCs within the framework of the GSP, and whether the DCs and LDCs can in fact surmount the bureaucratic hurdles of the Swiss GSP, which are characterized by a non-tariff dynamic.

The paradigm shift in development policy from pure donations to stabilization of the political and social systems and their institutions by including the DCs and LDCs in global trade is the main objective of the economic development instrument of the GSP. That the GSP is a not-to-be-underestimated instrument of economic development can be seen for example in the Philippines' request to be readmitted to the EU's GSP+, because it is assumed that readmission could in the future increase exports from the Philippines to the EU by 611 million euros per year (Remo, 2014). However, it is not just the DCs and LDCs for whom the GSP is likely to have a positive economic effect: US businesses for example had to spend an additional 672 million dollars on import tariffs when the US GSP expired at the end of July 2013. In a survey of American firms that use the GSP, 44 percent stated that the expiry of the US GSP led to delays in hiring. Forty per cent of those questioned found that the realization of investments slowed down or ceased entirely. Twenty-two percent of those surveyed stated that wages had to be cut, and 13 percent that the expiry of the US GSP had even led to redundancies (Bradner, 2014). Consequently, we may assume that the relevant exporters in the DCs and LDCs experienced a similarly negative impact on employment, wages and investments.

As the cited examples have shown, the GSP is of importance in development-aid policy for promoting social and economic development in the DCs and LDCs with a view to eliminating the current discrepancies and polarities in income and wealth between the global South and North (Henrich, 2004).

Because Switzerland's utilization of GSP preferences is associated with the overcoming of bureaucratic hurdles, the main focus of this article is to determine whether the quality of the institutions of a favored nation contributes to a significant increase in the utilization rate of the Swiss GSP. To investigate this issue, we use basic variables of the economic gravity equation as done most in studies related to the empirical evaluation on the utilization of preferential trade agreements (PTAs) like the GSP (e.g., Gasiorek et al., 2005; Manchin, 2006). A detailed description on literature including determinants potentially influencing the utilization rate can be found in Appendix 4.8. Furthermore, the indicator 'utilization rate' was calculated as the ratio between imports which de facto entered under GSP and GSP-eligible imports. Therefore, we consider an adaptation of basic variables of the economic gravity model for the current issue as appropriate.

To our knowledge, Manchin (2006) is the only publication which, in passing, takes up the subject of 'institutional quality' as part of an analysis of EU trade preferences (GSP and Lomé Convention) vis-à-vis the African, Caribbean and Pacific Group of States (ACP countries) over the period 1992 to 2001 beyond the variables 'GDP' and 'GDP per capita'. The institutional quality of a state in terms of overcoming bureaucratic hurdles can have a positive effect on the level of the rate of utilization of PTAs. The results of Manchin (2006), however, which cite the Economic Freedom Index (EFI) provided by The Fraser Institute, show that institutional quality has an equivocal effect on the level of the rate of utilization of the EU's preferential trade systems.

The remainder of this article is organized as follows. First, Section 4.2 describes the underlying data used. Section 4.3 presents stylized facts on the evolution of DCs' and LDCs' utilization rate during 2002 to 2011 (Subsection 4.3.1 and on the correlation of Good Governance indicators (Subsection 4.3.2). In a following step, the concept of 'Good Governance' is elucidated and associated with the present issue (Section 4.4). Section 4.5 presents the empirical strategy with the focus on dealing with zero values. Here, we provide information on the Poisson Pseudo Maximum Likelihood estimator (Subsection 4.5.1 and on the Heckman selection model (Subsection 4.5.2). In the following Section 4.6, the regression results for the Poisson Pseudo Maximum Likelihood estimator (Subsection 4.6.1) and the Heckman selection model (Subsection 4.6.2) are presented and discussed. To conclude, the essential findings of this article are summarized in brief (Section 4.7).

4.2 Data

The 'utilization rate' at the product level was chosen as the dependent variable. GSP imports and GSP-eligible imports were the basis for the calculation of the 'utilization rate' and were obtained from the database Swiss-Impex (Swiss Customs Administration, 2015). The dataset

contains annual observations. The foreign trade statistics of Switzerland had been methodically converted from producing country to country of origin in 2012. This methodological change in the foreign trade statistics has partly strong effects on the export values of the DCs and LDCs[4]. To ensure the comparativeness of the results, the year 2012 was excluded from this analysis. The utilization rate is calculated based on the following formula:

$$UR_{ijt} = (\frac{Preferential\ GSP_{ijt}}{Eligible\ GSP_{ijt}}) * 100 \tag{4.1}$$

where UR_{ijt} denotes the utilization rate of country i of product j at time t. $Preferential\ GSP_{ijt}$ represents the actual trade flows introduced under GSP conditions, and $Eligible\ GSP_{ijt}$ the GSP-eligible trade flows of country i and product j at time t. The value 'utilization rate' varies between 0 and 100 percent (The United Nations Conference on Trade and Development, 1999).

The 'preference margin' was calculated based on the dataset of the SCA. This dataset was specially prepared for this paper. Because of the different tariffs which exist for the different usages of a product (e.g., human consumption or technical usage), the highest tariffs were chosen in all cases. This assumption can lead to biases when calculating the 'preference margin' because the tariff for human consumption is in all of the cases higher than any other tariff. The preference margin was calculated according to the following formula based on Olarreaga and Özden (2005):

$$Preference\ Margin = 1 + (Tariff_{MFN} - Tariff_{GSP}) \tag{4.2}$$

where the most-favored nations (MFN) tariff represents the tariff to all WTO members, whilst the GSP tariff is granted only to the DCs and LDCs included in the GSP. The GSP tariff is at least equal to the MFN rate. As a rule, however, it is lower than the MFN tariff when the latter is not equal to zero (Olarreaga and Özden, 2005). Because Switzerland applies specific tariffs one would expect to compute 'ad-valorem equivalents' (AVEs). AVEs express specific taxes in percentages. The level of the AVE depends on the unit value (e.g. 1 kg), which is a proxy for the import price (International Trade Centre, 2010). As unit values vary, the preference margin calculated based on AVEs likewise varies what, in consequence causes an unnecessary variation of this independent variable. Consequently, we used specific tariffs and did not calculate AVEs.

[4]Until 2011, 30 percent of the coconut imports originated from the Netherlands. After the change from producing country to country of origin, the coconut imports from the Ivory Coast increased, and the Netherlands are therefore no longer included in the list of coconut importers (Fischer and Pfammatter, 2013).

The independent variables 'GDP' and 'population' were obtained from a dataset of The World Bank (2016). 'Distance' and 'common language official' originated from a dataset of the French Centre d'Etudes Prospectives et d' Informations Internationales (CEPII) (Mayer and Zignago, 2011). The economic remoteness in accordance to Head (2003) of trade partner c can be formalized by the following equation:

$$Remote_c = \sum k \frac{GDP_c}{GDP_w} Distance_{ck} \tag{4.3}$$

where k is an index running above all trade partners (including c), $Distance_{ck}$ is the distance from trading partner c to k, and GDP_c / GDP_w denotes trading partner $c's$ share of worldwide GDP.

The WGI was derived from The World Bank (2013b). The scale of this index ranges from 0 (lowest rank) to 100 (highest rank). The arithmetic mean was calculated based on the values of the six dimensions of the WGI. The WGI covers on average 200 countries (The World Bank, 2013b).

The IEF is published by the Wall Street Journal and the Heritage Foundation. The scale of this index ranges from 0 (repressed) to 100 (free). The economic freedom is based on 10 quantitative and qualitative factors which are categorized in four dimensions[5]. The IEF covers 186 countries (Heritage Foundation, 2014).

The HDI is published by The United Nations Development Programme (2014) and is based on the 'capability approach'[6] by Sen (1999). The scale ranges from 0 (low human development) to 1 (very high human development). The HDI is calculated as the geometric mean based on the following three indices: a health index, an education index and an index which is based on the Gross National Income (GNI). The HDI covers 186 countries.

[5]The four dimensions of the Economic Freedom Index (EFI) are: (1) Rule of Law (property rights, freedom from corruption), (2) Limited Government (fiscal freedom, government spending), (3) Regulatory Efficiency (business freedom, labor freedom, monetary freedom) and (4) Open Markets (trade freedom, investment freedom, financial freedom).

[6]Amartya Sen's 'capability approach' (Sen, 1999) defines the following five dimensions of freedom: (1) political freedom and civil rights (criticism, contradiction and voting rights), (2) economic institutions (access to resources, circumstances of exchange and allocation), (3) social opportunities (education, health and cultural participation), (4) guarantee of transparency (freedom of press and information obligations, e.g. against corruption) and (5) social security (unemployment insurance, welfare and minimum wages).

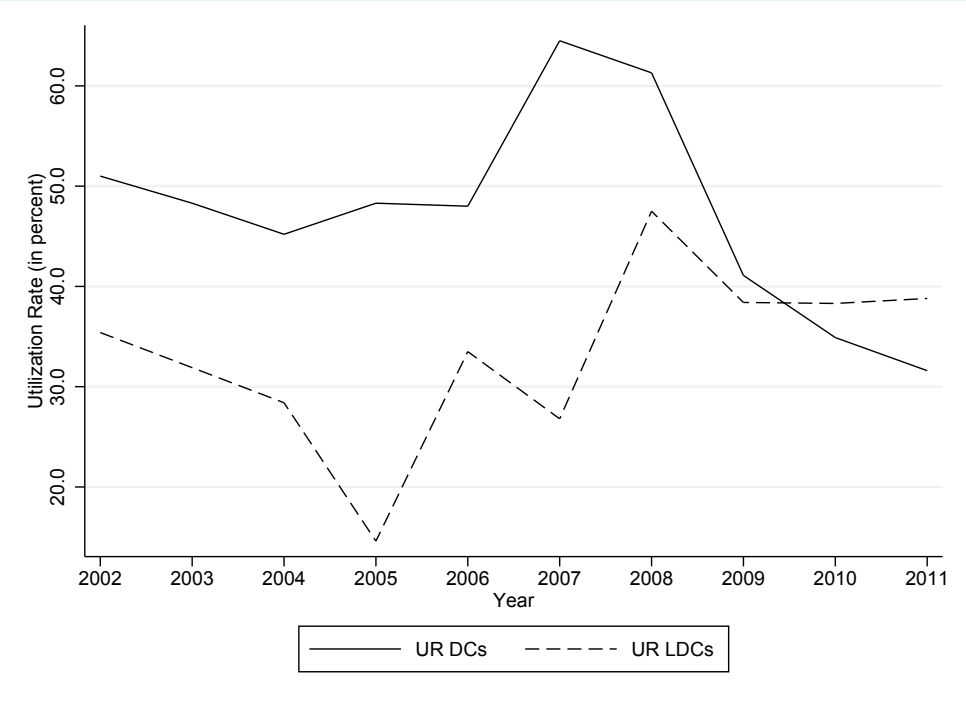

Figure 4.1: The evolution of DCs' and LDCs' utilization rate during 2002 to 2011 (Source: Swiss Customs Administration, 2015)

4.3 Stylized facts

4.3.1 The evolution of developing countries' and least-developed countries' utilization rate during 2002 to 2011

Based on the formula presented in Section 4.2, we calculated annual average utilization rates for DCs and LDCs for HS chapters 01 to 24 during 2002 to 2011. Figure 4.1 shows the according evolution of the according DCs' and LDCs' utilization rates during 2002 to 2011.

Firstly, it is clear that DCs' and LDCs' annual average utilization rates in the agro-food sector prove to be somewhat volatile during 2002 to 2011. Even though the average product coverage for DCs during 2002 to 2011 was lower compared to LDCs (see Section 4.1), DCs captured higher annual average utilization rates during 2002 to 2009. A strong slump of LDCs' utilization rate can be observed between 2004 and 2005. The utilization rate dropped from 28 percent in 2004 to 15 percent in 2005. Afterwards LDCs' utilization rate rose continuously. The peak of LDCs' utilization rate was reached in 2005 with nearly 50 percent. In contrast, DCs reached their highest utilization rate in the amount of nearly 65 percent in 2007. Afterwards DCs' utilization rate dropped and as from 2010 on LDCs' gained higher utilization rates than DCs. From 2002 to 2011, on average 46 percent of preferences of Switzerland's GSP in the agricultural and food sector were utilized for DCs whilst on average 36 percent were utilized

for LDCs.

In general, DCs' utilization rates tend to be high in markets with medium processed products such as HS chapter 02 'Meat and edible meat offal' and in markets with highly processed products such as HS chapter 19 'Preparations of cereals, our, starch or milk' or HS chapter 20 'Preparations of vegetables, fruits, nuts or other plants'. In contrast DCs' tend to be low or equal zero in markets with low processed products such as HS chapter 10 'Cereals' or HS chapter 12 'Oil seeds and oleaginous fruits'. The same holds true for LDCs' utilization rates. Corresponding utilization rates tend to be high in markets with highly processed products (e.g., HS chapters 19 'Preparations of cereals, our, starch or milk', 20 'Preparations of vegetables, fruits, nuts or other plants' and 21 'Miscellaneous edible preparations) and low in markets with low processed products (e.g., HS chapter 12 'Oil seeds and oleaginous fruits') (see Appendix 4.9).

Furthermore, most of DCs' successful markets are markets that are not sensitive and therefore are not in competition to Swiss farmers and food producers because most these products (e.g. cocoa, coffee, citrus fruits and tobacco) can only be produced in countries of the global south. A surprising exception is the market 'Meat and edible meat offal' (HS chapter 02). This market is characterized to be 'sensitive' and therefore market access is only worthwhile by importing agricultural and food products within tariff-rate quotas (TRQs) where a smaller tariff is granted than outside of the TRQ. The average utilization within HS chapter 02 was about 85 percent during 2002 to 2011 (see Appendix 4.9). By now (2016) the market for 'Animal and vegetable fats and oils' (HS chapter 15) is the most relevant agro-food market for LDCs regarding the absolute trade volume and the utilization rate with nearly 100 percent between 2002 to 2011 (see Appendix 4.9). In addition it is worth to be mentioned that LDCs' utilization rate increased enormous from 0.0 percent in 2002 up to 95.0 percent in 2011.

4.3.2 The correlation of Good Governance indicators

Because utilizing trade preferences is connected to bureaucratic obstacles in the form of the proof of origin, the proof of direct shipment and other non-tariff barriers to trade (NTBs) we were mainly interested in the effect of the institutional quality of a nation depicted by three Good Governance indicators (WGI, IEF and HDI) on utilizing trade preferences. In this context, the question arises if these indicators are positive correlated with each other, respectively, if these indicators measure (nearly) the same level of the institutional quality of a nation. Accordingly, Figure 4.2 presents the pairwise correlation of these three Good Governance indicators depicted by three scatter plots. For the pairwise correlation we used datasets which covered the time period from 2002 to 2011 and which include all countries (including industrialized countries). Furthermore, we did not transform the indicators by taking their natural logarithms because it did not provide higher linear relationships.

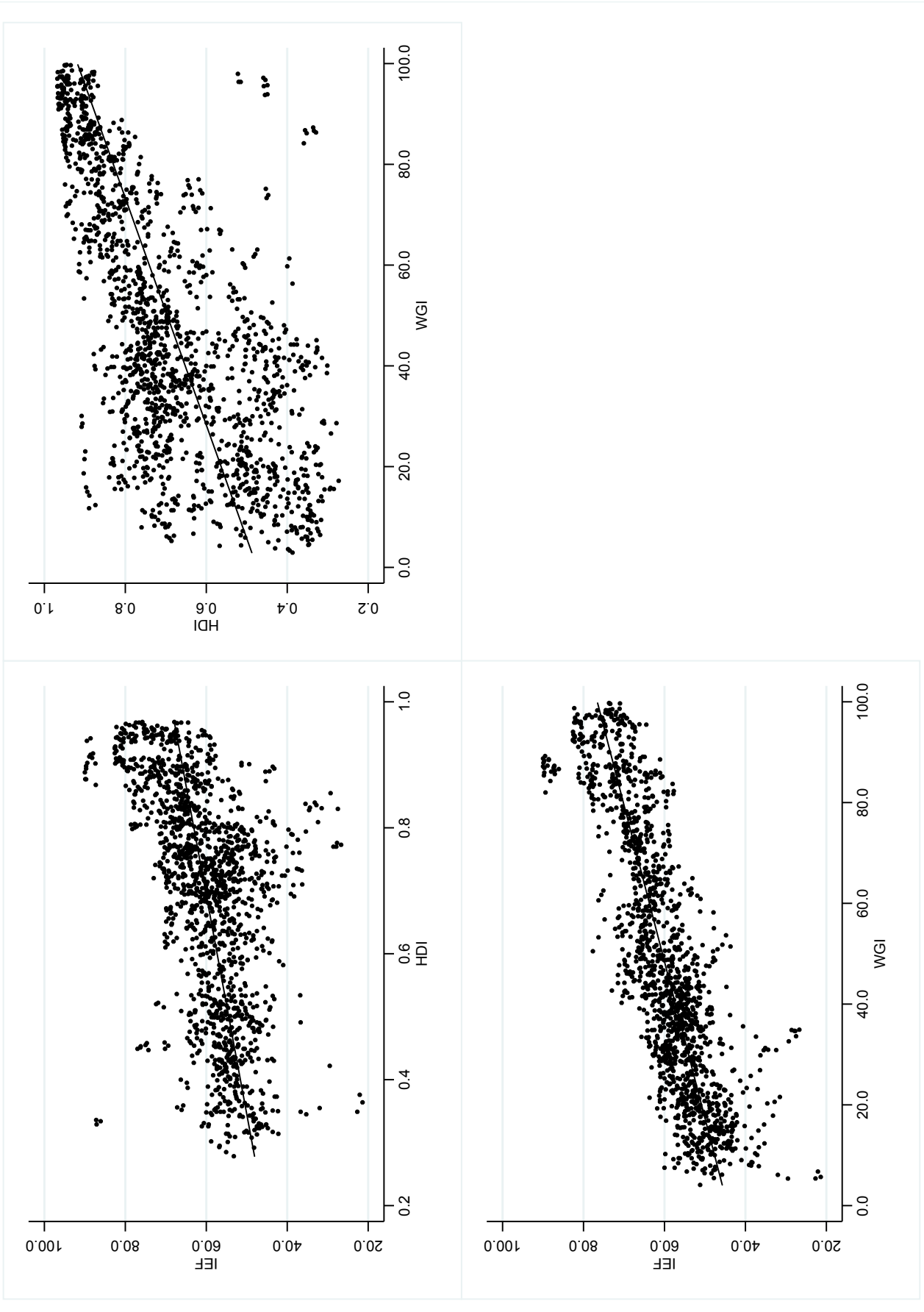

Figure 4.2: Pairwise correlation of Good Governance indicators (Sources: The World Bank, 2013b; Heritage Foundation, 2014; The United Nations Development Programme, 2014)

Table 4.1: Pearson's pairwise product-moment correlation coefficients

	HDI	WGI	IEF
HDI	1.000		
	(1,618)		
WGI	0.649***	1.000	
	(1,614)	(1,679)	
IEF	0.496***	0.804***	1.000
	(1,496)	(1,539)	(1,540)

*** p < 1%, ** p < 5%, * p < 10%
Number of observations in parentheses

It is clearly evident that the three Good Governance indicators are correlated positively which each other. However, only the relationship between the WGI and the IEF was more or less linear, whereas the relationships between the HDI and the WGI, respectively between the HDI and the IEF tended to be less linear. For instance, some countries showed a relatively high HDI which ranged between 0.6 and 0.8, but the same countries ended up with a low WGI which ranged between 10.0 and 20.0. This seems to be a contradiction because effective political institutions free from corruption represented by the WGI should cause a high level of human development represented by the HDI.

To measure the strength of the linear relationship between the three Good Governance indicators we used Person's product moment coefficient r which can range between +1 or -1 depending on whether the relationship is positive or negative, respectively. In contrast to Spearman's correlation coefficient which determines the strength and direction of a monotonic relationship between two variables, Pearson's correlation coefficient measures the strength and direction of linear relationship between two variables. A correlation coefficient between 0.1 to 0.3 indicates a small strength of a linear relationship, a correlation coefficient between 0.3 to 0.5 a medium strength of a linear relationship and a coefficient between 0.5 and 1.0 a large strength of a linear relationship (the same holds true for negative values of r) (Lund and Lund, 2013b; Lund and Lund, 2013a). Table 4.1 shows the according Pearson's pairwise product-moment correlation coefficients for the three Good Governance indicators used in this study.

As mentioned above, the positive correlation between the WGI and the IEF visually observed by the scatter plots from Figure 4.2 was more or less linear. Accordingly, Pearson's correlation coefficient r in the amount of 0.8 shows significant and strong positive correlation between the WGI and the IEF. The positive correlation between the WGI and the HDI in the amount of 0.6 likewise significant and strong. Only the positive correlation between the IEF and the HDI is just below the threshold which indicates a strong correlation. However, the positive correlation between the IEF and the HDI is statistically significant. To conclude, the pairwise correlation of the three Governance indicators indicate in tendency a strong and significant positive correlation. Consequently, these three indicators measure (nearly) the same level of the

institutional quality of a nation.

4.4 Good Governance, institutions and utilizing trade preferences

> Giving money can feed the hungry and help the sick - but it does not free people from the institutions that make them sick and hungry in the first place. It doesn't free them from the system which saps their opportunities and incentives (Acemoglu and Robinson, 2014).

Grethe (2001) emphasizes the threat that the reduction of classical agricultural protection (tariffs) enhances the possibility that NTBs are misused for protectional purposes. The implementation and the intensification of Non-Tariff Barriers to Trade[7] (NTBs) are connected to institutional and financial preconditions. Utilizing unilateral or bilateral trade preferences also generates costs (costs of compliance) for obtaining the certificate of origin (rules of origin) and the certificate of direct transport (Bureau et al., 2007; Keck and Lendle, 2012). These costs could be seen as NTBs. Especially exporters in DCs and LDCs consider NTBs in the form of additional trade documents (e.g. certificate of origin and certificate of direct shipment) as a major trade barrier (The United Nations Conference on Trade and Development, 2013b). The decision whether or not to utilize the GSP system is made by the exporter. The provision of information on the current GSP system as well as on impending changes in the GSP system is the responsibility of state institutions. The same holds true for the creation of framework conditions for overcoming other NTBs. Bureaucratic hurdles, particularly the restrictive rules of origin, are a significant obstacle for the utilization of the GSP. According to Wijayasiri (2007) and Häberli (2008), the opportunities offered by the GSP are largely unknown in most of the responsible state institutions and among the exporters of the DCs and LDCs. The same, however, applies for the importers in the respective industrial nations. An exporter's decision of whether or not to utilize trade preferences depends on the preference margin. A rationally behaved (i.e., profit-maximizing) exporter chooses to take advantage of trade preferences only if at the margin the tariff discount (preference margin) compensates for the costs of compliance associated with all preferential trade agreements (bilateral or unilateral). The main point of preferential trade systems granted exclusively to the DCs and LDCs is to overcome bureaucratic hurdles through suitable state institutions in order to achieve an economic advantage (rent-seeking)[8] through

[7] NTBs include *inter alia* the implementation of phytosanitary and health measures as well as compliance with technical and private (product) standards (Häberli, 2008).

[8] The GSP allows agricultural and food products to be imported into Switzerland at a reduced rate of duty or completely free of duty. This causes a difference between the price under the normal rate (MFN tariff) and the price under the preferential tariff rate. This difference (i.e. the tariff reduction) first of all represents the preferential

reduced duty, or no duty whatsoever (Olarreaga and Özden; 2005).

Because the creation of institutional framework conditions is a remit of the state and the quality of institutions is decisive for positive social and economic development, the Good Governance of the GSP-favored country is depicted in the regression equation. Here, the 'Good Governance' concept of the WGI of The World Bank is used. According to the WGI, Good Governance encompasses the following six dimensions: 'voice and accountability', 'political stability and absence of violence', 'government effectiveness', 'regulatory quality', 'rule of law' and 'control of corruption'. In this context, good governance is the precondition for the creation of state institutions to achieve sustainable development in the DCs and LDCs. Acemoglu and Robinson (2012) distinguish between 'inclusive' and 'extractive' institutions, with only the former being a guarantor of sustainable development. The Good Governance concept thus encompasses the aspect of distributive justice in that the inclusive state institutions arising therefrom ensure that each citizen has the same real opportunities to participate in economic and social processes. In the present article, we assume that high 'Good Governance indicator' values lead virtually automatically to a better performance of a state in the area of trade policy. This is especially relevant in the context of development policy because the political instability and lack of access to media information in most DCs and LDCs promote corruption and prevent the establishment of suitable state institutions for counteracting social and economic underdevelopment (Pellegrini and Gerlagh, 2007; Control Risks, 2014). According to Weller and Ulmer (2008), however, there may not always necessarily be a connection between 'Good Governance' on the one hand and 'trade creation' or 'utilizing trade preferences' on the other. Indonesia, for example, experienced economic growth under a corrupt dictatorship, and China has been able to attract foreign investors despite persistent corruption. Thus, we can logically assume that nations with a low per-capita GDP may still have a political system of high institutional quality, especially because the concept of 'Good Governance' does not focus exclusively on positive influence on trade policy, such as posited in this article (The United Nations Economic and Social Commission for Asia and the Pacific, 2014).

Whereas the WGI and the IEF focus directly on the World Bank's definitions of 'Good Governance', the HDI and the level of social and economic development of a state which it depicts are to be understood as the result of inclusive state institutions. In this context, Williams and Siddique (2008) highlight the strengths and limits of individual 'Good Governance indicators', pointing out for example the strengths and weaknesses of the Fraser Institute's Economic

tariff rent of the importer. If the exporter raises the price of a particular product, his share of the preferential rent also increases (Olarreaga and Özden; 2005). Olarreaga and Özden (2005) point out that the preferential status of the exporters may lead to price increases. The enforceability of a price increase, however, depends on the market power of the importer and the bargaining power of the exporter.

Freedom Index[9] (EFI), which is closest to the IEF from a methodological perspective[10]. The question of which Good Governance indicator is appropriate for which study in which context is not answered unequivocally. It is therefore up to the individual scientist in which context and for what question/issue to use such Good Governance indicators for the modelling of trade-related circumstances focusing on the institutional quality. In this context, Ritzel and Kohler (2016a) argued that estimating trade liberalization is usually plagued by selection bias. A cut-back of tariff barriers of trade in the framework of bilateral Free Trade Agreements (FTAs) is not randomized, since countries select themselves into FTAs. In contrast to bilateral FTAs, GSP benefiting DCs and LDCs did not select themselves into the status of an LDC or DC and the decision whether a country is included in the LDCs, or graduates from the Swiss GSP, is based on three threshold-based inclusion criteria (per capita income, economic vulnerability, and human development) that are defined by the United Nations (UN) (The United Nations Committee for Development Policy, 2014). Using the HDI as a proxy for UN LDCs status criteria solves the selection problem and therefore the authors were able to provide an unbiased estimate of the preference margin on the level of LDCs' preferential agro-food exports. As findings of Section 4.3.2 unequivocally indicated a positive pairwise correlation of the Good Governance indicators used in this study, the IEF and the WGI likewise solve the selection problem.

4.5 Empirical strategy - dealing with zero values

Because the utilization rate can be equal to zero using Ordinary Least-Squares (OLS) was inappropriate (the sample contains around 55 percent zero values). Consequently, we estimated our models using Poisson Pseudo Maximum Likelihood (PPML) with pooled panel data as a baseline estimation (Section 4.5.1). As an additional robustness check Shepherd (2013) suggests using the Heckman selection model (Section 4.5.2).

4.5.1 Poisson Pseudo Maximum Likelihood

The PPML technique is able to control for zero values and heteroscedasticity which is common for trade data (Silva and Tenreyro, 2006). Therefore, the PPML estimator provides consistent estimates of non-linear models such as gravity. Although the dependent variable for the

[9]The Economic Freedom Index (EFI) is published by the Fraser Institute. It measures the degree to which the policies and institutions of countries are supportive of economic freedom. The cornerstones of economic freedom are personal choice, voluntary exchange, freedom to compete, and security of privately owned property. Forty-two variables are used to construct a summary index and to measure the degree of economic freedom in five broad areas: (1) size of government, (2) legal system and property rights, (3) sound money, (4) freedom to trade internationally and (5) regulation. The EFI now covers 152 countries and territories. Data are available for approximately 100 nations and territories back to 1980, and many back to 1970 (Gwartney et al., 2013).

[10]Because the methodology of the EFI is similar to that of the IEF, we refrain from using the EFI in this article.

PPML regression is specified as utilization rate levels rather than logarithms, the coefficient of any independent variables entered in logarithms can still be interpreted as simple elasticities (Shepherd, 2013).

First, we estimated the following equation using pooled sample by not considering the country group effect.

$$UR_{ijt} = \beta_0 + \gamma\, GoodGov_{it} + \delta\, Gravity_{it} + \theta\, GSP_{ijt} + \varepsilon_{ijt} \tag{4.4}$$

where i denotes the trading partners from the GSP, j denotes the product on HS 8 digit level and t denotes the time. UR_{ijt} is the utilization rate of a GSP benefiting country calculated on HS 8 digit level. $GoodGov_{it}$ represents the institutional quality of a nation separately depicted by the WGI, the IEF and the HDI. All of these indicators were separately included in our model. We hypothesize that the higher the institutional quality of a GSP benefiting country (the higher the value of the WGI, the IEF or the HDI), the better a GSP benefiting country is able to overcome NTBs and so the higher is the utilization rate for a given product and year.

$Gravity_{it}$ is a vector of gravity controls, containing the economic size of a trading partner represented by the GDP_{it}, the population of a GSP benefiting country ($Population_{it}$), the bilateral distance ($Distance_i$) between the capital city of a GSP benefiting country to Switzerland's capital city Bern and the MTR term ($Remoteness_{it}$), which measures the trade barriers that each country faces with respect to all its trading partners. Furthermore, $Gravity_{it}$ contains $Official\ Language_{it}$ which is a dummy variable that indicates if a GSP benefiting country has the same official language as Switzerland. The dummy variable takes the value 1 if a GSP benefiting country has the same official language and the value 0 otherwise.

GSP_{ijt} represents a vector of GSP-related controls, containing the level of GSP-eligible trade of a GSP benefiting country measured in CHF ($GSP\ eligible_{ijt}$), the preference margin ($Preference\ margin_{ijt}$) and a binary dummy variable $Regional\ cumulation_{it}$, that takes the value of one for countries which are permitted regional cumulation within the GSP of Switzerland, and zero otherwise. Finally, GSP_{ijt} contains three product-related dummy variables less, medium and highly processed ($primary_{jt}$, $medium\ processed_{jt}$ and $highly\ processed_{jt}$). We excluded the dummy variable which indicates whether a product is less processed ($primary_{jt}$) or not from the regression equation as the base category to estimate the effect of medium and highly processed products in relation to less processed products. ε_{ijt} represents the residual term for unobserved characteristics of a country i, product j at time t (Note: Continuous variables are transformed in logs; product-related dummy variables are excluded from model variations where product fixed effects were added to the model).

Second, to identify the country group effect for DCs (and in turn for LDCs) for each independent variable we used interaction terms. Including an interaction term reflects a theory that

the impact of one x (e.g. the preference margin) is conditional upon the specific value of the other x (the country group status of the DCs) (McDaniel, 2016). The according models take the following basic form represented by equation (4.5).

$$UR_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 DC_{it} + \beta_3 \left(X_{ijt} \times DC_{it}\right) + \varepsilon_{ijt} \tag{4.5}$$

Where X_{ijt} contains all binary and continuous variables used in equation (4.4). As mentioned above, to identify the country group effect of DCs, we interact each x with the binary variable DC_{it}. Here, we calculated the marginal effects for nonlinear combination of estimators for each x ($\left(\left(X_{ijt} \times DC_{it}\right) + X_{ijt}\right)$).

4.5.2 Heckman selection model

Another way of looking at the zero value problem is the solution proposed by Heckman (1979). This solution amounts to a two-step procedure. The first step is to estimate the probability of preference eligibility and utilization, using a probit estimator. Therefore we get the following selection equation:

$$Prob(d_{ijt} = 1) = \Phi\left(\beta_0 + \gamma\, GoodGov_{it} + \delta\, Gravity_{it} + \theta\, GSP_{ijt} + \varepsilon_{ijt}\right) \tag{4.6}$$

$$\begin{aligned} d_{ijt} &= 1 \; if \; p_{ijt} > 0 \\ d_{ijt} &= 0 \; if \; p_{ijt} = 0 \end{aligned} \tag{4.7}$$

where p_{ijt} is a latent (observed) dummy variable, that takes the value of one, if the export flow for a given product was eligible for the GSP and the GSP was utilized, and zero if the export flow for a given product was eligible for the GSP and the GSP was *not* utilized. d_{ijt} is an (unobserved) dummy variable equal to unity for those observations that are in the sample, and zero for those that are not. The estimates of the probit model were then used to calculate the inverse Mill's ratio ($\frac{\phi}{\Phi}$), which corresponds to the probability of selection variable omitted from the original equation. Hereby the institutional quality of a nation depicted by $GoodGov_{it}$ and the standard variables of the gravity equation depicted by $Gravity_{it}$ serve as exclusion restrictions, which affect the selection (GSP eligibility of a country and product and GSP utilization). The inclusion of these variables solves the omitted variable bias and produces estimates that are consistent in the presence of non-random sample (Shepherd, 2013).

In a second step the Heckman selection model estimates a OLS model by means of the inverse Mill's ratio, where the sample was restricted to export flows which were eligible for the GSP and where the GSP was utilized. Consequently, we get the following outcome equation:

$$logUR_{ijt} = \beta_0 + \theta\ GSP_{ijt} + \varepsilon_{ijt} > 0 \tag{4.8}$$

By now, the outcome equation of the Heckman selection model only contains positive values of the utilization rate ($logUR_{ijt}$ is missing if p_{ijt} = 0) and variables which are exclusively related to the GSP scheme and provide incentives to export under preferential conditions and consequently affect the level of the utilization rate. Once the trade contract is established and the exporter has overcome bureaucratic obstacles of the GSP, the outcome equation of the Heckman selection model allows us to estimate the relationship between the utilization rate and the preference margin unbiased because Good Governance indicators used in the selection equation solve the selection problem (see Section 4.4). Consequently, the outcome equation only contains variables which affect the level of the utilization rate once preferences are demanded. Note: We did not integrate interaction terms to identify the DCs', respectively LDCs' country effect to the Heckman selection model procedure, because especially model variations where product fixed effects are included to the model did not achieve convergence.

4.6 Results and discussion

This section provides regression results for the baseline reference estimations from PPML (Subsection 4.6.1) and the additional robustness check estimations from the Heckman selection model (Subsection 4.6.2).

4.6.1 Results for Poisson Pseudo Maximum Likelihood

Table 4.2 presents PPML regression results for the individual Good Governance indicators (WGI, IEF and HDI) without interactions terms, whereas Table 4.3 presents PPML regression results with interaction terms to identify the country group effects. To improve clarity, we did not report detailed regression results and therefore put the focus on the effect of the individual Good Governance indicators. Detailed results can be found in Appendix 4.10 (results without interaction terms), respectively Appendix 4.11 (results with interaction terms). Furthermore, we did not report results where we simultaneously integrated time and product fixed effects to model (according results can likewise be found in Appendix 4.10 and 4.11).

The variable 'Good Governance', which reflects the WGI, the IEF and the HDI, shows over all model variations without interaction terms the expected positive sign and is highly signifi-

Table 4.2: PPML regression results for Good Governance indicators without interaction terms

Independent Variable	WGI (1)	WGI (2)	IEF (1)	IEF (2)	HDI (1)	HDI (2)
Good Governance	0.325***	0.382***	0.525***	0.611***	0.562***	1.018***
	(0.030)	(0.031)	(0.083)	(0.087)	(0.055)	(0.065)
TimeFE	No	Yes	No	Yes	No	Yes
ProductFE	No	No	No	No	No	No

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.3: PPML regression results for Good Governance indicators using interaction terms

Independent Variable	WGI (1)	WGI (2)	IEF (1)	IEF (2)	HDI (1)	HDI (2)
Good Governance DCs	0.235***	0.317***	0.477***	0.643***	0.248***	0.764***
	(0.034)	(0.033)	(0.087)	(0.086)	(0.059)	(0.074)
Good Governance LDCs	0.299***	0.300***	0.895**	0.990**	0.127	0.187
	(0.073)	(0.072)	(0.407)	(0.422)	(0.152)	(0.151)
TimeFE	No	Yes	No	Yes	No	Yes
ProductFE	No	No	No	No	No	No

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

cant. The results show that the institutional quality of a GSP benefiting country is supportive for utilizing the GSP. GSP benefiting countries with a high institutional quality are apparently better informed about the options of the Swiss GSP and are better able to overcome the bureaucratic obstacles in form of the proof of origin and the proof of direct shipment. In consequence, GSP benefiting countries with a high institutional quality have a high utilization rate and are able to achieve an economic benefit in form of low tariffs or duty-free market access. This potential economic benefit can lead to competitive advantages in form of lower prices in comparison with exporters of the industrialized countries, which are not benefiting from the GSP. The positive effect of 'Good Governance' on utilizing trade preferences remains, when using interaction terms to identify the individual country group effect. For DCs and LDCs the effect of 'Good Governance' is positive across all model variations. However, in case of the DCs this effect always highly significant, whereas in case of the LDCs the effect of the HDI is positive but only significant for the model variation with time and product fixed effects (see Appendix 4.11).

The variables 'GSP-eligible trade' and 'preference margin' show the expected positive signs and are highly significant. These results support our assumption that the costs of compliance affect the exporter's decision whether to demand trade preferences or not. For instance, an increase of the 'preference margin' by 10 percent leads to an increase of the utilization rate by on average 1.5 percent. Adding FE to the model intensifies the positive effect of the 'preference margin' for all model variations. Likewise, an increase of 'GSP eligible trade' by 10

percent leads to an increase of the 'utilization rate' by 0.3 percent. Therefore, trade preferences are demanded in cases where the GSP-eligible trade flow and the preference margin are high. The positive effect of the preference margin and GSP eligible trade is stronger in case of the LDCs. This is due to the fact, that LDCs were granted more GSP eligible tariff lines and higher preference margins compared to DCs (Ritzel and Kohler, 2016b).

The dummy variable 'regional cumulation' which focus on the proof of origin especially for more-highly processed products shows the expected positive sign and is highly significant. Consequently, a country which is a member of the ASEAN and which therefore is covered by the by the regional cumulation in the Swiss GSP gains a higher utilization rate compared to countries which are not covered by the regional cumulation. However, the positive effect of this variable is damped but remains statistically significant when time and product FE are added to model. Especially product FE allow to control for such product related aspects, so that a damping of the effect of this variable is the logical consequence. Here again, the positive effect is stronger in case of the LDCs.

Given that the proof of origin is easier to provide for 'low processed' products (e.g. commodities), the product-related dummy variables 'medium processed' and 'highly processed' which likewise focus on the rules of origin (proof of origin) show unexpected positive signs. This implies, that the Swiss GSP is better utilized in case of medium and highly processed products. This could be due to the fact, that medium and highly processed products have higher price and preference margins.

The variable'GDP' is highly significant and shows an unexpected negative sign in case of the model variation without interaction terms. The variable 'population' is likewise significant and shows the expected positive sign. This implies that especially highly-populated DCs and LDCs with a low GDP show high utilization rates and vice versa. The 'poorer' DCs and LDCs are more focused on realizing the above mentioned economic benefit which results from lower tariffs or duty-free market access. By using interaction terms to identify the individual country group effect of a given independent variable, the picture slightly changes. While the effect of 'GDP' remains negative in case of DCs, 'GDP' shows mostly a positive but not always significant effect in case of LDCs.

The variable 'distance', which is an approximation for transport costs, is highly significant and shows an unexpected positive sign in case of the model variation without interaction terms. This implies, that GSP benefiting countries with a larger distance to Switzerland and hence with higher transport costs have a higher utilization rate than those with a smaller distance. Here again, the effect of 'distance' changes when using interaction terms. While the effect of 'distance' remains positive in case of DCs, 'distance' shows consistently a positive effect in case of LDCs.

The variable 'common official language' is highly significant and initially shows an unex-

pected negative sign. Although the presence of at least one common official language in a DC or LDC creates better conditions to deal with bureaucratic obstacles that are connected to the GSP, it has a negative effect on the level of the utilization rate. However, the picture likewise changes when using interaction terms to identify the country group effect. While the effect of 'common official language' remains negative in case of DCs, 'common official language' shows consistently a positive effect in case of LDCs. This implies, that LDCs which have the same official language than Switzerland achieve higher utilization rates compared to DCs which likewise have the same official language than Switzerland.

At first glance, estimation results concerning the signs of the standard gravity variables are surprising. However, our analysis focus on the trade performance of the world's poorest countries, so that one cannot expect the same estimation results as in studies, which relate to the analysis of the trade performance of industrialized countries. The relevant literature concerning the evaluation of the effectiveness of preferential trade arrangements (see Appendix 4.8) indicates that thematically similar studies likewise produce ambiguous estimation results.

4.6.2 Results for the Heckman selection model

Table 4.4 presents regression results of Good Governance indicators for the selection equation of the Heckman selection model where the probability of preference eligibility and utilization is estimated by means of a probit model. Here again, to improve clarity, we did not report detailed regression results and therefore put the focus on the effect of the individual Good Governance indicators. Detailed results for the selection and outcome equations can be found in Appendix 4.12. Furthermore, we did not report results where we simultaneously integrated time and product fixed effects to model (according results can likewise be found in Appendix 4.12).

In general it can be stated that sample selection bias seems not to be a serious problem. A sample selection only creates bias if the error terms of the selection and outcome equations are correlated. That information is contained in the estimate of *rho*. An estimate of *rho* that is large in absolute values (up to maximum of one) suggests that the sample selection is a major problem in the dataset used. Likewise the null hypothesis that *rho* is equal to zero cannot be rejected. This implies, that the error terms of the selection and outcome equations are uncorrelated (this holds true for all model variations). (Shepherd, 2013).

Results of the selection equation, where the probability of preference eligibility and utilization is estimated by means of a probit model, show the same signs and approximately the same magnitudes of the estimators as indicated by PPML estimations (results of the selection equation can be found in Appendix 4.12). Likewise to the estimation results of the PPML model, the institutional quality of a nation separately depicted by the WGI, IEF and HDI, increases the probability significantly, that an exporter overcomes bureaucratic obstacles (proof of origin and

Table 4.4: Heckman regression results of the selection equation for Good Governance indicators without interaction terms

Independent Variable	WGI (1)	WGI (2)	IEF (1)	IEF (2)	HDI (1)	HDI (2)
Good Governance	0.171***	0.209***	0.683***	0.716***	0.423***	0.657***
	(0.023)	(0.024)	(0.077)	(0.078)	(0.047)	(0.054)
$TimeFE$	No	Yes	No	Yes	No	Yes
$ProductFE$	No	No	No	No	No	No

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

proof of direct shipment) and utilizes the GSP.

Results of the outcome equation (see Appendix 4.12) indicate that the positive and highly significant effect of the 'preference margin' increases when adding time and product FE to model. Accordingly, an increase of the 'preference margin' by 10 percent leads to an increase of the utilization rate by on average 0.9 percent. In contrast to PPML estimations, the variable 'GSP eligible trade' shows an unexpected negative sign and is highly significant. We assume that the size of 'GSP eligible trade' plays a tangential role compared to the 'preference margin' when the sample is restricted to positive values of the utilization rate. The variable 'regional cumulation' which focus on the rules of origin shows a negative sign for most of the model variations. Though, this negative effect is only significant for the model variation, where the WGI is included to the model. The product-related dummy variables 'medium processed' and 'highly processed' which likewise focus on the rules of origin (proof of origin) show unexpected positive signs. In accordance to PPML results this likewise implies, that the Swiss GSP is better utilized in case of medium and highly processed products. As mentioned above, this could be due to the fact, that medium and highly processed products have higher price and preference margins.

4.7 Conclusions

From a methodological perspective the PPML estimator seems to be more robust than the Heckman selection model. Even if Heckman's selection model provides an intuitive way to deal with zero values, for instance implementing and interpreting interaction terms is more sophisticated compared to the PPML model. Furthermore, the second stage (the outcome equation) only refers to positive values of the utilization rate. Consequently, underutilization of the GSP in the form of zero values cannot be considered. Nevertheless, the Heckman selection model provides a suitable robustness check for PPML results so that this requirement was met.

Our results unequivocally indicate, that the institutional quality of a nation depicted by the Good Governance indicators is an important element to overcome NTBs in the form of

export certificates such as the proof of origin and the proof of direct shipment. For all model variations, the variable 'Good Governance' shows a significant and positive effect on the level of the utilization rate. Therefore, exports from a country with a high institutional quality are more likely to gain benefits from the GSP, than exporters from a country with a low institutional quality. Furthermore, our results indicate that 'poorer', highly-populated DCs and LDCs with a high institutional quality and a low productivity in the agricultural sector are utilizing the GSP more often than other DCs and LDCs. By implication, 'wealthier', less-populated and more productive DCs and LDCs with a low institutional quality are rather exporting under the MFN scheme, where no costs of compliance occur, than under the GSP scheme. Especially the negative effect of the variable GDP is surprising, because this variable is often used as an approximation for the institutional quality of a nation. Consequently, we believe that the GDP is merely an indicator for the economic, respectively export performance of a nation and therefore should be understood as a purely economic performance indicator, which does not capture the institutional quality of a nation.

The 'preference margin' which represents the main incentive to export under preferential conditions, compensates the costs of compliance associated to the GSP and causes an additional benefit for the importer, has a consistent and positive effect on the level of the utilization rate. Furthermore, results unequivocally indicate that the GSP is even more utilized in case of medium and highly processed products. Especially the application of the Heckman selection model made clear, that once trade contracts are established and an exporter has overcome bureaucratic obstacles in the form of the proof of origin and the proof of direct shipment, the 'preference margin' appears as the main incentive to export under preferential conditions granted by the GSP. While the effect of the size of 'GSP eligible trade' had a positive and significant effect in case of the PPML estimations, the effect turned into negative when the sample was restricted to positive values of the utilization rate in case of the outcome equation of the Heckman selection model. This finding encourages our confidence that the 'preference margin' acts as the main incentive for exporting under preferential conditions.

4.8 Appendix: Literature survey on the utilization of Preferential Trade Agreements

Table 4.5: Relevant literature for regression models for explaining the level of the utilization rate as a dependent variable

Independent Variable	Expected Effect	Factual effect	Publication
GDP	+	+ and -	Manchin (2006)
Population	+	+ and -	Manchin (2006)
GDP per capita	+	+ and -	Gasiorek et al. (2005)
Distance	-	-	Gasiorek et al. (2005)
Transport costs	-	-	Gasiorek et al. (2005)
Remoteness	-	-	Hakobyan (2012)
Common border	+	+	Gasiorek et al. (2005)
Former colony	+	+	Gasiorek et al. (2005)
Common language	+	+ and -	Gasiorek et al. (2005)
Other preference systems	-	-	OECD (2005)
Preference margin	+	+	OECD (2005) Manchin (2006) Bureau et al. (2007) Gasiorek et al. (2005) Keck and Lendle (2012)
Preference eligible trade	+	+	OECD (2005) Bureau et al. (2007) Nilsson (2012) Keck and Lendle (2012)
Regional cumulation	+	+	Hakobyan (2012)
Primary product	+	+ and -	Nilsson (2012) Keck and Lendle (2012) Hakobyan (2012)
Highly-processed product	-	+	Bureau et al. (2007)
Product category	+ or -	+ and -	Manchin (2006) Nilsson (2012)
Institutional quality (EFI)	+	+ and -	Manchin (2006)

4.9 Appendix: Utilization rates on Harmonized System 2 digits level during 2002 to 2011

Table 4.6: DCs' utilization rate on HS 2 digits level from 2002 to 2011 (exports in CHF 1,000)

HS chapter	Chapter description	GSP exports	GSP eligible	UR
01	Live animals	82	3,033	2.7
02	Meat and edible meat offal	980,577	1,152,294	85.1
03	Fish and crustacean	111,022	301,184	36.9
04	Dairy products	2,910	32,714	8.9
05	Products of animal origin	0	45,375	0.0
06	Live tress and other plants	105,216	180,571	38.5
07	Edible vegetables	61,793	316,270	19.5
08	Edible fruits and nuts	309,480	850,975	36.4
09	Coffee, tea, malt and spices	32,181	1,316,431	2.4
10	Cereals	76,286	263,619	28.9
11	Products of the milling industry	0	12,769	0.0
12	Oil seeds and oleaginous fruits	1	37,219	0.0
13	Lac, gums, resins and other vegetable saps	0	10,922	0.0
14	Vegetable plaiting materials	3,809	3,834	99.3
15	Animal or vegetable fats and oils	140	314,615	0.0
16	Preparations of meat, of fish or of crustaceans	364,256	448,730	81.2
17	Sugars and sugar confectionery	115,861	178,900	64.8
18	Cocoa and cocoa preparations	18,287	30,544	59.9
19	Preparations of cereals, flour, starch or milk	98,208	115,000	85.4
20	Preparations of vegetables, fruits, nuts or other plants	580,448	838,902	69.2
21	Miscellaneous edible preparations	199,124	298,056	66.8
22	Beverages, spirits and vinegar	169,938	229,639	74.0
23	Residues and waste from the food industries	10,542	12,406	85.0
24	Tobacco and manufactured tobacco substitutes	18,762	85,867	21.9
Total		3,258,922	7,079,871	46.0

Table 4.7: LDCs' utilization rate on HS 2 digits level from 2002 to 2011 (exports in CHF 1,000)

HS chapter	Chapter description	GSP exports	GSP eligible	UR
01	Live animals	0	373	0.0
02	Meat and edible meat offal	34	243	13.8
03	Fish and crustacean	346	35,203	1.0
04	Dairy products	33	229	14.5
05	Products of animal origin	0	47,040	0.0
06	Live tress and other plants	17'087	44,332	38.5
07	Edible vegetables	664	5,179	12.8
08	Edible fruits and nuts	5'804	18,138	32.0
09	Coffee, tea, malt and spices	45'490	272,639	16.7
10	Cereals	12'639	13,309	95.0
11	Products of the milling industry	6	140	4.2
12	Oil seeds and oleaginous fruits	0	6,888	0.0
13	Lac, gums, resins and other vegetable saps	0	1,391	0.0
14	Vegetable plaiting materials	4	135	2.6
15	Animal or vegetable fats and oils	193,978	196,275	98.8
16	Preparations of meat, of fish or of crustaceans	0	4,192	0.0
17	Sugars and sugar confectionery	1,372	2,189	62.7
18	Cocoa and cocoa preparations	34	55,661	0.1
19	Preparations of cereals, flour, starch or milk	152	180	84.8
20	Preparations of vegetables, fruits, nuts or other plants	1,793	2,495	71.9
21	Miscellaneous edible preparations	547	635	86.0
22	Beverages, spirits and vinegar	471	1,067	44.2
23	Residues and waste from the food industries	0	101	0.0
24	Tobacco and manufactured tobacco substitutes	0	149,537	0.0
Total		280,454	857,570	34.6

4.10 Appendix: Poisson Pseudo Maximum Likelihood regression results without interaction terms

Table 4.8: PPML regression results without interaction terms (model WGI)

Independent Variable	WGI (1)	WGI (2)	WGI (3)
logGood Governance	0.325***	0.382***	0.336***
	(0.030)	(0.031)	(0.030)
logPreference Margin	0.154***	0.148***	0.380***
	(0.007)	(0.007)	(0.028)
logGSP eligible	0.034***	0.034***	0.031***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.219***	0.227***	0.117***
	(0.022)	(0.022)	(0.020)
Medium processed	0.197***	0.210***	
	(0.031)	(0.031)	
Highly processed	0.511***	0.580***	
	(0.024)	(0.029)	
logGDP	-0.214***	-0.256***	-0.325***
	(0.013)	(0.012)	(0.013)
logPopulation	0.226***	0.262***	0.294***
	(0.012)	(0.012)	(0.012)
logDistance	0.232***	0.212***	0.214***
	(0.038)	(0.039)	(0.036)
logRemoteness	-9.101***	-8.818***	-7.172***
	(0.720)	(0.738)	(0.731)
Official Language	-0.298***	-0.329***	-0.252***
	(0.041)	(0.041)	(0.042)
$TimeFE$	No	Yes	Yes
$ProductFE$	No	No	Yes
$Observations$	26,288	26,288	26,288
$PseudoR^2$	0.115	0.122	0.445

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.9: PPML regression results without interaction terms (model IEF)

Independent Variable	IEF (1)	IEF (2)	IEF (3)
logGood Governance	0.525***	0.611***	0.659***
	(0.083)	(0.087)	(0.085)
logPreference Margin	0.156***	0.151***	0.156***
	(0.007)	(0.007)	(0.007)
logGSP eligible	0.039***	0.039***	0.039***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.189***	0.198***	0.194***
	(0.022)	(0.022)	(0.022)
Medium processed	0.207***	0.218***	
	(0.031)	(0.031)	
Highly processed	0.587***	0.590***	
	(0.029)	(0.029)	
logGDP	-0.195***	-0.227***	-0.314***
	(0.012)	(0.012)	(0.014)
logPopulation	0.210***	0.239***	0.286***
	(0.013)	(0.013)	(0.013)
logDistance	0.263***	0.237***	0.220***
	(0.039)	(0.040)	(0.038)
logRemoteness	-9.034***	-8.615***	-7.046***
	(0.736)	(0.726)	(0.749)
Official Language	-0.375***	-0.413***	-0.339***
	(0.042)	(0.042)	(0.043)
$TimeFE$	No	Yes	Yes
$ProductFE$	No	No	Yes
$Observations$	26,154	26,154	26,154
$PseudoR^2$	0.111	0.117	0.443

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.10: PPML regression results without interaction terms (model HDI)

Independent Variable	HDI (1)	HDI (2)	HDI (3)
logGood Governance	0.561***	1.018***	0.769***
	(0.055)	(0.065)	(0.060)
logPreference Margin	0.214***	0.148***	0.386***
	(0.006)	(0.007)	(0.028)
logGSP eligible	0.034***	0.039***	0.035***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.207***	0.203***	0.103***
	(0.023)	(0.022)	(0.021)
Medium processed	-0.300***	0.211***	
	(0.062)	(0.031)	
Highly processed	0.474***	0.584***	
	(0.025)	(0.029)	
logGDP	-0.224***	-0.329***	-0.376***
	(0.012)	(0.014)	(0.014)
logPopulation	0.232***	0.335***	0.350***
	(0.013)	(0.014)	(0.014)
logDistance	0.198***	0.120***	0.116***
	(0.040)	(0.041)	(0.038)
logRemoteness	-6.236***	-4.370***	-3.105**
	(0.725)	(0.768)	(0.728)
Official Language	-0.314***	-0.347***	-0.249***
	(0.043)	(0.043)	(0.045)
$TimeFE$	No	Yes	Yes
$ProductFE$	No	No	Yes
$Observations$	25,844	25,844	25,844
$PseudoR^2$	0.116	0.105	0.446

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

4.11 Appendix: Poisson Pseudo Maximum Likelihood regression results with interaction terms

Table 4.11: Nonlinear combinations for PPML regression with interaction terms (model WGI)

Independent Variable	WGI (1)	WGI (2)	WGI (3)
logGood Governance	0.235***	0.317***	0.293***
	(0.032)	(0.034)	(0.033)
logPreference Margin	0.133***	0.125***	0.341***
	(0.007)	(0.007)	(0.029)
logGSP eligible	0.032***	0.033***	0.023***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.128***	0.117***	0.083***
	(0.022)	(0.022)	(0.021)
Medium processed	0.111***	0.127***	
	(0.032)	(0.032)	
Highly processed	0.493***	0.497***	
	(0.029)	(0.028)	
logGDP	-0.276***	-0.367***	-0.345***
	(0.013)	(0.015)	(0.014)
logPopulation	0.258***	0.336***	0.301***
	(0.012)	(0.014)	(0.013)
logDistance	0.206***	0.193***	0.208***
	(0.039)	(0.041)	(0.037)
logRemoteness	-7.185***	-6.282***	-6.407***
	(0.745)	(0.776)	(0.747)
Official Language	-0.713***	-0.671***	-0.858***
	(0.069)	(0.070)	(0.068)
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	26,288	26,288	26,288

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.12: Nonlinear combinations for PPML regression with interaction terms (model IEF)

Independent Variable	IEF (1)	IEF (2)	IEF (3)
logGood Governance	0.477***	0.642***	0.636***
	(0.081)	(0.087)	(0.086)
logPreference Margin	0.129***	0.120***	0.320***
	(0.007)	(0.007)	(0.029)
logGSP eligible	0.034***	0.034***	0.022***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.140***	0.130***	0.093***
	(0.022)	(0.022)	(0.020)
Medium processed	0.102***	0.118***	
	(0.032)	(0.032)	
Highly processed	0.488***	0.495***	
	(0.028)	(0.028)	
logGDP	-0.270***	-0.356***	-0.335***
	(0.013)	(0.015)	(0.014)
logPopulation	0.264***	0.340***	0.303***
	(0.013)	(0.015)	(0.014)
logDistance	0.224***	0.205***	0.206***
	(0.039)	(0.041)	(0.037)
logRemoteness	-8.270***	-7.223***	-7.129***
	(0.740)	(0.772)	(0.754)
Official Language	-0.875***	-0.856***	-0.740***
	(0.075)	(0.076)	(0.075)
$TimeFE$	No	Yes	Yes
$ProductFE$	No	No	Yes
$Observations$	26,158	26,158	26,158

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.13: Nonlinear combinations for PPML regression with interaction terms (model HDI)

Independent Variable	HDI (1)	HDI (2)	HDI (3)
logGood Governance	0.248***	0.764***	0.692***
	(0.059)	(0.074)	(0.066)
logPreference Margin	0.128***	0.119***	0.317***
	(0.007)	(0.007)	(0.028)
logGSP eligible	0.036***	0.035***	0.028***
	(0.003)	(0.003)	(0.003)
Regional Cumulation	0.143***	0.134***	0.096***
	(0.022)	(0.022)	(0.021)
Medium processed	0.147***	0.147***	
	(0.032)	(0.032)	
Highly processed	0.527***	0.514***	
	(0.029)	(0.029)	
logGDP	-0.264***	-0.397***	-0.365***
	(0.013)	(0.016)	(0.014)
logPopulation	0.252***	0.380***	0.335***
	(0.012)	(0.016)	(0.015)
logDistance	0.212***	0.134***	0.139***
	(0.041)	(0.043)	(0.038)
logRemoteness	-6.851**	-4.255***	-4.279***
	(0.741)	(0.802)	(0.744)
Official Language	-0.815***	-0.726***	-0.655***
	(0.079)	(0.080)	(0.077)
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	25,920	25,920	25,920

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

4.12 Appendix: Heckman regression results for the selection and the outcome equations

Table 4.14: Heckman regression results of the selection equation with and without fixed effects using pooled sample (model WGI)

Independent Variable	WGI (1)	WGI (2)	WGI (3)
logGood Governance	0.171***	0.209***	0.284***
	(0.023)	(0.024)	(0.028)
logPreference Margin	0.208***	0.204***	0.441***
	(0.006)	(0.006)	(0.012)
logGSP eligible	0.150***	0.151***	0.214***
	(0.003)	(0.003)	(0.004)
Regional Cumulation	0.217***	0.224***	0.272***
	(0.022)	(0.022)	(0.027)
Medium processed	-0.111***	-0.098***	
	(0.024)	(0.024)	
Highly processed	0.182***	0.188***	
	(0.023)	(0.023)	
logGDP	-0.167***	-0.196***	-0.351***
	(0.011)	(0.011)	(0.014)
logPopulation	0.187***	0.214***	0.365***
	(0.011)	(0.011)	(0.014)
logDistance	0.304***	0.286***	0.418***
	(0.035)	(0.035)	(0.040)
logRemoteness	-10.335***	-10.092***	-12.259***
	(0.678)	(0.680)	(0.789)
Official Language	-0.306***	-0.325***	-0.282***
	(0.032)	(0.032)	(0.027)
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	26,288	26,288	26,288
Sigma	1.068	1.066	0.996
Rho	0.073	-0.036	0.074
Lamda	0.078	-0.038	0.073

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.15: Heckman regression results of the selection equation with and without fixed effects using pooled sample (model IEF)

Independent Variable	IEF (1)	IEF (2)	IEF (3)
logGood Governance	0.683***	0.716***	0.842***
	(0.077)	(0.078)	(0.090)
logPreference Margin	0.215***	0.212***	0.463***
	(0.006)	(0.006)	(0.013)
logGSP eligible	0.152***	0.153***	0.221***
	(0.003)	(0.003)	(0.004)
Regional Cumulation	0.249***	0.266***	0.330***
	(0.022)	(0.022)	(0.027)
Medium processed	-0.085***	-0.080***	
	(0.024)	(0.024)	
Highly processed	0.183***	0.186***	
	(0.023)	(0.023)	
logGDP	-0.126***	-0.139***	-0.282***
	(0.010)	(0.011)	(0.013)
logPopulation	0.159***	0.171***	0.306***
	(0.011)	(0.011)	(0.013)
logDistance	0.280***	0.257***	0.397***
	(0.035)	(0.035)	(0.040)
logRemoteness	-10.650***	-10.384***	-12.679***
	(0.689)	(0.692)	(0.807)
Official Language	-0.297***	-0.313***	-0.310***
	(0.032)	(0.032)	(0.038)
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	26,137	26,137	26,137
Sigma	1.080	1.073	1.007
Rho	0.015	0.076	0.174
Lamda	0.161	0.081	0.175

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parenthese

Table 4.16: Heckman regression results of the selection equation with and without fixed effects using pooled sample (model HDI)

Independent Variable	HDI (1)	HDI (2)	HDI (3)
logGood Governance	0.423***	0.657***	0.783***
	(0.047)	(0.054)	(0.065)
logPreference Margin	0.207***	0.203***	0.436***
	(0.006)	(0.007)	(0.013)
logGSP eligible	0.152***	0.153***	0.223***
	(0.003)	(0.003)	(0.004)
Regional Cumulation	0.213***	0.227***	0.273***
	(0.022)	(0.022)	(0.027)
Medium processed	-0.103***	-0.099***	
	(0.024)	(0.024)	
Highly processed	0.198***	0.196***	
	(0.023)	(0.023)	
logGDP	-0.134***	-0.190***	-0.365***
	(0.011)	(0.013)	(0.015)
logPopulation	0.161***	0.213***	0.382***
	(0.011)	(0.013)	(0.015)
logDistance	0.395***	0.342***	0.473***
	(0.035)	(0.036)	(0.041)
logRemoteness	-10.304***	-9.129***	-9.828***
	(0.672)	(0.685)	(0.797)
Official Language	-0.105***	-0.121***	-0.077**
	(0.033)	(0.033)	(0.039)
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	25,917	25,917	25,917
Sigma	1.105	1.082	1.014
Rho	0.251	0.025	0.177
Lamda	0.278	0.027	0.179

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.17: Heckman regression results of the outcome equation with and without fixed effects using pooled sample (model WGI)

Independent Variable	WGI (1)	WGI (2)	WGI (3)
logPreference Margin	0.090***	0.075***	0.103***
	(0.014)	(0.014)	(0.020)
logGSP eligible	-0.124***	-0.135***	-0.134***
	(0.007)	(0.007)	(0.007)
Regional cumulation	-0.047*	-0.063**	-0.048**
	(0.026)	(0.024)	(0.024)
Medium processed	0.319***	0.324***	
	(0.032)	(0.032)	
Highly processed	0.430***	0.410***	
	(0.029)	(0.029)	
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	26,288	26,288	26,288
Sigma	1.068	1.066	0.996
Rho	0.073	-0.036	0.074
Lamda	0.078	-0.038	0.073

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.18: Heckman regression results of the outcome equation with and without fixed effects using pooled sample (model IEF)

Independent Variable	IEF (1)	IEF (2)	IEF (3)
logPreference Margin	0.084***	0.073***	0.105***
	(0.014)	(0.014)	(0.020)
logGSP eligible	-0.115***	-0.122***	-0.122***
	(0.008)	(0.008)	(0.007)
Regional cumulation	0.039	0.031	-0.000
	(0.027)	(0.032)	(0.025)
Medium processed	0.306***	0.312***	
	(0.032)	(0.032)	
Highly processed	0.478***	0.465***	
	(0.030)	(0.030)	
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	26,137	26,137	26,137
Sigma	1.080	1.073	1.007
Rho	0.015	0.076	0.174
Lamda	0.161	0.081	0.175

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 4.19: Heckman regression results of the outcome equation with and without fixed effects using pooled sample (model HDI)

Independent Variable	HDI (1)	HDI (2)	HDI (3)
logPreference Margin	0.111***	0.078***	0.145***
	(0.014)	(0.014)	(0.020)
logGSP eligible	-0.109***	-0.132***	-0.124***
	(0.008)	(0.007)	(0.007)
Regional cumulation	0.003	-0.030	-0.020
	(0.027)	(0.026)	(0.024)
Medium processed	0.328***	0.340***	
	(0.033)	(0.032)	
Highly processed	0.505***	0.462***	
	(0.031)	(0.031)	
TimeFE	No	Yes	Yes
ProductFE	No	No	Yes
Observations	25,917	25,917	25,917
Sigma	1.105	1.082	1.014
Rho	0.251	0.025	0.177
Lamda	0.278	0.027	0.179

*** p < 1%, ** p < 5%, * p < 10%

Robust standard errors in parentheses

5 Preferential tariffs for developing countries: Did they foster agricultural exports to Switzerland?

Joint work with Andreas Kohler and Stefan Mann

5.1 Introduction[1]

The ability of foreign aid to promote economic and social development is nowadays called into question. The bulk of theoretical and empirical literature in development economics finds that foreign aid is ineffective (Williamson, 2010). In this context preferential trade agreements such as the Generalized System of Preferences (GSP) have become more and more important for developing countries (DCs) and least-developed countries (LDCs) to reduce poverty and spur economic development. Since March 1st 1972, Switzerland, like the USA, the EU, Canada and Japan, has granted preferential tariffs for DCs and LDCs for industrial and agricultural products on a voluntary and non-reciprocal basis[2].Depending on the product, DCs and LDCs are not charged any tariff or enjoy reduced tariffs on their exports to Switzerland. Since April 1st 2007, exports of agricultural and food products from LDCs have generally been duty-free and quota-free (DFQF) and are not bound by seasonal restrictions[3]. Depending on the product, exports of agro-food products from DCs are possible with a lower tariff or duty-free. However, DCs are still bound by quotas (Häberli, 2008; The United Nations Conference on Trade and Development, 2012).

The agricultural and food sector plays an important role for many of those countries. After the GSP was introduced in 1968, many authors praised its positive effect in subsequent years

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[2] At first the non-reciprocal preferential treatment of DCs/LDCs contradicted the Most-Favored-Nation (MFN) clause of the General Agreement on Tariffs and Trade (GATT) of the World Trade Organization (WTO). This preferential treatment was given legal effect within the GATT by means of a 1971 waiver from the most-favoured-nation obligation in Article I of the GATT. The system of tariff preferences was made permanent by the 1979 'Enabling Clause'. The Enabling Clause also contains a waiver to grant additional preferences exclusively to LDCs (Bartels and Häberli, 2010).

[3] According to Art. 6 (2) of the Tariff Preference Regulation, those countries equated to LDCs are the ones which benefit from the debt-relief initiative and are not yet cleared of debt.

(Baldwin and Murray, 1977; Sapir; 1981; Brown, 1989). However, recent discussion about the potential effects of the GSP has been rather skeptical (OECD, 2005; Özden and Reinhardt, 2005; Gasiorek et al., 2005). Häberli (2008) argues that LDCs, which were granted complete DFQF market access via the GSP of Switzerland in 2007 and the EU in 2008, would not be able to increase their agricultural exports to the EU substantially, with the exception of sugar exports, partly due to non-tariff barriers. Nevertheless, we argue that Switzerland's highly protected agricultural and food market has become more accessible through the GSP.

The main focus of this paper was to investigate whether the GSP has increased the integration of LDCs into the Swiss agro-food market. In this context, we additionally evaluated the 2007 DFQF market access for LDCs. To address this issue adequately, we only took into account trade flows that entered Switzerland under preferential conditions offered by the GSP from 2002 to 2011. Besides exporting under GSP tariffs, LDCs also had the option of exporting under alternative tariff regimes, e.g., WTO MFN tariffs. In practice, preferential trade agreements such as the GSP or bilateral Free Trade Agreements (FTAs) are never fully utilized due to bureaucratic obstacles in the form of export certificates (e.g., certificate of origin and certificate of direct shipment) (Bureau et al., 2007; Keck and Lendle, 2012). If there is no differentiation between prevailing tariff regimes, biased estimates of trade liberalization effects are likely to be obtained[4].

Utilizing unilateral or bilateral trade preferences also generates costs (costs of compliance) for obtaining the certificate of origin (rules of origin) and the certificate of direct transport (Bureau et al., 2007; Keck and Lendle, 2012). These costs could be seen as Non-Tariff Measures (NTMs). Especially exporters in DCs and LDCs consider NTMs in the form of additional trade documents (e.g., certificate of origin and certificate of direct shipment) as a major trade barrier (The United Nations Conference on Trade and Development, 2013b). Therefore, an exporter's decision whether or not to utilize trade preferences depends on the preference margin (relative to differences in transaction costs between the GSP and alternative tariff regimes). A rationally behaving (i.e., profit-maximizing) exporter chooses to take advantage of trade preferences only if at the margin the tariff discount (preference margin) compensates for the costs of compliance associated with all preferential trade agreements (bilateral or unilateral). Therefore we test, if the preference margin has a positive effect on the size of preferential trade flows. Estimating trade liberalization is usually plagued by selection bias (Baier and Bergstrand, 2007). We argue that the GSP status of DCs and LDCs is given exogenously so that we are able to estimate the unbiased effect of the preference margin on LDCs' preferential agro-food exports. To control for the level of development of a particular country, we used the 'Human Development Index'

[4]Suppose that MFN tariffs co-occur with Preferential Trade Agreement (PTA) tariffs. Countries might choose to export under MFN tariffs rather than PTA tariffs due to lower transaction costs. If preferential trade flows are a relatively small fraction of total trade flows (i.e. preferential plus MFN trade flows) looking at total trade flows might well lead to an underestimation of PTAs.

(HDI) provided by the United Nations Development Programme (UNDP) as a proxy for UN LDC status criteria.

5.2 Data

Preferential trade flows were based on the Swiss-Impex database provided by the Swiss Customs Administration (Swiss Customs Administration, 2015) friom 2000 to 2011. We used agro-food exports (including fishery) from HS chapters 01 to 24. Trade data was available on the disaggregated HS 8 digits level for around 190 trading partners. Since the Swiss Customs Administration changed the methodology of foreign trade statistics from producing country to country of origin in 2012, years from 2012 onwards were excluded from the analysis to ensure comparability of the results (Fischer and Pfammatter, 2013).

The dummy variables 'DCs' and 'LDCs' indicate whether a given DC or LDC benefits from the GSP. The information concerning the individual status of a GSP-benefiting DC or LDC was derived from the 'Tariff Preference Regulations' for the years 2002 to 2011. The 'preference margin' was calculated based on the dataset of the SCA. Because of the different tariffs, which exist for different usages of a product (e.g. human consumption or technical usage), the highest tariffs were chosen in all cases. This assumption can lead to biases when calculating the 'preference margin' because the tariff for human consumption is always higher than any other tariff. The original dataset contains MFN and GSP tariffs at the product level.

Further control variables 'Gross Domestic Product' (GDP), 'Population' and 'Economic Remoteness' developed by Baier and Bergstrand (2009a) came from a dataset of The World Bank (2016). The control variables 'Distance', 'Landlocked', 'Island' and 'Common Official Language' were from a dataset of the French Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) (Mayer and Zignago, 2011). The HDI was published by The United Nations Development Programme (2014) and covered 186 countries. The scale ranges from 0 (low human development) to 1 (very high human development).

5.3 Stylized facts

From 2002 onwards, average annual preferential exports decreased until 2004 for DCs and until 2005 for LDC. Afterwards, preferential exports increased for both country groups. Whereas preferential exports of LDCs increased steadily until the end of the observation period, those of DCs reached their highest level in 2007. Between 2007 and 2010, preferential exports of DCs decreased slightly, then increased slightly between 2010 and 2011. In contrast, LDCs showed a steady rise in preferential exports from 2005 to 2011, but a steeper increase from 2007 onwards, when the DFQF market access for LDCs was introduced. However, the descriptive

analysis indicated that trade liberalization was a success story for only a few LDCs, namely Tanzania, Ethiopia, Côte d'Ivoire, Mozambique, Malawi, Senegal, and Uganda. These seven countries captured a total share of nearly 80 percent of LDCs' agro-food exports to Switzerland. A large share of the treatment success can be assigned to the market for 'raw cooking oils' (sunflower oil, coconut oil, groundnut oil and palm oil) for which LDCs' exporters face a tariff cut (preference margin) equal to the product price per kg at the border. For example, the world market price for raw coconut oil is about CHF 1.50 per kg whereas the bound MFN-tariff for this product is likewise CHF 1.50 per kg. A complete tariff cut generates an incentive for exporting under preferential conditions granted by the GSP. In consequence, LDCs' share of total imports in the Swiss market for raw cooking oils increased from zero percent in 2000 to 16 percent in 2011. By now (2016) the GSP is nearly 100 percent utilized within the market for raw cooking oils.

Figure 5.1 shows the (percentage) change in DCs' and LDCs' preferential agro-food exports in relation to the base year 2002. Preferential exports (GSP=0 and GSP<MFN) were aggregated by country and year including zero values. We did not consider the country and product dynamic of the GSP (e.g., in the GSP, graduation from the GSP, or a status change of countries from GSP to FTA). Further, we used nominal rather than real trade flows.

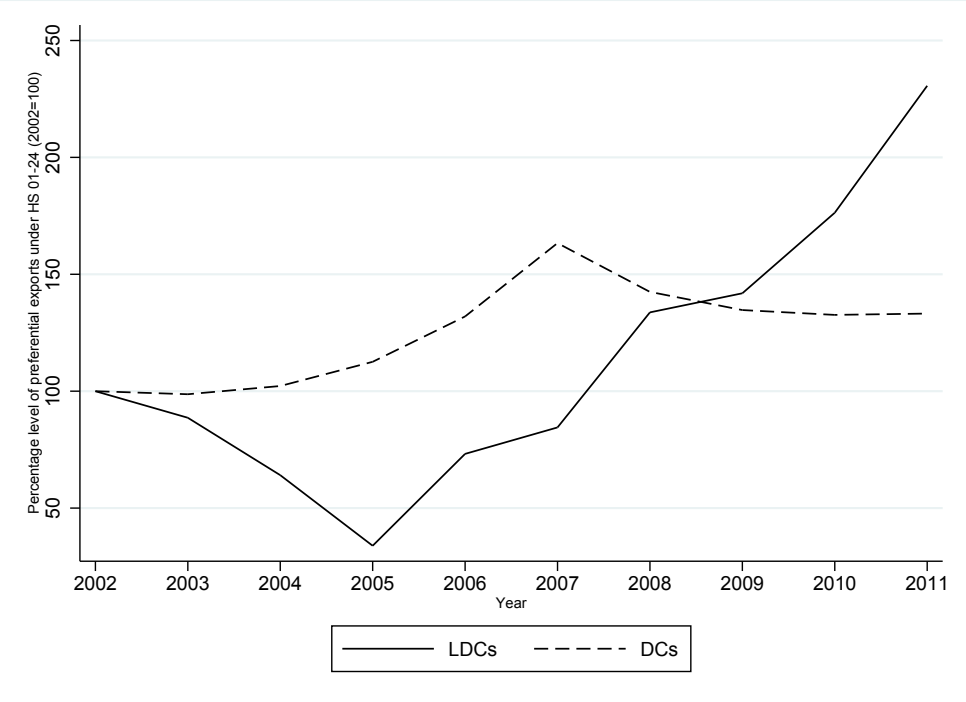

Figure 5.1: Evolution of DCs' and LDCs' preferential agro-food exports to Switzerland (2002=100) (Source: Swiss Customs Administration, 2015)

Using percentage levels of preferential agro-food exports in relation to the base year 2002 rather than absolute values gave a clear picture of the positive effect of the DFQF market access

for LDCs in 2007. LDCs' GSP trade flows more than doubled between 2007 and 2011. Furthermore, and just as important as the increase in LDCs' GSP trade flows after 2007, the DFQF market access for LDCs did not cause a reduction in DCs' preferential agro-food exports.

From 2002 to 2011, the bulk of agro-food exports from GSP-benefiting DCs and LDCs entered Switzerland under a reduced tariff regime or a tariff regime equal to zero. Figure 5.2 shows MFN=0[5], GSP and other reduced tariffs as a percentage of DCs' total exports to Switzerland from 2002 to 2011.

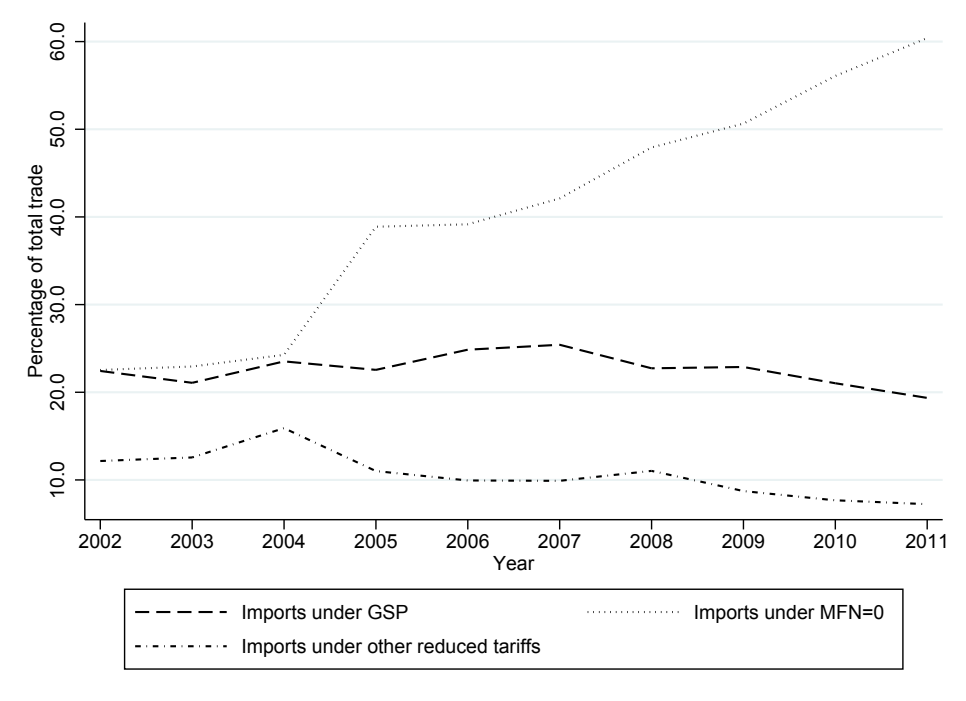

Figure 5.2: Imports under MFN=0, GSP and other reduced tariffs as a percentage of DCs' total trade (Source: Swiss Customs Administration, 2015)

From 2002 to 2004, about 50 percent of DCs' agro-food exports entered under reduced or zero tariffs. Therefore the remaining 50 percent of imports entered mostly under tariff regime 'under tariff' (tariff code 110) which is granted to all WTO members. During 2002 to 2011, 23 percent of agro-food products from DCs were exported under the GSP, 41 percent were exported under the MFN=0 regime and 10 percent were exported under other reduced tariff

[5]The most-favored-nation (MFN) principle is one of the principles of the World Trade Organization (WTO) trading system. 'A country should not discriminate between its trading partners (giving them equally MFN-status); and it should not discriminate between its own and foreign products, services or nationals' (World Trade Organization, 2014a). Therefore, MFN=0 is a tariff which is equal to zero and which is granted to all WTO members.

regimes[6]. From 2002 to 2011, the coverage rate[7] for HS chapters 01 to 24 averaged 34 percent according to the WTO Integrated Database (World Trade Organization, 2014b). From 2002 to 2011, the utilization rate[8] of the DCs was about 46 percent. In total, 74 percent of agricultural and food products from DCs were imported under a tariff lower than the 'under tariff' (tariff code 110) or equal to zero.

Figure 5.3 presents MFN=0, GSP and other reduced tariffs as a percentage of LDCs' total exports to Switzerland from 2002 to 2011.

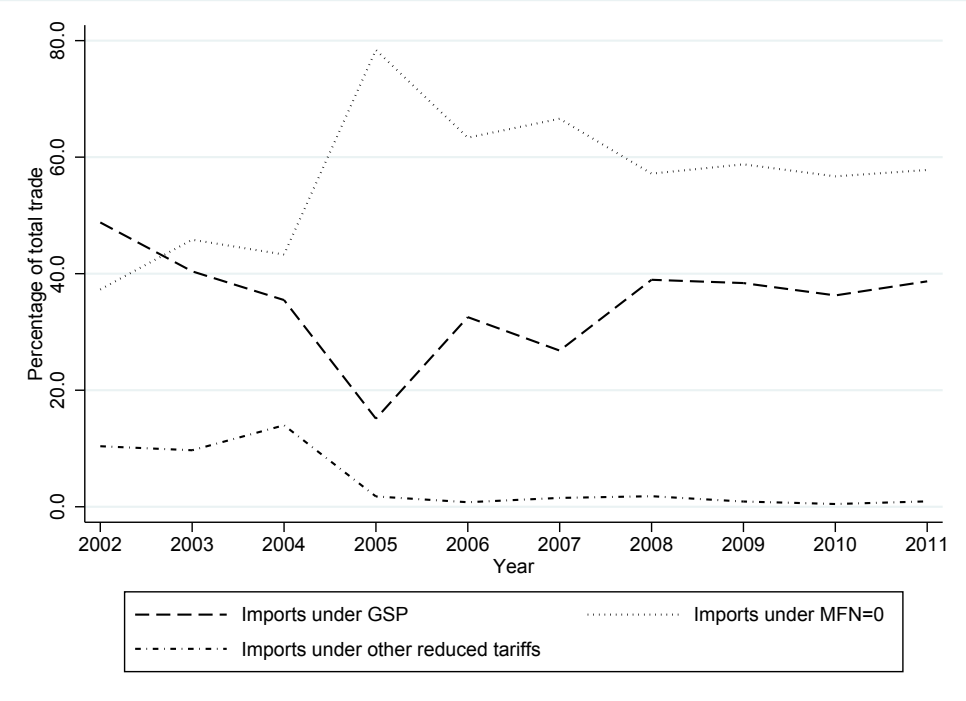

Figure 5.3: Imports under MFN=0, GSP and other reduced tariffs as a percentage of LDCs' total trade (Source: Swiss Customs Administration, 2015)

[6]Other reduced tariffs are: tariff code 140 'customs relief', which is smaller than the tariff that is granted to WTO members (tariff code 110 'under tariff'); tariff code 355 'customs relief', which is equal to zero; tariff code 375 'commercial processing traffic', which is equal to zero; and tariff code 380 'returned goods', which is equal to zero (Swiss Customs Administration, 2015).

[7]The 'coverage rate' is the percentage of products eligible for preferential treatment out of the total number of dutiable products (The United Nations Conference on Trade and Development, 1999).

[8]The utilization rate is calculated based on the following formula:

$$UR_{ijt} = \left(\frac{Preferential\ GSP_{ijt}}{Eligible\ GSP_{ijt}}\right) * 100 \tag{5.1}$$

where UR_{ijt} denotes the utilization rate of country i of product j at time t. $Preferential\ GSP_{ijt}$ represents the actual trade flows introduced under preferential conditions, and $Eligible\ GSP_{ijt}$ the GSP-eligible trade flows of country i and product j at time t. The value 'utilization rate' varies between 0 and 100 percent (The United Nations Conference on Trade and Development, 1999).

In 2002, nearly 50 percent of LDCs' agro-food exports entered Switzerland under the GSP, 40 percent under MFN=0 and 10 percent under other reduced tariffs. From 2002 to 2005, exports under the GSP decreased strongly. In 2005 only 16 percent of imports from LDCs entered Switzerland under the GSP while 78 percent entered under MFN=0. Since 2006 and especially since the DFQF market access in 2007, exports under the GSP recovered and increased steadily. However, on average 40 percent of imports entered under the GSP and about 60 percent under MFN=0. In contrast to GSP-benefiting DCs, the coverage rate of the GSP benefiting LDCs was nearly 100 percent between 2002 and 2011 (World Trade Organization, 2014b). The utilization rate of LDCs is therefore equal to the percentage of imports from LDCs under the GSP (36 percent). In total 93 percent of agricultural and food imports from LDCs entered under an MFN or GSP tariff which was equal to zero or a GSP tariff which was smaller than the tariff that is granted to WTO members.

5.4 Method

5.4.1 Free trade and selection bias

As mentioned above, preferential tariffs for DCs and LDCs under the Swiss GSP are granted on a voluntary and non-reciprocal basis. Contrary to bilateral FTAs, DCs and LDCs did not select themselves into the status of DC or LDC. Furthermore, preferential tariff lines and preferential tariffs to be liberalized are also not selected (Baier and Bergstrand, 2007; Ito, 2013) and the decision whether a country is included in, or graduated from the GSP for DCs and LDCs respectively is based on three threshold-based inclusion criteria which are defined by The United Nations Committee for Development Policy (UN-CDP). Switzerland uses the United Nations (UN) classification of LDCs based on per capita income, economic vulnerability, and human development (The United Nations Committee for Development Policy, 2014). Because data availability on economic vulnerability is meager, we use the HDI as a proxy for UN LDC status criteria.

The HDI which can be considered as a proxy for UN LDC status criteria is based on the 'capability approach'[9] by Sen (1999). The scale ranges from 0 (low human development) to 1 (very high human development). The HDI is calculated as the geometric mean of the following three indices: a health index, an education index and an index based on GNI per capita. UN LDC status criteria and the HDI comprise similar indicators to assess the development stage of

[9]Amartya Sen's 'capability approach' (Sen, 1999) defined the following five dimensions of freedom: (1) political freedom and civil rights (criticism, contradiction and voting rights), (2) economic institutions (access to resources, circumstances of exchange and allocation), (3) social opportunities (education, health and cultural participation), (4) guarantee of transparency (freedom of press and information obligations, e.g. against corruption) and (5) social security (unemployment insurance, welfare and minimum wages).

a nation. For instance, UN LDC status criteria and the HDI use GNI per capita to capture economic growth effects and 'soft factors' concerning education and health. Therefore, countries which are defined as LDCs based on UN LDC status criteria end up with a middle or low human development index within the HDI ranking (The United Nations Development Programme, 2015a).

Furthermore, it seemed highly unlikely that poor countries hold back their macroeconomic development simply in order to benefit from preferential market access to the Swiss market or any other market offering preferential access. Consequently, the exogenous nature of the GSP status reduced the endogeneity problem, so that we were able to provide an unbiased estimate of unilateral trade liberalization.

5.4.2 Empirical strategy

This section provides the empirical strategy for evaluation of the overall effectiveness of the GSP in the agro-food sector (Section 5.4.2.1) and for evaluation of the potential positive effect of the 2007 DFQF market access for LDCs (Section 5.4.2.2). The ultimate goal is to estimate the unbiased effect of the main incentive to export under preferential conditions - the preference margin. The preference margin was calculated according to the following formula based on Olarreaga and Özden (2005):

$$Preference\ Margin = 1 + (Tariff_{MFN} - Tariff_{GSP}) \tag{5.2}$$

where the MFN tariff represents the tariff granted to all WTO members, while the GSP tariff is granted only to the DCs and LDCs included in the GSP. The GSP tariff is at least equal to the MFN rate. As a rule, however, it is lower than the MFN tariff when the latter is not equal to zero. Because Switzerland applies specific tariffs, one would expect to compute 'ad-valorem equivalents' (AVEs). AVEs express specific taxes in percentages. The level of the AVE depends on the unit value (e.g., 1 kg), which is a proxy for the import price (International Trade Centre, 2010). As unit values vary, the preference margin calculated based on AVEs likewise varies, which in consequence causes an unnecessary variation of this independent variable. Furthermore, AVEs cannot be calculated when zero trade flows are considered as done in this study. Consequently, we used specific tariffs and did not calculate AVEs.

5.4.2.1 Estimating the overall effectiveness of the Generalized System of Preferences

First, to estimate the overall effectiveness of the GSP in the agro-food sector we use the following binary logistic regression to determine factors that influence the probability of utilizing the GSP (equation 5.3). Here, the sample consists only of GSP-eligible trade flows.

$$\pi_{ijt} = Pr(Y_{ijt} = 1|X_{ijt} = x_{ijt}) = \beta_0 + \beta_1 logHDI_{it} + \beta_2 logPM_{jt} + \beta_3 LDC_{it} + \varepsilon_{ijt} \tag{5.3}$$

Where i denotes the individual trading partner, j denotes the product at the disaggregated HS 8 digits level and t denotes the time. We consider the case where Y_{ijt} is binary, assuming only two values. Consequently, we define

$$Y_{ijt} = \begin{cases} 1 & \text{preferences used} \\ 0 & \text{preferences not used} \end{cases} \tag{5.4}$$

We consider Y_{ijt} as a realization of a random variable that can take the values of one and zero with the probabilities π_{ijt} and $1-\pi_{ijt}$ respectively (Note: if $Y_{ijt} = 1$ we obtain π_{ijt} and if $Y_{ijt} = 0$ we obtain $1-\pi_{ijt}$). Therefore, the ultimate goal of the logistic regression is to estimate the probability of observing $Y_{ijt} = 1$ respectively $Pr(Y_{ijt} = 1)$ (preferences used) given a particular value for each of the vector of independent variables X_{ijt} (Rabe-Hesketh and Skrondal, 2012). Here, X_{ijt} consists of HDI_{it} as a proxy for LDC status criteria, PM_{jt} the preference margin which acts as an incentive to export under preferential conditions and LDC_{it} which is a binary variable that takes the value of one if an exporter is an LDC, and zero otherwise. Because we are mainly interested in the country group effect of the LDCs on PM_{jt}, we calculated marginal effects for cases where the dummy variable LDC_{it} takes the value of one. ε_{ijt} represents the residual term for unobserved characteristics of a country i, product j at time t (Note: Continuous variables are transformed into logs). Furthermore, we integrate time and product fixed effects. Time fixed effects control for time related variations, which affect all countries equally, for example a global crop failure due to extreme weather events. Product fixed effects allow control for product group-related effects/characteristics which are constant over time, for example 'perishable products vs. long-lasting products' or 'animal vs. vegetable products'.

To control for the trade performance of a given DC or LDC, we further consider basic variables of the economic gravity equation. Tinbergen (1962) took the Newtonian theory of gravitation, which states that the gravitational force is proportional to the product of the masses of the two planets and inversely proportional to their squared distance, and adapted it to the economic theory of international trade. Just as planets are mutually attracted in proportion to their sizes and proximity, so countries trade in proportion to their relevant economic sizes (e.g., GDP or gross national income (GNI)) and their distance (The United Nations Conference on Trade and Development and The World Trade Organization, 2012).

Besides the integration of the classical gravity variables (GDP, Population, Distance and/or GDP per Capita), our model contains a composite term measuring barriers and incentives for

trade between two countries and a term measuring barriers to trade between each country and the rest of the world. For the latter aspect, we use a simple approximation for a multilateral trade-resistance (MTR) term according to Baier and Bergstrand (2009a)[10]. In this study only unidirectional preferential exports of GSP-benefiting DCs and LDCs to Switzerland were used. Therefore, factors which are specific to Switzerland (e.g., GDP, population or market information concerning the GSP) are captured by the constant term β_0. Adding the vector of basic variables $Gravity_{it}$ of the economic gravity model we obtain the following equation (4.6).

$$\pi_{ijt} = Pr(Y_{ijt} = 1 | X_{ijt} = x_{ijt}) = \beta_0 + \beta_1 logHDI_{it} + \beta_2 logPM_{jt} + \beta_3 LDC_{it} + \delta\, Gravity_{it} + \varepsilon_{ijt} \tag{5.6}$$

Notations of the variables for the basic setup are the same as in equation (4.3). In addition we added the vector of basic variables of the gravity equation $Gravity_{it}$. This vector contains the GDP which reflects the supply capacity of a trading partner *i*, the distance between the capital city of a trading partner *i* to Switzerland's capital city Bern and the MTR term which measures trade barriers that each country faces with respect to all its trading partners. The gravity vector was supplemented by various binary control variables which depict exporter specific factors affecting trade (Shepherd, 2013). These binary control variables are 'island', 'landlocked' and 'common official language'. Here again, we calculated marginal effects for cases where the dummy variable LDC_{it} takes the value of one.

Second, to estimate the overall effectiveness of the GSP we restrict the sample to positive exports that entered Switzerland under preferential conditions. For this purpose we separately estimate equation (5.3) and (5.6) using ordinary least squares (OLS). To identify the country group effect for LDCs for each independent variable we use interaction terms. Including an interaction term reflects a theory that the impact of one *x* (e.g., the PM) is conditional upon the specific value of the other *x* (the country group status of the LDCs) (McDaniel, 2016). The corresponding OLS models take the following basic form represented by equation (5.7):

[10] Baier and Bergstrand (2009a) suggest estimating a linear approximation (by means of a first-order Taylor series expansion) of the MTR terms, thus avoiding the non-linear procedure used in Anderson and Wincoop (2003). The MTR of Baier and Bergstrand (2009a) can be formalized by the following equation:

$$\sum_c logDistance_c - \frac{1}{2}\sum_k \sum_c logDistance_{ck} \tag{5.5}$$

Where θ_c represents the share of importer *c* in the worldwide gross national income or gross domestic product. The first term is a weighted average of the trade costs towards all potential trade partners which importer *c* is facing. The second term is the worldwide resistance towards trade flows. This term is identical for all of the trade partners; therefore, it is captured in the constant.

$$logY_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 LDC_{it} + \beta_3 \left(X_{ijt} \times LDC_{it}\right) + \varepsilon_{ijt} \tag{5.7}$$

Where $logY_{ijt}$ represents the logarithmic value of preferential exports under the GSP of exporter i for product j at the disaggregated HS 8 digits level at time t. X_{ijt} depicts the vector of all binary and continuous variables used in equations (4.3) and (4.6). As mentioned above, to identify the country group effect of LDCs, we interact each x with the binary variable LDC_{it}. Here, we calculated the marginal effects for nonlinear combination of estimators for the variable $logPM_{jt}$ $\left(\left(logPM_{jt} \times LDC_{it}\right) + logPM_{jt}\right)$.

As an additional robustness check we estimate equation (5.7) using Poisson Pseudo Maximum Likelihood (PPML). In contrast to OLS, PPML is able to include zero values and account for heteroscedasticity, which are both common in trade data (Silva and Tenreyro, 2006). The PPML is the one of the most reliable estimators currently available to estimate regression models in the presence of excessive zero values. Although the dependent variable for the PPML regression is specified as levels rather than logarithms, the coefficient of any independent variables entered in logarithms can still be interpreted as simple elasticities (Shepherd, 2013).

5.4.2.2 Estimating the effect of duty-free and quota-free market access for least developed countries

Since 2007, Switzerland has offered LDCs DFQF market access to the Swiss market for all agricultural products. Here, we are interested in whether there is a difference in the relationship between Y and each x across two time periods and consequently if the DFQF market access with the corresponding complete tariff cut had a positive effect on LDCs' preferential exports (Note: This subsection refers exclusively to McDaniel (2016)). The first time period is from 2002 to 2006 (prior to the DFQF market access) and the second time period is from 2007 to 2011 (after the DFQF market access). First, we test the structural shift caused by the 2007 DFQF market access by performing the Chow test (Chow, 1960) using the following equation (5.8):

$$logY_{ijt} = \beta_0 + \beta_1 logHDI_{it} + \beta_2 logPM_{jt} + \delta\, Gravity_{it} + \varepsilon_{ijt} \tag{5.8}$$

Notations of the variables are the same as in equation (5.6). The Chow test is used to test a structural shift of a model. Therefore, the Chow test is a test for performance differences between two regressions measured by the standard error of the estimate (SSE). For this purpose, we split the sample (restricted to LDCs) into two sub-samples ($size = n_1$ from 2002 to 2006 and $size = n_2$ from 2007 to 2011), and compare their SSE with the overall performance (full sample $n = n_1 + n_2$ from 2002 to 2011). Therefore, we estimate the same model three times using

these three samples. After saving the SSE for the full sample and the split samples, we have to calculate an F-test[11]. The null hypothesis suggests that there is no structural shift whereas the alternative hypothesis suggests the existence of a structural shift. If the models are different in the two sub-samples, then the fit of each model in the corresponding sub-sample will be much better than the fit of the model as a whole (sample $size = n$). To check the significance of the potential structural shift, one has to consider the F-distribution table.

Second, we test the effect of the 2007 DFQF market access for LDCs by using a model that includes a time related dummy variable for the time period from 2007 to 2011 and involving this time related dummy variable and each X. For this purpose we restrict the sample to preferential exports of the LDCs using the following model (equation 5.10).

$$logY_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 DFQF_t + \beta_3 \left(X_{ijt} \times DFQF_t\right) + \varepsilon_{ijt} \tag{5.10}$$

Notations of the variables are the same as in equations (5.3), (5.6) and (5.7). Instead of the binary country group LDC_{it} we integrate the time related dummy variable $DFQF_t$ that takes a value of one for the years from 2007 to 2011 (after the DFQF market access) and zero for the years from 2002 to 2006 (prior to the DFQF market access). Because the DFQF market access constitutes a complete tariff cut, we are mainly interested in the effect of the preference margin on preferential exports. Note: Because the DFQF market access itself implicitly has a time dimension, we did not control for time fixed effects. Furthermore, the linearity measured by the R^2 and the fit of the model measured by the SSE did not increase significantly.

5.5 Results and discussion

5.5.1 Overall effect of the Generalized System of Preferences

The emphasis of the following interpretation is dedicated to the effect of the preference margin on LDCs' preferential exports. Consequently, Table 5.1 presents marginal effects for $logPM_{jt}$ for LDCs on Y for the logistic, OLS and PPML regressions. Detailed regression results can be found in Appendix 5.7. Because the literature has already pointed out that common borders, geographic distance, and other covariates do affect trade flows, we omit this discussion and

[11] The F-test is based on the following formula:

$$f = \frac{\frac{SSE_n - (SSE_{n1} + SSE_{n2})}{k+1}}{\frac{SSE_{n1} + SSE_{n2}}{[n_1 - (k+1)] + [n_2 - (k+1)]}} \tag{5.9}$$

Where f represents the calculated test statistic (Note: we work on the 95 percent confidence level). k depicts the number parameters estimated (including the intercept β_0) (McDaniel, 2016).

Table 5.1: Marginal effects for the independent variable $logPM_{jt}$
(Logit, OLS and PPML)

Logit (Basic)	OLS (Basic)	PPML (Basic)	Fixed Effects
0.048***	0.412***	0.448***	none
(0.002)	(0.092)	(0.027)	
0.047***	0.395***	0.430***	time
(0.002)	(0.092)	(0.026)	
0.053***	0.253**	0.295***	time & product
(0.003)	(0.109)	(0.034)	
Logit (Basic)	OLS (Gravity)	PPML (Gravity)	Fixed Effects
0.051***	0.331***	0.442***	none
(0.002)	(0.093)	(0.027)	
0.047***	0.326***	0.433***	time
(0.002)	(0.093)	(0.024)	
0.052***	0.171	0.306***	time & product
(0.003)	(0.109)	(0.033)	

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

focus more on the discussion about the effectiveness of the GSP in form of the relationship between the preference margin and preferential agro-food exports.

GATT/WTO negotiations since 1947 have led to a gradual reduction in the average applied tariffs. Many of the applied MFN-tariffs are nowadays near or equal to zero (Lederman and Özden, 2004). In consequence, a large share of DCs' and LDCs' agro-food exports entered Switzerland under MFN=0 or other reduced tariffs aside from the GSP (see Section 5.3). In this context it has to be emphasized that the GSP works within the framework of the WTO and can be considered as an additional opportunity for DCs and LDCs to export under (preferential) duty-free and reduced tariffs. Accordingly, the incentive for a Swiss importer may increase for choosing an exporter located in a DC or LDC, because the tariff advantage generates so-called 'preference rents' (Cirera, 2014).

Regression results for logistic, OLS and PPML unequivocally indicate the expected positive relationship between the preference margin and LDCs' preferential agro-food exports. In general, calculated marginal effects for logit, OLS and PPML estimations can be interpreted as elasticities. In case of logit estimations we restricted the sample to trade flows which had been eligible for preferential treatment under the GSP. Therefore, we estimated whether or not preferences had been used (binary dependent variable Y_{ijt}). For all logit model variations a one percent increase in the preference margin increases the probability of the GSP for LDCs being utilized by on average five percentage points.

In case of the OLS and PPML estimations the marginal effect of the preference margin on

LDCs' preferential agro-food exports is likewise positive and highly significant for most of the model variations. Furthermore, magnitudes of the marginal effects of the OLS and PPML estimators do not differ significantly from each other. Only in the case of the model variation 'OLS - Gravity with time and product fixed effects' is the positive effect of the preference margin statistically non significant. It should be noted in this regard that the positive effect of the preference margin on LDCs' preferential agro-food exports is damped when time and product fixed effects are added to the models. Because the preference margin is time and product related (it varies over time and products), we assume, that time and product fixed effects capture costs of compliance in the form of obtaining certificates of origin and direct shipment. According to Häberli (2008), NTMs are more relevant than tariffs, especially for LDCs. While tariffs are mostly near or equal to zero, NTMs of the GSP in the form of restrictive rules of origin and certificate of direct shipment are - besides sanitary and phytosanitary requirements, private product standards and environmental standards - additional obstacles to benefiting from preferential market access. Nevertheless, the positive effect of the preference margin on LDCs' preferential exports is robust throughout the majority of model variations. Consequently, a one percent increase in the preference margin increases LDCs' preferential agro-food exports by between 0.25 and 0.45 percentage points.

5.5.2 The 2007 duty-free and quota-free market access for least developed countries

Regression results where we used the pooled sample from 2002 to 2011 (including DCs) unequivocally indicated that the preference margin increases the probability of the GSP being utilized by an exporter located in an LDC and that the preference margin increases the size of preferential exports. In this section we want to investigate whether this positive effect of the preference margin on LDCs' preferential agro-food exports was triggered by the 2007 DFQF market access. For this purpose we identify the occurrence of a structural shift using (i) the Chow test and (ii) an interaction model (see Section 5.4.2.2). For the interaction model we calculated nonlinear combinations of estimators $\left(\left(X_{ijt} \times DFQF_t\right) + X_{ijt}\right)$. Parameter estimates for the interaction model are identical to those of the Chow test of the split sample n_2 (split sample from 2007 to 2011). Therefore, estimation results for the interaction model can be found in Appendix 5.8. Here again, we omit this discussion on gravity controls and focus more on the discussion about the relationship between the preference margin and preferential agro-food exports.

Table 5.2 presents results for the Chow test (n = full sample from 2002 to 2011; n_1 = split sample from 2002 to 2006; n_2 = split sample from 2007 to 2011) using OLS without and with product fixed effects (Note: the sample was restricted to LDCs' preferential agro-food exports). The integration of product fixed effects increases the linearity of the model measured by the R^2

Table 5.2: Chow test: OLS regression results with the dependent variable $logY_{ijt}$

Independent Variable	OLS (n)	OLS (n)	OLS (n_1)	OLS (n_1)	OLS (n_2)	OLS (n_2)
logPM	0.331***	0.827**	0.201	0.567	0.337***	-0.734
	(0.093)	(0.333)	(0.137)	(0.352)	(0.122)	(2.851)
logHDI	-1.460**	-0.473	-8.820***	-1.532	-0.030	0.281
	(0.735)	(0.532)	(2.010)	(2.469)	(0.877)	(0.692)
logGDP	0.198	0.610**	-0.251	0.127	1.459***	0.839*
	(0.320)	(0.261)	(0.709)	(0.450)	(0.396)	(0.464)
logPopulation	-0.292	-0.509*	-0.389	-0.141	-1.433***	-0.478
	(0.295)	(0.261)	(0.681)	(0.679)	(0.341)	(0.469)
logDistance	0.496	-0.092	1.427	-1.089	-2.725**	-3.182**
	(0.828)	(0.702)	(1.147)	(1.080)	(1.244)	(1.552)
logMTR	7.548	-27.381	-51.379**	-15.761	97.847***	6.857
	(20.775)	(18.358)	(20.444)	(23.226)	(23.019)	(35.412)
Official Language	-1.582***	-0.618*	-3.025***	-0.211	-1.928***	-1.701***
	(0.327)	(0.326)	(0.769)	(1.054)	(0.406)	(0.512)
Landlocked	-0.973***	0.315	-2.125***	0.609	-0.353	-0.229
	(0.338)	(0.320)	(0.620)	(0.605)	(0.401)	(0.450)
Island	-2.174***	0.343	0.523	0.449	-3.342***	0.637
	(0.475)	(0.480)	(0.782)	(1.075)	(0.587)	(0.844)
ProductFE	No	Yes	No	Yes	No	Yes
TimeFE	No	No	No	No	No	No
Observations	740	740	324	324	416	416
R^2	0.182	0.757	0.161	0.800	0.331	0.811
SSE	5,592.9	1,659.9	2,170.4	516.6	2,838.8	804.1

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

and the fit of the model measured by the *SSE*. For all model variations (without and with product fixed effects) we can reject the null hypothesis of equal slopes and intercepts ($p < 0.000$).

Estimation results for the full sample (2002 to 2011) indicate a positive effect of the preference margin on LDCs' preferential agro-food exports. In contrast to logit, OLS and PPML estimation results including DCs, the positive effect of the preference margin on LDCs' preferential agro-food exports increases when product fixed effects are added to the model. Consequently, a one percent increase in the preference margin increases LDCs' preferential agro-food exports by between 0.3 and 0.8 percentage points.

In the case of the model variations for the split sample n_1 (2002 to 2006) the positive effect of the preference margin likewise increases when time and product fixed effects are added to the model. However, the positive effect of the preference margin is statistically non-significant in the case of the model variations without and with product fixed effects. In the case of the model variations for the split sample n_2 (2007 to 2011) we obtained a negative but statistically non-significant effect of the preference margin where time and product fixed effects are added to model. In this context it is important to note, that the 2007 DFQF market access for LDCs was gradually introduced in 2001 with a 10 to 50 percent tariff reduction and in 2004 with a 55 to 75

percent tariff reduction compared to the MFN tariff (The United Nations Conference on Trade and Development, 2012; Swiss Customs Administration, 2015). Figure 5.4 shows the evolution of specific MFN and GSP tariffs for HS 1512.1190 'sunflower oil' with the corresponding progressive tariff cuts in 2004 and 2007 (vertical dotted lines).

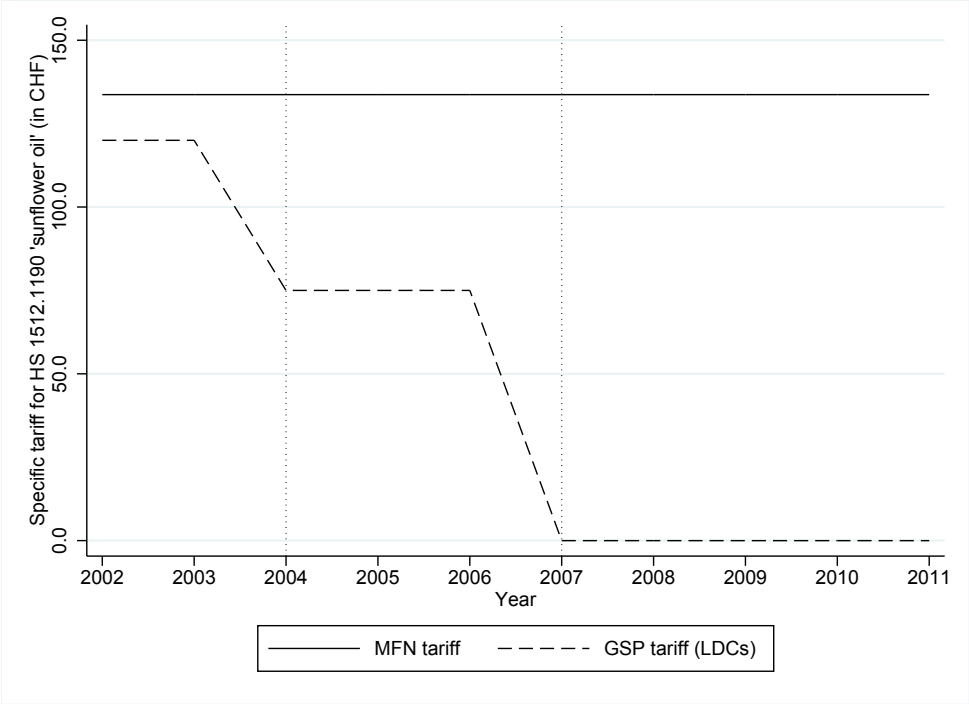

Figure 5.4: Specific MFN and GSP tariffs for HS 1512.1190 'sunflower oil' from 2002 to 2011 (Source: Swiss Customs Administration, 2015)

This example illustrates that, after the 2007 DFQF market access with a 100 percent tariff cut, the preference margin for a given product no longer varies over time and products. Therefore, adding product fixed effects to the model (e.g., capturing costs of compliance) dampens the effect of the preference margin, or turns the effect negative (but statistically non-significant).

This exercise clearly demonstrates that it is difficult to model the boost in LDCs' preferential agro-food indicated by Figure 5.1 (Section 5.3). Even though it must be assumed that the boost in LDCs' preferential agro-food exports is triggered by the 2007 DFQF market access, or by the progressive tariff cuts, it is quite challenging to evaluate the potential positive effects of free trade using simple regression techniques. Ritzel and Kohler (2016b) used methods of causal inference to estimate the unbiased causal effect of the Swiss 2007 DFQF market access on LDCs' preferential agro-food exports. Similar to this study, the authors argued that the LDC status was given exogenously and can therefore be considered as a quasi-experiment. Using the synthetic control group method in combination with difference-in-differences analysis, the authors found that LDCs' preferential agro-food exports increased by between 80 and 160 percent. Here, variations concerning the causal effect mainly occurred due to data limitations and/or to

choice of matching-covariates.

5.6 Conclusions

The main focus of this analysis concerns the question whether the GSP fosters LDCs' preferential agro-food exports and consequently whether the GSP was suitable to integrate LDCs into the Swiss agro-food markets. The descriptive analysis indicated that LDCs' GSP trade flows more than doubled between 2007 and 2011. Therefore, we primarily analyzed the effect of the preference margin on LDCs' preferential agro-food exports. An exporter's decision whether or not to utilize trade preferences depends on the preference margin. A rationally behaving (i.e., profit-maximizing) exporter chooses to take advantage of trade preferences only if at the margin the tariff discount (preference margin) compensates for the costs of compliance associated with all preferential trade agreements (bilateral or unilateral). Using the HDI as a proxy for UN LDC status criteria we were able to provide an unbiased estimate of the preference margin on LDCs' preferential agro-food exports. We found (i) that a one percent increase in the preference margin increases the probability of the GSP for LDCs being utilized by on average five percentage points and (ii) that a one percent increase in the preference margin increases LDCs' preferential agro-food exports by between 0.25 and 0.45 percentage points. However, from 2002 to 2011 a large share of LDCs' agro-food exports entered Switzerland under MFN=0 where - in contrast to the GSP - virtually no costs of compliance accrue. Nevertheless, the GSP works within the framework of the WTO and, the GSP can therefore be considered as an additional opportunity to export under duty-free concessions.

The exercise of estimating the (unbiased) effect of the 2007 DFQF market access for LDCs showed how difficult it was to evaluate such a policy change within the framework of simple regressions. Although here again, we identified a positive effect of the preference margin on LDCs' preferential agro-food exports, adding product fixed effects turned the effect negative (but statistically non-significant). However, this was also due to the fact that, after the complete tariff cut in 2007, the preference margin for a given product no longer varied over time and products. Nevertheless, this exercise clearly showed that methods of causal inference are more appropriate to evaluate an exogenous policy change in the form of the 2007 DFQF market access for LDCs.

5.7 Appendix: Logistic, Ordinary Least Squares and Poisson Pseudo Maximum Likelihood regression results

Table 5.3: Logistic regression results with the dependent binary variable Y_{ijt} (baseline model)

Independent Variable	Logit (Basic)	Logit (Basic)	Logit (Basic)
logPM	0.258***	0.253***	0.569***
	(0.008)	(0.008)	(0.041)
logHDI	0.165**	0.232***	0.256***
	(0.065)	(0.069)	(0.082)
LDC	-0.512***	-0.495***	0.100
	(0.048)	(0.049)	(0.067)
ProductFE	No	No	Yes
TimeFE	No	Yes	Yes
Observations	31,860	31,860	26,983
$PseudoR^2$	0.031	0.033	0.121

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 5.4: Logistic regression results with the dependent binary variable Y_{ijt} (reduced gravity model)

Independent Variable	Logit (Gravity)	Logit (Gravity)	Logit (Gravity)
logPM	0.261***	0.255***	0.570***
	(0.008)	(0.008)	(0.042)
logHDI	0.164**	0.605***	0.594***
	(0.074)	(0.090)	(0.105)
LDC	-0.382***	-0.497***	0.003
	(0.058)	(0.060)	(0.080)
logGDP	-0.204***	-0.336***	-0.384***
	(0.017)	(0.022)	(0.026)
logPopulation	0.250***	0.362***	0.397***
	(0.017)	(0.020)	(0.024)
logDistance	0.109**	0.060	0.038
	(0.052)	(0.053)	(0.059)
logMTR	-5.316***	-3.401***	-2.960***
	(0.953)	(0.979)	(1.140)
Language	-0.435***	-0.430***	-0.436***
	(0.055)	(0.056)	(0.067)
Landlocked	-0.378***	-0.405***	-0.389***
	(0.076)	(0.076)	(0.189)
Island	0.460***	0.384***	0.410***
	(0.037)	(0.038)	(0.044)
$ProductFE$	No	No	Yes
$TimeFE$	No	Yes	Yes
$Observations$	31,837	31,837	26,977
$PseudoR^2$	0.046	0.051	0.137

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 5.5: OLS regression results with the dependent variable $logY_{ijt}$ (baseline model)

Independent Variable	OLS (Basic)	OLS (Basic)	OLS (Basic)
logPM x LDC	0.611***	0.604***	0.280***
	(0.095)	(0.176)	(0.087)
logHDI x LDC	-1.752***	-2.384***	-1.056***
	(0.438)	(0.448)	(0.397)
logPM	-0.199***	-0.210***	-0.027
	(0.022)	(0.022)	(0.090)
logHDI	0.336**	0.765***	0.234
	(0.161)	(0.176)	(0.159)
LDC	-3.416***	-3.763***	-2.603***
	(0.443)	(0.449)	(0.407)
ProductFE	No	No	Yes
TimeFE	No	Yes	Yes
Observations	11,158	11,158	11,158
R^2	0.011	0.017	0.405

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 5.6: OLS regression results with the dependent variable $logY_{ijt}$ (reduced gravity model)

Independent Variable	OLS (Gravity)	OLS (Gravity)	OLS (Gravity)
logPM x LDC	0.509***	0.504***	0.218**
	(0.095)	(0.095)	(0.089)
logHDI x LDC	-2.015***	-2.509***	-2.258***
	(0.750)	(0.761)	(0.554)
logPM	-0.177***	-0.178***	-0.047
	(0.022)	(0.022)	(0.087)
logHDI	0.554***	0.869***	0.630***
	(0.168)	(0.200)	(0.181)
LDC	56.674	61.971	55.217**
	(39.335)	(38.191)	(23.748)
logGDP x LDC	-0.358	-0.387	0.149
	(0.320)	(0.317)	(0.225)
logPopulation x LDC	0.243	0.259	-0.215
	(0.295)	(0.291)	(0.212)
logDistance x LDC	1.298	1.512*	0.319
	(0.831)	(0.814)	(0.498)
logMTR x LDC	-29.728	-32.959	-27.653**
	(20.779)	(20.191)	(12.493)
Language x LDC	-0.983***	-1.045***	-0.392
	(0.367)	(0.370)	(0.288)
Landlocked x LDC	-2.062***	-2.101***	-0.060
	(0.408)	(0.409)	(0.343)
Island x LDC	-0.892*	-0.832*	0.733**
	(0.477)	(0.472)	(0.353)
logGDP	0.556***	0.521***	0.409***
	(0.038)	(0.048)	(0.043)
logPopulation	-0.535***	-0.503***	-0.330***
	(0.035)	(0.043)	(0.040)
logDistance	-0.803***	-0.797***	-0.603***
	(0.111)	(0.111)	(0.101)
logMTR	37.276***	37.306***	21.902***
	(2.291)	(2.332)	(2.106)
Language	-0.598***	-0.559***	-0.382**
	(0.171)	(0.174)	(0.157)
Landlocked	1.089***	1.077***	0.196
	(0.231)	(0.231)	(0.224)
Island	-1.281***	-1.322***	-0.985***
	(0.072)	(0.077)	(0.068)
ProductFE	No	No	Yes
TimeFE	No	Yes	Yes
Observations	11,156	11,156	11,156
R^2	0.125	0.130	0.449

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 5.7: PPML regression results with the dependent variable Y_{ijt} (baseline model)

Independent Variable	PPML (Basic)	PPML (Basic)	PPML (Basic)
logPM x LDC	0.243***	0.244***	0.015
	(0.029)	(0.029)	(0.073)
logHDI x LDC	0.474	0.145	0.135
	(0.574)	(0.551)	(0.551)
logPM	0.206***	0.186***	0.280***
	(0.011)	(0.012)	(0.056)
logHDI	0.300	0.688**	0.692**
	(0.296)	(0.307)	(0.307)
LDC	-3.450***	-3.569***	-2.806***
	(0.389)	(0.374)	(0.335)
$ProductFE$	No	No	Yes
$TimeFE$	No	Yes	Yes
$Observations$	1,646,096	1,646,096	1,646,096
$PseudoR^2$	0.084	0.088	0.227

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

Table 5.8: PPML regression results with the dependent variable Y_{ijt} (reduced gravity model)

Independent Variable	PPML (Gravity)	PPML (Gravity)	PPML (Gravity)
logPM x LDC	0.249***	0.247***	0.050
	(0.027)	(0.027)	(0.071)
logHDI x LDC	2.428***	2.047**	2.029**
	(0.816)	(0.840)	(0.839)
logPM	0.193***	0.186***	0.255***
	(0.011)	(0.012)	(0.055)
logHDI	-0.322	0.098	0.118
	(0.335)	(0.419)	(0.420)
LDC	-23.123	-18.986	-17.166
	(42.685)	(42.858)	(42.833)
logGDP x LDC	-0.823***	-0.803***	-0.801***
	(0.170)	(0.180)	(0.178)
logPopulation x LDC	1.034***	1.019***	1.015***
	(0.294)	(0.306)	(0.305)
logDistance x LDC	-1.598	-1.524	-1.496
	(1.627)	(1.675)	(1.669)
logMTR x LDC	17.402	14.936	14.320
	(24.071)	(24.386)	(24.350)
Official Language x LDC	1.573***	1.541***	1.536***
	(0.416)	(0.414)	(0.414)
Landlocked x LDC	0.358	0.409	0.410
	(0.455)	(0.453)	(0.452)
Island x LDC	-2.158***	-2.084***	-2.085***
	(0.542)	(0.534)	(0.535)
logGDP	0.472***	0.343***	0.348***
	(0.081)	(0.095)	(0.095)
logPopulation	0.125*	0.239**	0.238***
	(0.070)	(0.081)	(0.082)
logDistance	0.431	0.251	0.234
	(0.294)	(0.324)	(0.325)
logMTR	39.686***	43.157***	43.607***
	(4.323)	(4.832)	4.851
Official Language	-0.671***	-0.684***	-0.676***
	(0.232)	(0.232)	(0.231)
Landlocked	-1.797***	-1.890***	-1.889***
	(0.307)	(0.310)	(0.309)
Island	-1.608***	-1.694***	-1.691***
	(0.154)	(0.159)	(0.158)
ProductFE	No	No	Yes
TimeFE	No	Yes	Yes
Observations	1,632,347	1,632,347	1,632,347
PseudoR^2	0.259	0.260	0.451

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

5.8 Appendix: 2007 duty-free and quota-free market access interaction model

Table 5.9: Interaction model: OLS regression results with the dependent variable $logY_{ijt}$

Independent Variable	OLS (1)	OLS (2)
logPM	0.337***	-0.734
	(0.122)	(2.820)
logHDI	-0.030	0.281
	(0.878)	(0.684)
DFQF	-52.032***	-18.220
	(13.669)	(69.903)
logGDP	1.460***	0.839*
	(0.397)	(0.459)
logPopulation	-1.433***	-0.478
	(0.341)	(0.464)
logDistance	-2.725**	-3.182**
	(1.246)	(1.506)
logMTR	97.847***	6.857
	(23.055)	(35.023)
Official Language	-1.929***	-1.701***
	(0.407)	(0.507)
Landlocked	-0.353	-0.229
	(0.402)	(0.446)
Island	-3.342***	0.637
	(0.587)	(0.834)
ProductFE	No	Yes
TimeFE	No	No
Observations	740	740
R^2	0.268	0.807

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

6 Protectionism, how stupid is this? The causal effect of free trade for the world's poorest countries: Evidence from a quasi-experiment in Switzerland

Joint work with Andreas Kohler

6.1 Introduction[1]

> Since the start of the new millennium we have seen strong evidence of how trade, as a critical component of economic growth and development, can make a positive difference in people's lives. Rapid economic growth in many developing economies over this period has been combined with deeper integration into the global trading system (Roberto Azevêdo, Director-General of the World Trade Organization (WTO) (World Trade Organization, 2014b).

There is a broad body of literature in (development) economics proposing a positive correlation between trade liberalization and economic growth (see e.g. Edwards, 1992; Harrison, 1994). The argument is usually that openness to trade provides access to imported inputs, which embody new technology, increase the size of markets for exports, and affect a country's specialization patterns. Whatever the channel, it is usually assumed that an increase in trade has an effect on economic growth. Hence, trade policy through trade liberalization or a deeper integration into the world economy might stimulate economic growth. For the validity of this argument, it is crucial to know if and to what extent trade liberalization actually causes more trade especially for the poorest countries in the world. This seemingly trivial question that should be straightforward to answer turns out to be challenging. The main reason why it is so hard to find convincing answers is that trade partners select themselves into Free Trade Agreements (FTAs). This voluntary participation implies that most studies on the effects of free trade are likely to be confounded by selection bias: unobserved factors that determine the selection into FTAs also affect trade flows (Baier and Bergstrand, 2007; Baier and Bergstrand, 2010).

[1] A version of this article is published in Journal of Policy Modeling, 2017, Vol. 39(6), pp. 1007-1018 (Elsevier).

To overcome the selection bias, we studied a quasi-experimental setup in Switzerland. In the context of the WTO's Generalized System of Preferences (GSP), Switzerland offers preferential market access to Developing Countries (DCs) and Least Developed Countries (LDCs). Since 2007, Switzerland has offered LDCs Duty-Free and Quota-Free (DFQF) access to the Swiss market for all agricultural products (The United Nations Conference on Trade and Development, 2012). This reform offers a quasi-experimental setup that allowed us to study the causal effect of (unilateral) free trade on agro-food exports of LDCs to a small and rich market. First, and most important, there is no self-selection into the LDC status. Switzerland uses the United Nations (UN) classification of LDCs based on per capita income, economic vulnerability, and human development. It seems highly unlikely that poor countries would hold back their macroeconomic development just in order to benefit from DFQF access to the Swiss market. Second, during the observation period preferential market access to Switzerland has not changed for DCs. This fact allowed us to construct a control unit. Although the allocation of the treatment is not random, i.e., the DFQF market access is granted to LDCs but not to DCs, we argue that conditional on LDC status, the allocation of treatment can be viewed as random. Our paper contributes to the literature by providing a causal estimate of the effects of free trade on the poorest countries' exports. Thus, we also provide evidence for a crucial (necessary but not sufficient) condition in the argument that trade policy affects economic growth, namely, that trade liberalization causes exports from the poorest countries to increase.

So far, the existing literature on the evaluation of trade liberalization with regard to trade flows estimated either economic gravity models (e.g. Emlinger et al., 2008; Cirera and Gasiorek, 2011; Gil-Pereja et al., 2014) or computable general equilibrium models (e.g. Haddad et al., 2002; Kitwiwattanachai et al., 2010; Xin, 2014). Although most studies emphasized selection bias issues in estimating the causal effect of trade liberalization, they usually neglected them in the analysis. To our knowledge Baier and Bergstrand (2009b) were the first ones who tried to provide empirical evidence for causal effects of FTAs. They applied nonparametric matching techniques to estimate the causal long-term effects of FTAs on bilateral international trade flows as well as the long-term effects of membership in the European Economic Community and Central American Common Market between 1960 and 2000. Using the same techniques, Baier and Bergstrand (2010) evaluated the impact of the bilateral FTA between Switzerland and Mexico in 2002. The authors found that the Swiss-Mexican FTA in 2002 increased bilateral trade by about 37 percent after only four years in place. Similar to Baier and Bergstrand (2009b; 2010), Magrini et al. (2013) estimated the causal effect of trade preferences granted by the European Union (EU) to southern Mediterranean countries by using matching techniques. The results of their study showed a significant impact of EU preferences in agriculture and fishery granted to southern Mediterranean countries on trade flows. Whereas these studies addressed selection bias by using matching techniques, we went one step further

by studying the quasi-experimental setup of the GSP reform offering LDCs DFQF access to the Swiss market. To estimate the causal effect of the DFQF treatment for LDCs in 2007, we applied the synthetic control method in combination with Difference-in-Differences (DiD) analysis. The GSP reform creates a natural control group of DCs that are not affected by the reform. As the group of DCs is very heterogeneous, we constructed a synthetic control unit of DCs based on the UN LDC status criteria. The method of creating a synthetic control unit was pioneered by Abadie and Gardeazabal (2003) and Abadie et al. (2010) who applied it to a wide range of socio-economic phenomena caused by political or other collective interventions. Abadie and Gardeazabal (2003) estimated unbiased effects of the economic costs of conflict measured by a negative Gross Domestic Product growth rate in the Basque Country after the occurrence of several terroristic attacks by the Euskadi Ta Askatasuna, whereas Abadie et al. (2010) studied the causal effect of California's Tobacco Control Program on reducing individual smoking activity.

Besides exporting under GSP tariffs, LDCs also have the possibility to export under alternative tariff regimes, e.g., WTO Most-Favored Nations (MFN) tariffs (if they are a WTO member). In practice, preferential trade agreements, like the GSP or FTAs, are never fully utilized due to bureaucratic obstacles in the form of export certificates (e.g., certificate of origin and certificate of direct shipment) (Bureau et al., 2007; Keck and Lendle, 2012). By not differentiating between prevailing tariff regimes, one is likely to obtain biased estimates of trade liberalization effects[2]. Contrary to the existing literature, we took this factor into account examining trade flows under preferential tariff regimes.

The remainder of this paper is organized as follows: In Section 6.2 an introduction to the Swiss trade policy and the GSP reform for LDCs in 2007 is provided. Next, the underlying data set is described (Section 6.3). In Section 6.4, stylized facts of the incentives and developments that are associated with the GSP reform for LDCs in 2007 are presented. Section 6.4 includes incentives in form of the product coverage rate and the preference margin (Subsection 6.4.1) as well as the common trend of preferential trade flows of DCs and LDCs (Subsection 6.4.2). Section 6.5 presents the empirical strategy including information concerning the concept of causal inference (Section 6.5.1), the DiD analysis (Section 6.5.2), DiD matching applied to LDC status criteria (Section 6.5.3), and finally the synthetic control method (synth-algorithm) (Section 6.5.4). Section 6.6 discusses the results of the DiD matching approach (Subsection 6.6.1) and results of the synth-algorithm in combination with DiD analysis (Subsection 6.6.2). To conclude, the essential findings of this article are summarized in Section 6.7.

[2]Suppose that MFN tariffs co-occur with Preferential Trade Agreement (PTA) tariffs. Countries might choose to export under MFN tariffs rather than PTA tariffs due to lower transaction costs. If preferential trade flows are a relatively small fraction of total trade flows (i.e. preferential plus MFN trade flows) looking at total trade flows might well lead to an underestimation of PTAs.

6.2 Swiss trade policy and Generalized System of Preferences reform

No other nation has signed more bilateral and multilateral FTAs than Switzerland. As of 2016, 32 bilateral and multilateral FTAs are in effect and nine FTAs are currently under negotiation (State Secretariat for Economic Affairs, 2015). Swiss trade policy rests upon five main pillars: WTO membership, bilateral agreements with the EU, bilateral agreements with non-EU members, multilateral European Free Trade Agreement, and finally unilateral trade preferences via the GSP for DCs and LDCS (Baier and Bergstrand, 2010).

Evaluating international trade liberalization is often confounded by selection bias. A cutback of tariff barriers to trade in the framework of bilateral and multilateral FTAs is not randomized, since countries select themselves into FTAs. Further, self-selection into FTAs is associated with transaction costs (e.g., transaction costs for extensive negotiations) (Baier and Bergstrand, 2007; Baier and Bergstrand, 2010).

In this case study, we used a quasi-experimental setup in Switzerland to estimate the casual effect of unilateral trade liberalization for GSP-benefiting LDCs in the agro-food sector. Since March 1st, 1972 Switzerland has granted on a voluntary and non-reciprocal basis preferential market access to DCs and LDCs. At first glance, the voluntary and non-reciprocal preferential treatment of the DCs and LDCs contradicts the MFN clause of the General Agreement on Tariffs and Trade (GATT) of the WTO. This preferential treatment was given legal effect within the GATT by means of a 1971 waiver from the MFN obligation in Article I of the GATT. The system of tariff preferences was made permanent by the 1979 Enabling Clause. The Enabling Clause also contains a waiver to grant additional preferences exclusively to LDCs (Bartels and Häberli, 2010).

Additional preferences for LDCs were extended in the following two steps: Since April 1st, 2004, Switzerland has granted a 55 to 75 percent tariff reduction compared with the MFN tariff for nearly all of the agro-food imports, and since April 1st, 2007, imports of agro-food products have been in general duty free and quota free and have not been bound to seasonal restrictions for the complete tariff lines. In contrast, the market access for agro-food imports of GSP-benefiting DCs has not changed (The United Nations Conference on Trade and Development, 2012; Swiss Customs Administration, 2015).

As we were interested in the causal effect of complete trade liberalization, we investigated the DFQF treatment for LDCs in 2007. We argue that the voluntary and non-reciprocal trade liberalization for LDCs was given exogenously and therefore can be considered as a quasi-experiment. In other words, countries did not select themselves into the status of an LDC or DC at the time of the treatment in 2007. Furthermore, the decision whether a country is included in the LDCs, or graduates from the GSP for DCs and LDCs, is based on three threshold-based

inclusion criteria that are defined by The United Nations Committee for Development Policy (The UN-CDP)[3]. A brief discussion on the topic of LDC-status criteria can be found in Section 6.5.4.

6.3 Data

Average annual aggregated GSP trade flows were calculated based on the Swiss-Impex database provided by the Swiss Customs Administration (Swiss Customs Administration, 2015) between the years 2000 and 2011. We used agricultural and food products from Harmonized System (HS) chapters 01 to 24. Trade data were available on the disaggregated HS 8 digits level for around 190 trading partners. Because the Swiss Customs Administration has changed the methodology of the foreign trade statistics from producing country to country of origin in 2012, years from 2012 onwards were excluded from the analysis to ensure comparability of the results.

The product coverage rate[4] for the DCs and LDCs was calculated based on the foreign trade statistics from the Swiss Customs Administration. Tariff lines that were eligible for trade preferences were obtained from various preferential customs regulations for DCs and LDCs between 2000 and 2011. The average annual preference margin for DCs and LDCs was calculated based on specific bound tariffs[5]. Because the aggregated preference margin was only used to describe stylized facts and not an explanatory variable, we did not compute ad valorem equivalents.

Controls for the DiD analysis and for the construction of the synthetic control unit were from the following sources. The Economic Vulnerability Index (EVI) and the Human Assets Index (HAI) with filled gaps were provided by The Foundation for International Development Study and Research (2013) and The Foundation for International Development Study and Research (2014). The dataset for the EVI covered the period from 1980 to 2011 for 130 DCs and LDCs, whereas the dataset for the HAI with filled gaps covered a period from 1970 to 2011 for 172 countries. Data availability for the EVI was imperfect. Thus, we used approximate

[3] According to internal sources at the Swiss Federal Office for Agriculture the complete removal of tariffs in the 2007 GSP reform for LDCs was not controversial within the office.

[4] The product coverage rate is the percentage of products eligible for a given tariff arrangement (GSP, FTA or MFN) out of the total number of dutiable products (The United Nations Conference on Trade and Development, 1999).

[5] The preference margin was calculated based on the following formula:

$$\text{Preference Margin} = \frac{(\text{Tariff}_{MFN} - \text{Tariff}_{GSP})}{(1 + \text{Tariff}_{MFN})}$$

where the MFN tariff represents the tariff granted to all WTO members, whereas the GSP tariff is granted only to the DCs and LDCs included in the GSP. The GSP tariff is less than or equal to the MFN rate. As a rule, however, it is lower than the MFN-tariff whenever the latter is not equal to zero (The United Nations Conference on Trade and Development, 1999).

EVI using data on undernourished population and mortality rate for small children. Population undernourished in percent and the Gross National Income (GNI) in current USD were obtained from The United Nations Statistics Division (2016c) and The United Nations Statistics Division (2016a). Data on mortality rate for children aged five years or under and on population were taken from The World Bank (2016).

6.4 Stylized facts

This section gives an overview of the incentives and developments that are associated with the DFQF market access for LDCs in 2007. Therefore, the aim of this section is to demonstrate that the GSP reform affected only LDCs and did not have any effects on DCs (e.g., reduced market access and declining preferential trade flows as a consequence of the DFQF market access for LDCs) as well as to demonstrate that GSP trade flows of LDCs and DCs followed a (nearly) common trend during the pre-treatment period. Furthermore, for the empirical analysis it is important that the effect of the GSP reform was not tainted by spillovers between LDCs and DCs, for instance through trade diversion.

6.4.1 Effects of the Generalized System of Preferences reform on developing countries and least developed countries

We argue that the GSP reform of 2007 had an effect only on LDCs but not on DCs. The most important aspect of the reform was the reduction in tariffs for all agro-food products for LDCs, which changed the incentives for LDCs to export under the GSP tariff scheme. The incentives to export under a certain tariff scheme can be summarized by (i) how many products are covered by the tariff scheme (product coverage rate) and (ii) the tariff discount an exporter receives by using a certain tariff scheme relative to an alternative one (preference margin).

First, we considered the product coverage rate for DCs and LDCs during the observation period 2000 to 2011. Figure 6.1 presents the product coverage rate for DCs and LDCs between 2000 and 2006 (pre-treatment), and from 2007 to 2011 (post-treatment). We computed the product coverage rate as the percentage of products eligible for a given tariff arrangement (MFN=0, MFN>0, GSP=0 and GSP<MFN) out of the total number of dutiable agricultural and food products.

It is obvious that the product coverage rate for DCs did not change significantly between the pre- and post-treatment periods. On average, 36 percent (16 percent GSP duty-free and 20 percent GSP reduced) of the agro-food exports in the pre-treatment period and 34 percent (16 percent GSP duty-free and 18 percent GSP reduced) in the post-treatment period were eligible for trade preferences. The majority of DCs' agro-food exports were subject of the

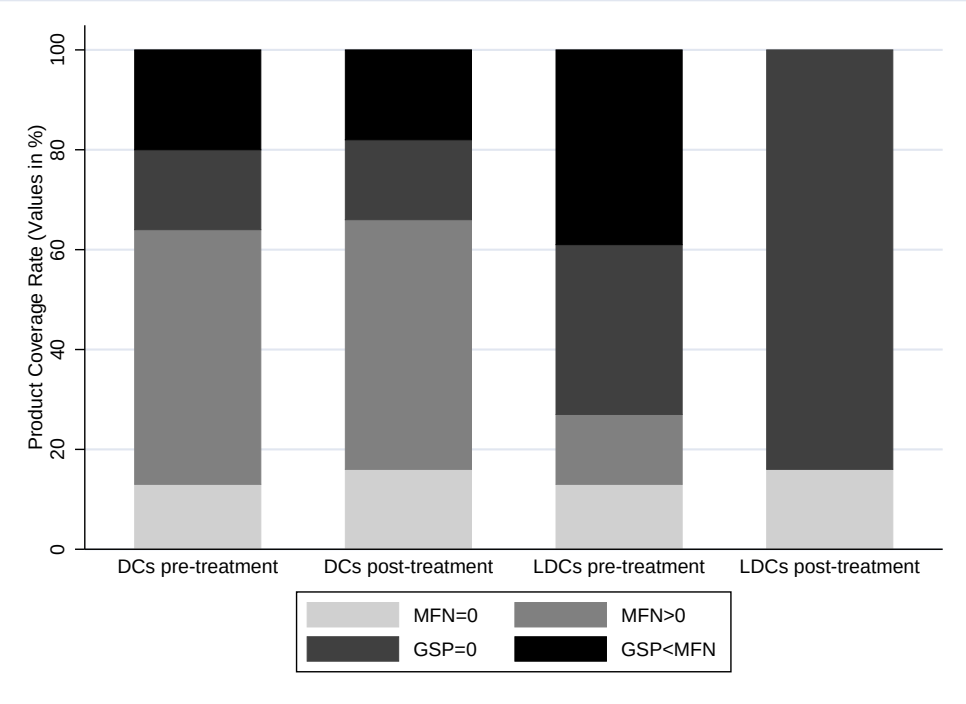

Figure 6.1: The Product Coverage Rate for DCs and LDCs (Source: Swiss Customs Administration, 2015)

MFN arrangement which is granted to all WTO members and observers (64 percent and 66 percent in pre- and post-treatment periods, respectively).

In contrast, 73 percent of agro-food exports of the LDCs were eligible for trade preferences in the pre-treatment period (34 percent GSP duty-free and 39 percent GSP reduced), whereas 13 percent of the agro-food exports were covered by the MFN=0 tariff and 13 percent by the MFN>0 tariff. From 2007 onwards, we observe the complete trade liberalization for LDCs: 84 percent of all products entered DFQF under the GSP scheme and the remaining 16 percent at zero tariffs under the MFN scheme. Note that the product coverage rate for GSP duty-free jumped from 34 percent to 84 percent.

Next, we examined the preference margin, i.e., the tariff discount that exporters receive when exporting under a preferential tariff scheme. Utilizing unilateral or bilateral trade preferences also generates costs (costs of compliance) for obtaining the certificate of origin (rules of origin) and the certificate of direct transport (Keck and Lendle, 2012). These costs could be seen as Non-Tariff Measures (NTMs). Especially exporters in DCs and LDCs consider NTMs in the form of additional trade documents (e.g., certificate of origin and certificate of direct shipment) as a major trade barrier (The United Nations Conference on Trade and Development, 2013b). Therefore, an exporter's decision of whether or not to utilize trade preferences depends on the preference margin (relative to differences in transaction costs between GSP and alternative tariff schemes). A rationally behaved (i.e., profit-maximizing) exporter chooses to take advantage of

trade preferences only if at the margin the tariff discount (preference margin) compensates for the costs of compliance associated with all preferential trade agreements (bilateral or unilateral) (Keck and Lendle, 2012).

Here, it is important that NTMs in the form of transaction costs to export to Switzerland have not changed with the 2007 GSP reform. According to internal sources at Federal Office for Agriculture Switzerland has not systematically increased those costs for LDCs (or DCs).

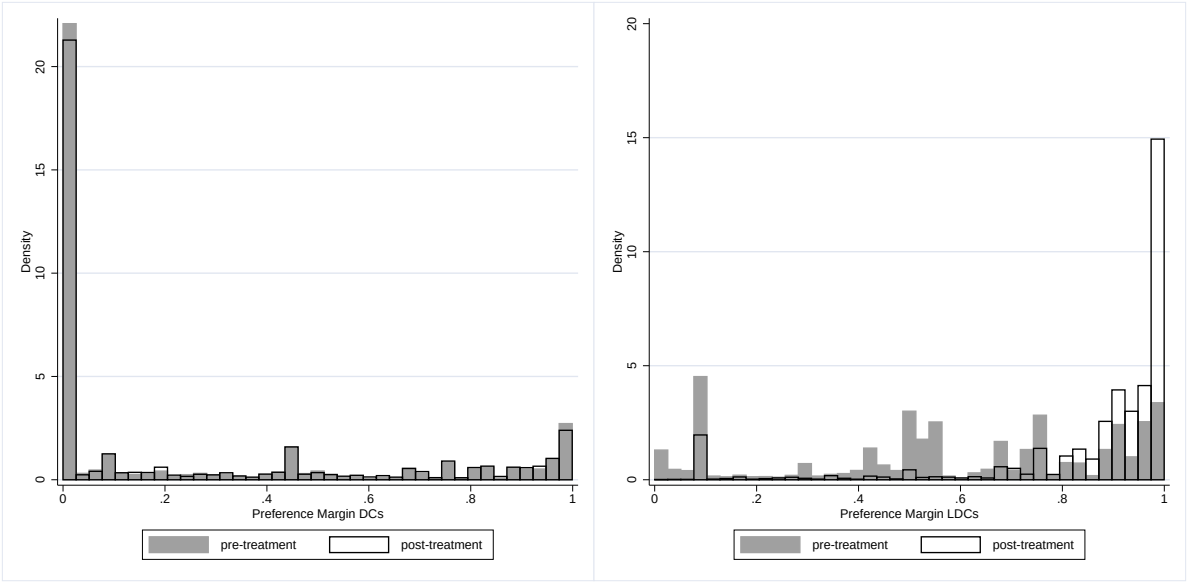

Figure 6.2: Preference margin calculated based on bound specific tariffs on HS 8 digits level for DCs between 2000 to 2006, respectively from 2007 to 2011 and for LDCs between 2000 and 2006, respectively from 2007 to 2011 (Source: Swiss Customs Administration, 2015)

The distribution of the average preference margin in case of the DCs was right-skewed (or had positive skewness) for the pre- and post-treatment periods. This result implies that exporters from DCs faced a relatively low preference margin. Most important, the preference margin did not vary significantly between the pre- and post-treatment periods (Figure 6.2). For a large share of products, the preference margin of the DCs ranged between 0 and 0.3. The preference margin for DCs was about 0.26 between 2000 and 2011.

An exporter located in an LDC faced an average preference margin of 0.5 between 2000 and 2006. The complete trade liberalization for LDCs in 2007 caused a shift in product coverage rates from tariff schemes MFN>0 and GSP<MFN to GSP=0 tariff. Hence, the average preference margin for LDCs increased. Accordingly, the distribution of preference margins for LDCs was left-skewed (or had negative skewness) for the post-treatment period (Figure 6.2). In other words, most product groups faced a preference margin that ranged between 0.5 and 1.0. By the granting of DFQF market access to LDCs in 2007 the incentive for an exporter in a LDC to export under the GSP scheme increased, holding transaction costs constant.

6.4.2 Common trends

From 2000 onwards, average annual GSP trade flows decreased until 2004 for DCs and until 2005 for LDC. Afterwards, GSP trade flows increased for both country groups. Whereas the GSP trade flows of LDCs increased steadily until the end of the observation period, those of DCs reached their highest level in 2007. Between 2007 and 2010, GSP trade flows of DCs slightly decreased, then slightly increased between 2010 and 2011. In contrast, LDCs showed a continuous increase in GSP trade flows from 2005 to 2011, but with a steeper increase from 2007 onwards, when the complete trade liberalization for LDCs was introduced. However, the descriptive analysis indicated that trade liberalization was merely a success story for a few LDCs, namely Tanzania, Ethiopia, Côte d'Ivoire, Mozambique, Malawi, Senegal, and Uganda. These seven countries captured a total share of nearly 80 percent of LDCs' agro-food exports to Switzerland. A large share of the treatment success can be assigned to the market of "raw cooking oils" (sunflower oil, coconut oil, groundnut oil and palm oil) for which LDCs' exporters face a tariff cut (preference margin) in the same amount of the product price per kg at the border. For example, the world market price for raw coconut oil is about CHF 1.50 per kg whereas the bound MFN-tariff for this product is likewise CHF 1.50 per kg. A complete tariff cut generates an incentive for exporting under preferential conditions granted by the GSP. In consequence, LDCs' share of total imports in the Swiss market of raw cooking oils increased from zero percent in 2000 to 16 percent in 2011. By now (2016) the GSP is utilized by nearly 100 percent within the market for raw cooking oils in the post-treatment period. The utility rate of the GSP for LDCs was on average 40 percent in the pre- and post-treatment periods[6]. Forty percent of the LDCs' agro-food exports entered Switzerland under the MFN=0 scheme. Although the utility rate of the GSP for LDCs was equal among pre- and post-treatment periods, preferential trade flows more than doubled due to higher preference margins in the post-treatment period. Thus, the share of imports from LDCs in total agro-food imports increased from 0.9 percent in the pre-treatment period to 1.5 percent in the post-treatment period. However, compared with DCs, which had a share of 15 percent in total agro-food imports, LDCs' share still remained at a low level. Similar to the LDCs, DCs showed a constant utility rate of the GSP of 30 percent during the pre- and post-treatment periods. On average, 40 and 50 percent of DCs' agro-food exports in the pre- and post-treatment periods, respectively, were imported under the MFN=0 scheme.

Figure 6.3 shows the (percentage of) change of GSP trade flows in relation to the base year 2007 for DCs and LDCs. GSP trade flows (GSP=0 and GSP<MFN) were aggregated by country and year including zero values. We did not consider the country and product dynamic of the GSP (e.g., in the GSP, graduation from the GSP, or a status change of countries from GSP

[6]The utility rate is defined as the ratio between covered imports actually receiving preferences and dutiable imports (The United Nations Conference on Trade and Development, 1999).

to FTA). Further, we used nominal instead of real trade flows. As we were interested in annual differences in GSP trade flows, deflating of the trade flow values was not necessary.

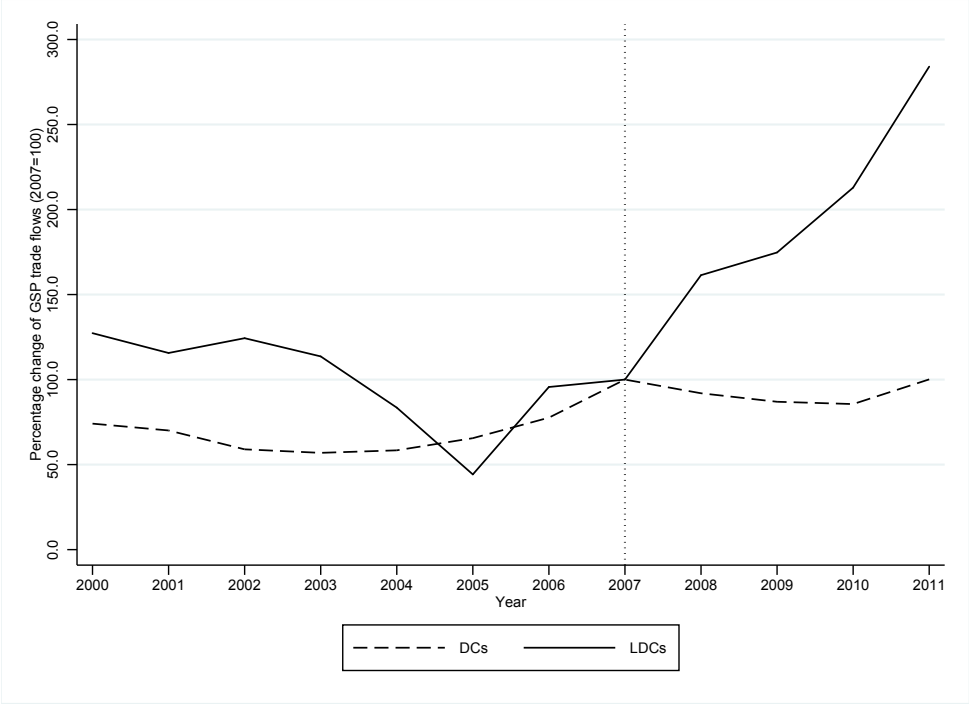

Figure 6.3: Evolution of DCs' and LDCs' exports to Switzerland (2007=100) (Source: Swiss Customs Administration, 2015)

Using percentage levels of GSP trade flows in relation to the base year 2007 instead of absolute values gave a clear picture of the positive effect of the DFQF market access for LDCs in 2007. LDCs' GSP trade flows more than doubled between 2007 and 2011. Furthermore, and just as important the increase in LDCs' GSP trade flows after 2007, the DFQF market access for LDCs did not cause a reduction in trade flows for the control unit.

6.5 Empirical strategy

6.5.1 Causal inference

The main idea of causal inference is based on the concept of the counterfactual state (Roy, 1951; Rubin, 1974). In this case study, the counterfactual state is the extent of the preferential exports of the LDCs if Switzerland had not improved the market access for LDCs. The difference between the factual and counterfactual state is the causal effect of the treatment in 2007. The fundamental assumption of the counterfactual approach to causality is the stable unit treatment assumption, which implies that potential outcomes (aggregated annual GSP trade flows)

are entirely influenced by the treatment status of the prevailing observation unit, and not by the treatment status of other observation units (Morgan and Winship, 2007). In our case study this assumption seemed not violated; although potential outcomes (Y^T and Y^C) showed different export levels (different intercepts), the tendency of decreasing and increasing average annual GSP trade flows showed similar trends in the pre- and post-treatment periods. Despite the difference in sample size (the country group of GSP-benefiting DCs was composed of around 80 countries whereas the LDC country group was composed of around 50 countries), large differences in the stage of socio-economic development of DCs and LDCs and thereof resulting discrepancies in the individual export performance caused different intercepts. The GSP of Switzerland was not very dynamic in its composition (e.g., inclusion and exclusion from the GSP as well as a change from unilateral GSP preferences to bilateral FTA preferences). For instance, only five countries changed their country status from DC to LDC during the observation period. Whereas preferential agro-food exports of Afghanistan, Timor-Leste and the Democratic Republic of Congo were negligible, we coded preferential agro-food exports of Senegal and the Ivory Coast during 2000 to 2006 as LDC trade flows. Senegal changed its country status from DC to LDC in 2004 and the Ivory Coast in 2007. It is noteworthy that preferential agro-food exports of both countries began to increase with the year of the change from DC to LDC. Accordingly, our study further investigated whether the change from DC to LDC was associated with the DFQF market access. A list of GSP-benefiting countries and how handled the GSP dynamics in our analysis can be found in Table 6.5 in Appendix 6.8.

Because the counterfactual state can never be observed, we could only analyze the difference in preferential exports between countries that had been affected by the treatment (LDCs) and those countries that had not been affected by the treatment (DCs). In principle, this difference is confounded by selection bias. In a randomized and controlled study the random allocation of the treatment eliminates selection bias. In this case study, we analyzed a quasi-experiment, namely, the GSP reform in 2007. We argue that the treatment in 2007 was given exogenously to market players. In other words, countries did not select themselves into the status of an LDC or DC at the time of the GSP reform in 2007. Although the allocation of the treatment was clearly not random, we observed the conditions on which the treatment was allocated. Thus, we argue that conditional on these observed conditions, the treatment was as good as random. This approach should eliminate selection bias. Furthermore, the conditions that determine whether a country is included in the GSP scheme are based on three criteria defined by The UN-CDP. A brief discussion on the topic of LDC inclusion criteria can be found in the section on synthetic control method (Section 6.5.4).

Hence, we got a binary treatment with two potential outcomes. Y_i^T is the potential outcome (average annual GSP trade flows) for country i within the treatment unit consisting of LDCs and Y_i^C is the potential outcome for country i within the control unit C consisting of DCs. The

resulting treatment effect for LDCs arises from the difference of the potential outcomes $Y_i^T - Y_i^C$ (Gelman and Hill, 2007).

6.5.2 Difference-in-Differences analysis

In principle, the setup of the GSP reform itself solved the selection problem after controlling for treatment allocation criteria (UN LDC inclusion criteria). Thus, we constructed a synthetic control unit (an average LDC) based on the group of DCs matching the LDC inclusion criteria. The idea was to construct a control unit out of untreated DCs that was similar to the treatment unit of an average LDC. The comparison of preferential exports of the average LDC (treatment unit) with those of DCs (synthetic control unit) should enable us to identify the causal effect of the treatment. To estimate this causal effect quantitatively, we conducted a DiD analysis after the construction of the synthetic control unit. The DiD analysis is a specific type of fixed effects regression model that allows estimating an unbiased effect of a treatment by comparing trends from (country-) groups that are either assigned to a treatment or not. The unit assigned to the treatment (treatment unit) is compared with the unit that is not assigned to the treatment (control unit), with the result that the control unit (consisting of GSP-benefiting DCs) is used as the counterfactual trend for the treatment unit (the average LDC) (Meyer, 1995).

Following Imbens and Wooldridge (2008), the DiD analysis can be formalized by the set of equations shown in Table 6.1.

Table 6.1: Difference-in-Differences setup

	control group	treatment group
pre-treatment period	$Y_{pre}^C = \lambda_{pre} + \gamma^C$	$Y_{pre}^T = \lambda_{pre} + \gamma^T$
post-treatment period	$Y_{post}^C = \lambda_{post} + \gamma^C$	$Y_{post}^T = \lambda_{post} + \gamma^T + \beta$
	$\Delta Y^C = (\lambda_{post} - \lambda_{pre})$	$\Delta Y^T = (\lambda_{post} - \lambda_{pre}) + \beta$

The difference-in-differences then yields

$$\Delta Y^T - \Delta Y^C = \beta \tag{6.1}$$

where Y denotes the outcome of interest (in this case study aggregated average annual GSP trade flows) for the treatment unit T (the average LDC) or the control unit C (consisting of GSP-benefiting DCs). The subscript pre identifies the period before the treatment (2000 to 2006), whereas post identifies the period after the treatment (2007 to 2011). γ depicts country-

specific effects that are constant over time (e.g., geographic characteristics like island, area or sharing a common border), whereas λ represents a common time trend (e.g., capturing shocks to the global economy like the financial crisis in 2008). The coefficient β allows to quantifying the causal treatment effect.

The first difference ΔY eliminates country-specific effects γ, whereas the difference of the differences $\Delta Y^T - \Delta Y^C$ eliminates the common time trend λ. As a result, we get an unbiased estimator β of the causal effect of the treatment in 2007.

In addition, the DiD analysis can be implemented econometrically. Our baseline regression equation was based on that of Imbens and Wooldridge (2008) (equation 6.2).

$$Y_i = \beta_0 + \beta_1 D_i^T + \beta_2 D_i^{post} + \beta_3 \left(D_i^T \times D_i^{post}\right) + \varepsilon_i \tag{6.2}$$

where Y represents aggregated average annual GSP trade flows on country group level. Superscript post identifies the period after the treatment, and subscript T identifies the treatment unit (the average LDC). Accordingly, D^{post} is a time dummy variable that takes the value one for years after the treatment, and zero for years before the treatment. D^T represents a treatment unit dummy variable that takes the value one in case of the average LDC, and zero in the case of a GSP-benefiting DC. β_3 is the coefficient of interest identified by the multiplicative interaction term $D^T \times D^{post}$, and quantifies the causal effect of the treatment. We are interested in the sign and size of β_3. Note that β_3 is identical to the coefficient β from equation (6.1). ε represents the residual term for unobserved characteristics of a country at time t. This term is assumed to fulfil the zero conditional mean assumption. To identify the average treatment effect in every year separately, we added a time dummy for each year after 2007 instead of the post-treatment dummy D^{post}. Thereby, each annual time dummy was interacted with D^T (results can be found in Table 6.6 in Appendix 6.9).

6.5.3 Difference-in-Differences matching

Angrist and Pischke (2009) argued that the causal interpretation of a regression coefficient is based on the conditional independence assumption. The conditional independence assumption states that the covariates that affect the treatment assignment and the outcomes of the treatment are observable. Therefore, both matching and DiD analysis are control strategies that enable to use regression as a particular kind of weighted matching estimator. As mentioned in Section 6.5.2, the DiD estimator allows controlling for time-invariant unobservable differences between the treatment and control groups. In consequence, we combined the DiD analysis with matching for (observable) LDC status criteria as follows (equation 6.3).

$$Y_i = \beta_0 + \beta_1 D_i^T + \beta_2 D_i^{post} + \beta_3 \left(D_i^T \times D_i^{post}\right) + \gamma LDCcrit_i + \varepsilon_i \tag{6.3}$$

Notations of the variables for the basic setup are the same as in equation (6.2). Because the treatment was conditional on LDC status, we added *LDCcrit* as a vector of matching covariates (GNI per capita, the EVI and the HAI) to this equation. Having controlled for these variables, adding further controls to the DiD equation should not change our estimate of β_3 significantly. This would the assumption that conditional on LDC status criteria, the allocation of treatment was as good as random.

Because potential outcomes (Y^T and Y^C) showed different export levels (different intercepts), we estimated equation (6.3) using percentage levels of GSP trade flows in relation to the base year 2007 instead of absolute values in CHF. For calculating the percentage of change in aggregated GSP trade flows, we chose 2007 as the base year. A well-defined control unit (here: DCs) does not differ from the treatment unit (here: LDCs) in any aspect other than the absence of the treatment. As an alternative matching strategy to ensure that both units did not differ significantly from each other in their observable characteristics, we applied the synthetic control method (Abadie and Gardeazabal, 2003; Abadie et al., 2010). In particular, we constructed a synthetic control unit based on DCs that did not differ significantly in their observable characteristics from the treatment unit (the average LDC) in the pre-treatment period.

6.5.4 Synthetic control method

To determine the causal effect of a treatment on the potential outcome, we needed to answer the question, how would preferential exports of the LDCs have developed if Switzerland had not improved market access for LDCs? To check the robustness of our simple DiD matching analysis in the previous section, we constructed a synthetic control unit consisting of GSP-benefiting DCs, that had not been affected by the treatment in 2007. Thereby all control units (DCs) got a weight between 0 and 1, with all weights of the individual control units summing up to 1. Individual control units were pooled to a synthetic control unit (the synthetic LDC constructed from GSP-benefiting DCs). Weights of the individual control units within the synthetic control unit were chosen in accordance to a common trend (common trend assumption) concerning the outcome variable and/or covariates in the pre-treatment period. To control for potential unobserved determinants of the outcome variable, Abadie et al. (2010) suggested including the outcome variable in the matching procedure. Further, calculated weights of the synthetic control unit were used to estimate the hypothetical development of the outcome variable for the treatment unit, that would have been realized without the treatment (Abadie and Gardeazabal, 2003; Abadie et al., 2010). In consequence, differences concerning the outcome variable between the average LDC and the synthetic LDC in the post-treatment period could be attributed to the treatment and therefore could be esteemed as the treatment effect[7].

[7]The significance of the causal effect computed by the synth-algorithm can be tested by so-called placebo tests, in which the approach of the synthetic control unit is conducted with each treatment and control unit. We did not

Because DCs and LDCs are quite heterogeneous in their socio-economic characteristics and data availability is meager, we faced the issue of selecting appropriate control variables and covariates that depict the socio-economic development of a nation. The corresponding selection of covariates and controls was based on criteria for the inclusion and graduation from LDC status. As mentioned in Section 6.5.1, The United Nations Committee for Development Policy (2014) defined the following three threshold-based criteria for the inclusion in or graduation from the LDC status: GNI per capita, EVI and HAI. GNI per capita represents the basic income criterion for being included in or graduated from LDC status. The fundamental threshold for inclusion is based on a three-year average of the level of GNI per capita. For example, in 2015 the inclusion threshold was USD 1,035 , whereas the normal graduation threshold was set 20 percent above the inclusion threshold (USD 1,242). The income-only graduation threshold is twice the normal graduation threshold (USD 2,484). Above the income-only graduation threshold a country is eligible for graduation, even if thresholds of the EVI and the HAI are not met. The EVI measures structural vulnerability of countries to exogenous economic and environmental shocks. The EVI is grouped into two sub-indices and contains eight indicators that are weighted equally (the weight for each indicator is 1/8)[8]. In 2012, the inclusion threshold based on the EVI was set at 36, whereas the graduation threshold was set 10 percent lower than the inclusion threshold (32). The HAI is a measure which depicts the level of human development (human capital) of a country. It consists of four indicators which are likewise weighted equally (1/4)[9]. Two indicators on health and nutrition and two on education. In 2012 the inclusion threshold based on the HAI was set at 60, while the graduation threshold was set 10 percent higher than the inclusion threshold (66) (The United Nations Committee for Development Policy, 2014).

For the construction of the synthetic LDC, we used these three criteria. Whereas data availability for GNI per capita and the EVI was suitable, data availability for the HAI with filled gaps was scarce. To avoid losing too many treatment and control units, we included the following two individual components of the HAI: Percentage of population undernourished and Mortality rate for children aged five years or under. We believe that these two components are an adequate approximation of the HAI and provide a proper data quality during our observation period.

To check the robustness of our results, the empirical setup for constructing a synthetic LDC and the DiD matching approach consisted of the following steps, which were based on each

compute placebo tests. Instead, we used setups including covariates and DiD matching as robustness checks.

[8]The EVI is based on the following eight indicators: Population, Remoteness, Merchandise export concentration, Share of agriculture, forestry and fishery, Share of population in low elevated costal zones, Instability of exports and services, Victims of natural disasters, and Instability of agricultural production (The United Nations Committee for Development Policy, 2014).

[9]The HAI consists of the following four indicators: Percentage of population undernourished, Mortality rate for children aged five years or under, Gross secondary school enrolment ratio and Adult literacy rate (The United Nations Committee for Development Policy, 2014).

other. In a first step, we constructed synthetic LDCs solely based on the income criterion GNI per capita. In a second step, we added the EVI as a covariate besides the income criterion GNI per capita. In a third step, we added the HAI so that all LDC status criteria were added. Finally, in a fourth and fifth step, we added Percentage of population undernourished and Mortality rate for children aged five years or under instead of the HAI. Steps four and five were applied merely for the construction of the synthetic control group because the synth-algorithm considered the complete pre-treatment time series and would have caused an excessive exclusion of treatment and control units (for detailed discussion see the results section below).

6.6 Results and discussion

6.6.1 Difference-in-Differences matching

Table 6.2 presents results for the DiD matching approach using percentage levels of GSP trade flows and percentage levels of LDC status criteria in relation to the base year 2007 instead of absolute values. Whereas integrating the HAI with filled gaps as a covariate in Model (3) caused a significant reduction concerning treatment and control units (the synth-algorithm merely considers the complete pre-treatment time series), using the HAI with filled gaps for the DiD matching approach did not cause a significant reduction of treatment and control units. Therefore, we did not use components of the HAI as proxies as done in the subsequent section.

The coefficient of interest, β_3 showed a positive average annual causal effect of the GSP reform for the DiD matching approach with and without LDC status criteria. Further, we obtained no significant difference concerning the causal effect between Model (1) and Model (2). Model (2), which included all LDC status criteria, showed the highest explanatory power with a corresponding R^2 of 83 percent. Accordingly, we are confident that the causal effect of the DFQF market access was estimated unbiased when controlling for LDC status criteria. Consequently, relying on Model (2), LDCs' preferential exports would have been by 50 percent lower if Switzerland had not granted DFQF market access in 2007.

6.6.2 Synthetic control method

Table 6.3 presents results for the construction of a synthetic control unit (synthetic LDC). As mentioned in Section 6.5.4, we constructed a synthetic LDC stepwise to check if the average annual causal treatment effect remained robust when adding further covariates.

The matching results indicated a good fit concerning the values of matching covariates between the average LDC and the synthetic LDC for most of the matching variations. An ex-

Table 6.2: Results for the DiD-matching approach using percentage levels of GSP trade flows in relation to the base year 2007

Independent Variable	Model (1)	Model (2)
$D_i^T \times D_i^{post}$	59.0*	50.0**
	(32.1)	(23.0)
D_i^T	34.7***	12.0
	(11.7)	(16.0)
D_i^{post}	27.0***	-17.0
	(4.4)	(31.0)
$GNIpercapita$		2.9**
		(1.1)
EVI		-2.4
		(3.7)
HAI		-10.2***
		(3.4)
$\_cons$	66.0***	1062.4**
	(3.2)	(501.1)
$Observations$	24	24
R^2	0.649	0.829

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

ception was Model (3), where we observed lower aggregated GSP trade flows for the average LDC and the synthetic LDC as well as a higher GNI per capita for the synthetic LDC compared with all other models. This result is a clear indicator that adding the HAI filled with gaps as a covariate caused the exclusion of some LDCs and DCs, because the synth-algorithm took the complete pre-treatment time series for a given LDC or DC into account. To avoid the loss of LDCs and DCs, we stepwise included two individual indicators of the HAI in steps four and five: Percentage of population undernourished and Mortality rate for children aged five years or under. In our opinion, these indicators provided good approximations for the HAI.

Although Model (4) showed a slight deviation concerning aggregated GSP trade flows, all other covariates showed similar magnitudes. Finally, adding Mortality rate for children aged five years or under in Model (5), we obtained some deviation in child mortality rates between the average LDC and the synthetic LDC. The stepwise integration of covariates demonstrated the heterogeneity of said country groups and the actual existing differences concerning the stage of development. It showed how difficult it is to construct an adequate control unit in the context of international trade policy evaluation. Nevertheless, we used all variations for the quantification of the causal effect of the DFQF market access for LDCs to check if significant differences concerning the average annual causal treatment effect existed.

Figure 6.4 presents the outputs of the synth-algorithm that corresponded to the matching

Table 6.3: Results for the construction of synthetic control units

	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)	
Covariate	LDC	Synthetic	LDC	Synthetic	LDC	Synthetic	LDC	Synthetic	LDC	Synthetic
Aggregated GSP trade flows (in CHF)	483,000	483,000	483,000	472,000	419,000	425,000	483,000	512,000	483,000	483,000
GNI per capita (in current US $)	575.00	590.00	575.00	563.00	525.00	914.00	575.00	582.00	575.00	582.00
Economic Vulnerability Index			44.0	44.0	45.0	45.0	44.0	44.0	44.0	44.0
Human Assets Index					41.0	49.0				
% Population undernourished							28.8	28.8	28.8	28.8
Child mortality (per 1'000 live births)									118.0	70.0

Sources: The Foundation for International Development Study and Research (2013);The Foundation for International Development Study and Research (2014); Swiss Customs Administration (2015); The World Bank (2016); The United Nations Statistics Division (2016b)

Table 6.4: Results for the DiD analysis based on the synthetic control method dataset

Independent Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$D_i^T \times D_i^{post}$	0.608**	0.836***	0.419***	0.839***	0.826***
	(0.236)	(0.243)	(0.222)	(0.242)	(0.243)
D_i^T	-0.000	0.011	-0.005	0.029	-0.000
	(0.559)	(0.075)	(0.049)	(0.063)	(0.064)
D_i^{post}	0.204***	-0.023	0.092***	-0.026	-0.013***
	(0.025)	(0.063)	(0.023)	(0.061)	(0.062)
_cons	0.484***	0.472***	0.425***	0.512***	0.483***
	(0.024)	(0.056)	(0.021)	(0.037)	(0.039)
Observations	24	24	24	24	24
R^2	0.665	0.668	0.727	0.662	0.669

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses
Estimators and standard errors in CHF million

results of Table 6.3. The vertical bar in each graph indicates the DFQF treatment for LDCs in 2007.

During 2000 until 2005, preferential exports of the average LDC showed a decreasing trend. From 2005 onwards, preferential exports of the average LDC increased constantly until the end of the observation period in 2011. However, a steeper increase in preferential exports of the average LDC could be observed after the GSP reform in 2007. Furthermore, the gap of the preferential exports between the average LDC and the synthetic LDC in 2007 was negative for Models (1), (4) and (5), whereas the gap was positive from 2008 until 2011. In contrast, preferential exports of the synthetic control unit were relatively constant during the entire observation period, followed a similar trend to that of the treatment unit before the GSP reform in 2007. The results shown in Figure 6.4 increase our confidence that the strong increase in GSP trade flows seen for the average LDC after 2007 captured only the causal effect of the DFQF treatment in 2007.

Next, we quantify the causal effect of the 2007 GSP reform using DiD. Table 6.4 presents results for the DiD analysis based on the synthetic control method dataset. The interaction term $D^T \times D^{post}$ identifies the causal effect of the DFQF market access for LDCs in 2007.

The coefficient of interest, β_3 showed a positive average annual causal effect of the GSP reform for all model specifications. Models (1) and (3) showed lower average annual causal treatment effects than Models (2), (4) and (5). Depending on the specific model, we estimate average annual causal treatment effects between CHF 0.4 and 0.8 million. These monetary values correspond to increased preferential trade flows between 80 and 160 percent in the post-

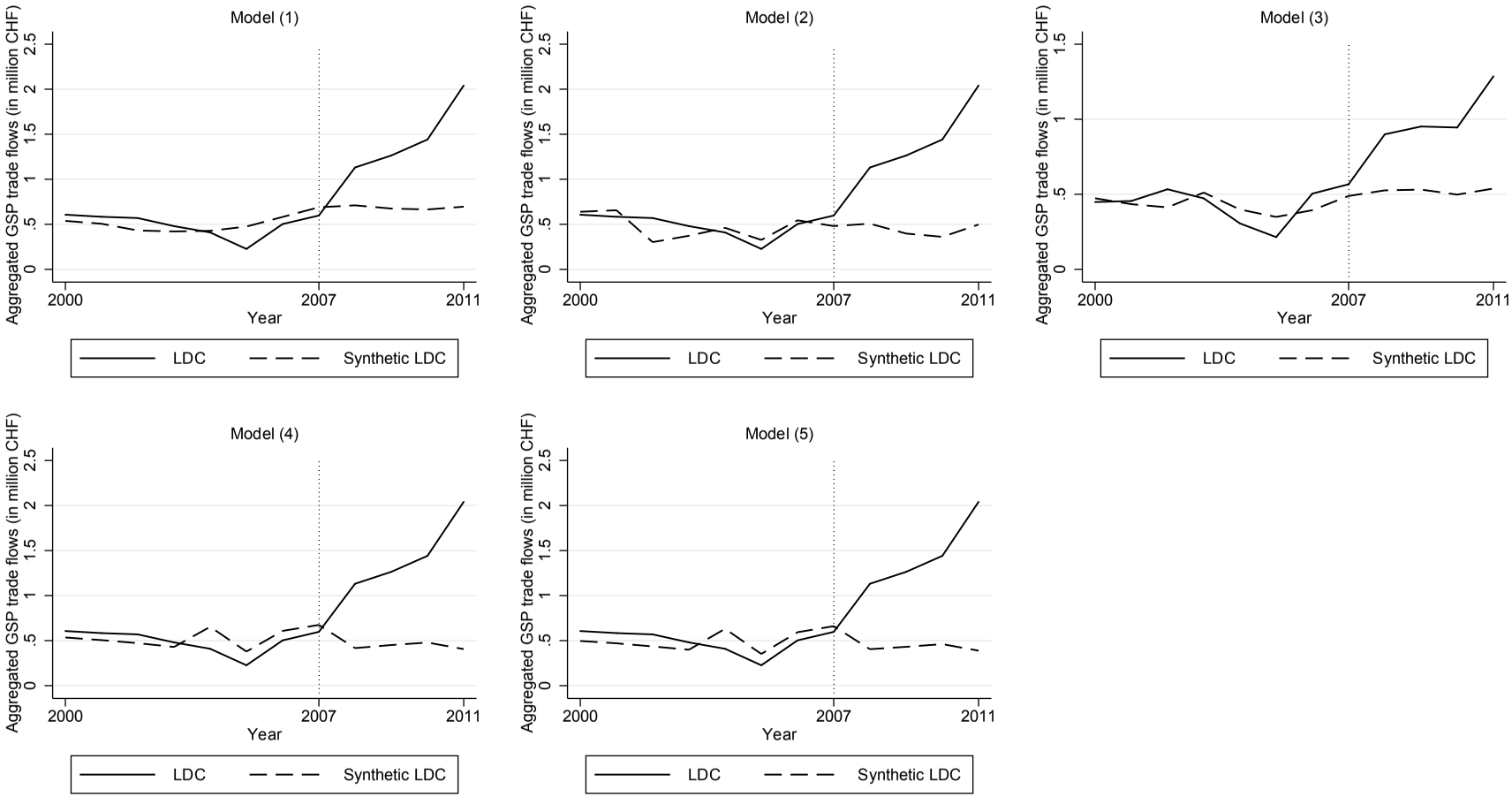

Figure 6.4: Outputs of the synth-algorithm for Model (1), (2), (3), (4) and (5)

Weights for Model (1): Kirghiz Republic (0.78), Uzbekistan (0.05), North Korea (0.04)

Weights for Model (2): North Korea (0.76), Zimbabwe (0.13), Cameroon (0.04), Pakistan (0.02), India (0.01)

Weights for Model (3): Nigeria (0.75), Mongolia (0.24), United States Minor Outlying Islands (0.01)

Weights for Model (4): North Korea (0.72), Nigeria (0.19), India (0.06), Ghana (0.03)

Weights for Model (5): North Korea (0.73), Nigeria (0.19), India (0.07), Ghana (0.02)

treatment period. In other words: If Switzerland had not granted DFQF market access in 2007 to LDCs, the average annual preferential exports of the average LDC would have been reduced by CHF 0.4 and 0.8 million, or 80 to 160 percent. The positive effect of the GSP reform was statistically significant in all model variations. Our results are in line with those of Baier and Bergstrand (2010) as well as Magrini et al. (2013) who found similar positive effects of treatments in the form of trade liberalization.

Even though the matching variations differed in the estimated average annual causal treatment effect, we always obtained increasing GSP trade flows caused by the GSP reform in 2007, i.e., a positive treatment effect (results from adding a time dummy for each particular year after 2007 instead of the post-treatment dummy D^{post} can be found in Appendix 6.9). Furthermore, constant GSP trade flows for the synthetic LDC in Figure 6.4 suggest that the DFQF market access for LDCs did not cause trade diversion from the synthetic LDC to the average LDC. Even though we cannot verify that the treatment did not affect the interaction between treatment unit and control unit, the data in Figure 6.4 support this assumption.

6.7 Conclusions

We used a quasi-experiment in Switzerland to identify the causal effect of trade liberalization on exports of LDCs. Estimation of the effects of FTAs is often confounded by selection bias leading to fragile and sometimes conflicting results. Switzerland's GSP reform in 2007 provided a quasi-experimental situation that allowed us to overcome selection bias and estimate the unbiased and consistent effect of DFQF market access for agro-food exports of LDCs. By considering a quasi-experiment, we went beyond the existing literature, which to our knowledge has addressed self-selection issues related to FTAs solely by using matching techniques.

We found that the average annual causal treatment effect on preferential exports ranged from CHF 0.4 to 0.8 million (about 80 to 160 percent in terms of pre-treatment exports). In other words: If the DFQF market access in 2007 had not been granted to the LDCs, the average annual preferential exports of the average LDC would have been between CHF 0.4 and 0.8 million lower. Variations concerning the average annual causal treatment effect mainly occurred due to data limitations and/or to choice of matching-covariates which in turn had an influence on the compilation of the treatment and control units.

We believe that our exercise was a clean quasi-experiment and thus had high internal validity. It considered all major concerns in the analysis of trade liberalizations like political economy concerns (e.g., unobserved political reactions with consequences for cross-border trade), selection (i.e., no self-selection into treatment) and attrition (i.e., no countries excluded from the treatment unit for political reasons). However, our exercise also showed that in the context of assessing international trade policies, it is challenging to construct good control units even if a

clean quasi-experiment is being used. Although we believe our case study to have high internal validity, we are cautious regarding its external validity. First, today's FTAs go beyond tariff reductions by regulating market access in general (i.e., NTMs like product standards). Thus, one has to be careful to generalize the results from cutting tariffs to the expected effects of comprehensive FTAs. Second, the reaction of DCs (including the LDCs) to trade liberalization may be different from the reaction of developed countries. In other words, the effect of trade liberalization might depend on the level of development. Nevertheless, we think that we can generalize our results to DCs' or LDCs' reaction of agro-food exports to DFQF market access something that has been missing in the literature.

6.8 Appendix: Country list

Table 6.5: Country list and GSP status

Country	ISO3 code	GSP status
Afghanistan	AFG	LDC to DC in 2002; DC to LDC in 2007
Albania	ALB	LDC
Algeria	DZA	DC
American Virgin Islands	VIR	excluded from DC in 2010
Angola	AGO	LDC
Anguilla	AIA	DC
Antigua & Barbuda	ATG	DC
Argentina	ARG	DC
Armenia	ARM	DC
Aruba	ABW	excluded from DC in 2010
Azerbaijan	AZE	DC
Bahrain	BHR	DC
Bangladesh	BGD	LDC
Barbados	BRB	DC
Belize	BLZ	DC
Benin	BEN	LDC
Bhutan	BTN	LDC
Bolivia	BOL	DC
Bosnia & Herzegovina	BIH	DC
Botswana	BWA	switch to bilateral FTA in 2008
Brazil	BRA	DC
British Indian Ocean Territory	IOT	excluded from DC in 2010
Burkina Faso	BFA	LDC
Burundi	BDI	LDC
Cambodia	KHM	LDC
Cameroon	CMR	DC
Cape Verde	CPV	LDC
Central African Republic	CAF	LDC
Chad	TCD	LDC
Chile	CHL	switch to bilateral FTA in 2005
China	CHN	DC
Colombia	COL	DC
Comors	COM	LDC

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Table 6.5 – continued from previous page

Country	ISO3 code	GSP status
Cook Islands	COK	DC
Costa Rica	CRI	DC
Cuba	CUB	DC
Democratic Republic of the Congo	COD	switch from DC to LDC in 2007
Democratic People's Republic of Korea	PRK	DC
Djibouti	DJI	LDC
Dominica	DOM	DC
Dominican Republic	DOM	DC
Ecuador	ECU	DC
Egypt	EGY	switch to bilateral FTA in 2007
El Salvador	SLV	DC
Equatorial Guinea	GNQ	LDC
Eritrea	ERI	LDC
Ethiopia	ETH	LDC
Fiji Islands	FJI	DC
French Polynesia	PYF	excluded form DC in 2010
Gabon	GAB	DC
Gambia	GMB	LDC
Georgia	GEO	DC
Ghana	GHA	DC
Gibraltar	GIB	DC from 2002-2010
Grenada	GRD	DC
Guatemala	GTM	DC
Guinea	GIN	LDC
Guinea-Bissau	GNB	LDC
Guyana	GUY	DC
Haiti	HTI	LDC
Honduras	HND	DC
India	IND	DC
Indonesia	IDN	DC
Iran	IRN	DC
Iraq	IRQ	DC
Ivory Coast	CIV	switch from DC to LDC in 2007
Jamaica	JAM	DC
Kazahkstan	KAZ	DC
Kenya	KEN	DC
Kosovo	KSV	DC since 2005

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Table 6.5 – continued from previous page

Country	ISO3 code	GSP status
Kyrgyz Republic	KGZ	DC
Laos	LAO	LDC
Lesotho	LSO	switch to bilateral FTA in 2008
Liberia	LBR	LDC
Libya	LBY	DC
Macau	MAC	excluded from DC in 2010
Madagascar	MDG	LDC
Malawi	MWI	LDC
Malaysia	MYS	DC
Maldives	MDV	LDC
Mali	MLI	LDC
Malta	MLT	DC from 2002-2004
Marshall Islands	MHL	DC
Mauritania	MRT	LDC
Mauritius	MUS	DC
Macedonia	MKD	switch to bilateral FTA in 2002
Mexico	MEX	switch to bilateral FTA in 2002
Micronesia	FSM	DC
Moldova	MDA	DC
Mongolia	MNG	DC
Montenegro	MNE	DC from 2002-2011
Montserrat	MSR	DC
Mozambique	MOZ	LDC
Myanmar	MMR	LDC
Namibia	NAM	switch to bilateral FTA in 2008
Nepal	NPL	LDC
Netherlands Antilles	ANT	excluded from DC in 2010
New Caledonia	NCL	excluded from DC in 2010
Nicaragua	NIC	DC
Niger	NER	LDC
Nigeria	NGA	DC
Niue Islands	NIU	DC
Oman	OMN	DC
Pakistan	PAK	DC
Panama	PAN	DC
Papua New Guinea	PNG	DC
Paraguay	PRY	DC

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Table 6.5 – continued from previous page

Country	ISO3 code	GSP status
Peru	PER	DC
Philippines	PHL	DC
Pitcairn Islands	PCN	excluded from DC in 2010
Republic Congo	COG	DC
Rwanda	RWA	LDC
Samoa	WSM	LDC
Sandwich Islands	SGS	excluded from DC in 2010
Sao Tome & Principe	STP	LDC
Saudi Arabia	SAU	DC
Senegal	SEN	switch from DC to LDC in 2004
Serbia	SRB	DC from 2006-2010
Seychelles	SYC	DC
Sierra Leone	SLE	LDC
Solomon Islands	SLB	LDC
Somalia	SOM	LDC
South Africa	ZAF	switch to bilateral FTA in 2008
Sri Lanka	LKA	DC
St. Lucia	LCA	DC
St. Pierre & Miquelon	SPM	excluded from DC in 2010
St. Vincent & the Grenadines	VCT	DC
Sudan	SDN	LDC
Suriname	SUR	DC
Swaziland	SWZ	switch to bilateral FTA in 2008
Syria	SYR	DC
Tanzania	TZA	LDC
Thailand	THA	DC
Timor-Leste	TLS	switch from DC to LDC in 2007
Togo	TGO	LDC
Tokelau Islands	TKL	DC
Tonga	TON	DC
Trinidad & Tobago	TTO	DC
Tunisia	TUN	switch to bilateral FTA in 2005
Turkmenistan	TKM	DC
Turks & Caicos Islands	TCA	DC
Tuvalu	TUV	LDC
Uganda	UGA	LDC
Ukraine	UKR	DC from 2002-2004; 2009-2011

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Table 6.5 – continued from previous page

Country	ISO3 code	GSP status
United States Minor Outlying Islands	UMI	excluded from DC in 2010
Uruguay	URY	DC
Uzbekistan	UZB	DC
Vanuatu	VUT	LDC
Venezuela	VEN	DC
Vietnam	VNM	DC
Yemen	YEM	LDC
Zambia	ZMB	LDC
Zimbabwe	ZWE	DC

Note: The GSP country status was taken from several ordinances concerning preferential tariffs for developing countries between the years 2000 and 2011 (ordinances are available upon request)

6.9 Appendix: Difference-in-Differences analysis - annual treatment effects

Table 6.6: Annual results for the DiD-analysis based on the synthetic control method dataset

Independent Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
$D^T \times D^{2007}$	-0.092	0.106	0.084	-0.048	-0.063
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
$D^T \times D^{2008}$	0.421***	0.614***	0.379***	0.743***	0.726***
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
$D^T \times D^{2009}$	0.589***	0.856***	0.425***	0.842***	0.833***
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
$D^T \times D^{2010}$	0.777***	1.070***	0.453***	0.992***	0.981***
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
$D^T \times D^{2011}$	1.346***	1.533***	0.753***	1.664***	1.653***
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
D^T	-268.00	0.011	-0.005	-0.029	-0.000
	(0.072)	(0.097)	(0.063)	(0.081)	(0.082)
D^{2007}	0.206***	0.009	0.064**	0.162***	0.178***
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
D^{2008}	0.228***	0.035	0.101***	-0.095*	-0.078
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
D^{2009}	0.192***	-0.074	0.106***	-0.060	-0.051
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
D^{2010}	0.182***	-0.110	0.073**	-0.033	-0.022
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
D^{2011}	0.213***	0.026	0.114***	-0.106**	-0.094*
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
_cons	0.483***	0.472***	0.425***	0.512***	0.483***
	(0.031)	(0.072)	(0.027)	(0.048)	(0.050)
Observations	24	24	24	24	24
R^2	0.965	0.943	0.926	0.958	0.958

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses
Estimators and standard errors in CHF million

7 The causal effect of unilateral free trade: A comparative case study of Bangladesh's textile exports

Joint work with Andreas Kohler and Stefan Mann and Silviu Beciu

7.1 Introduction[1]

At the Fourth World Trade Organization (WTO) Ministerial Conference held in Doha in 2001, WTO members declared their commitment to provide duty-free and quota-free market access (DFQFMA) to Least Developed Countries (LDCs) (Jatkar, 2008). The fundamental objective of the Doha Development Round launched at this conference was to improve the trading prospects of Developing Countries (DCs) and LDCs (World Trade Organization, 2016b). Four years later, at the 2005 WTO Ministerial Conference in Hong Kong, WTO members decided that industrialized countries and DCs were in a position to provide DFQFMA for at least 97 percent of products originating from LDCs by 2008 or no later than the start of the implementation period (Odari, 2013). According to the World Trade Organization (2016a), 20 industrialized countries and DCs currently provide DFQFMA arrangements for LDCs. For instance, the European Union (EU) began granting DFQFMA for LDCs under the Everything But Arms (EBA) initiative in 2001, while the USA has granted DFQFMA to Sub-Saharan African countries under the African Growth and Opportunity Act (AGOA) since 2000 (World Trade Organization, 2016a). The Swiss 2007 DFQFMA for LDCs and countries currently in the process of debt relief was gradually introduced in 2001 with a 10-50 percent tariff reduction and in 2004 with a 55-75 percent tariff reduction compared to the most-favored-nation (MFN) tariff. In addition, there was a phasing in until September 2009 for broken rice, animal feed, cane and beet sugar, and chemically pure sucrose in solid form, with progressive tariff cuts. Since this transition period, there is a 100 percent DFQFMA for LDCs (The United Nations Conference on Trade and Development, 2012). In contrast, market access for preferential exports of GSP-benefiting DCs has not changed since 2000.

This paper challenges the effectiveness of the progressively introduced DFQFMA for LDCs

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provided by Switzerland under the Generalized System of Preferences (GSP) in enhancing trade activities from affected countries. In a comparative case study, we investigated Bangladesh's preferential textile and clothing exports under Harmonized System chapters 50-67 during 2000 to 2011[2]. During this period Bangladesh accounted for, on average, 80 percent of LDCs' preferential textile and clothing exports into Switzerland[3]. Because trade flows in Swiss foreign trade statistics were not differentiated according to different tariff schemes prior to 2000 (e.g., MFN tariff or GSP tariff), we only analyzed the potential effects of the interventions in 2004 (55-75 percent tariff reduction) and 2007 (100 percent DFQFMA) on Bangladesh's preferential textile and clothing exports using interrupted time series analysis (ITSA) for a single unit, multiple units and multiple interventions (Linden, 2015). Here, we compared Bangladesh's preferential textile and clothing exports with those of its main competitors from Asia, namely Malaysia, Vietnam, Pakistan, India, Sri Lanka, Thailand, China, Philippines and Indonesia. Bangladesh's Asian competitors are all GSP-benefiting DCs which can be considered as counterfactual control units. In sum, Bangladesh and its major Asian competitors captured 86 percent of DCs' and LDCs' preferential textile and clothing exports which entered Switzerland de facto under the GSP during 2000 to 2011. In addition, we provided a robustness check of our baseline ITSA, by using the synthetic control method developed by Abadie and Gardeazabal (2003) and Abadie et al. (2010) in combination with ITSA for multiple units and interventions. Because there was no self-selection into LDC status, we considered the progressively introduced DFQFMA as a quasi-experimental setup which allowed us to estimate causal, comparative and unbiased average treatment effects on the treated (ATTs) of unilateral and non-reciprocal free trade.

The textile and clothing sector is of particular importance in accelerating socioeconomic development in LDCs, DCs and, especially in Bangladesh. The World Finance Magazine (2016) stated that "While the rest of Asia disappointed in terms of export revenues in 2015, there was one surprising anomaly to the pattern - Bangladesh. Export earnings rose to $ 3.2bn last December, thereby setting a new record for the South Asian country. This phenomenal success can be attributed to Bangladesh's growing apparel industry, which accounted for over 83 percent of December's figures." Bangladesh's textile and clothing sector is a major source of exports and foreign exchange accounting for more than 10 percent of its Gross Domestic Product (GDP)

[2]Besides exporting under preferential GSP tariffs, LDCs can also export under alternative tariff regimes, e.g., WTO MFN-tariffs (if they are WTO members). In practice, preferential trade agreements (PTAs), like the unilateral GSP or bilateral Free Trade Agreements, are never fully utilized due to bureaucratic obstacles in the form of export certificates (e.g., certificate of origin) (Bureau et al., 2007; Keck and Lendle, 2012). If there is no differentiation between prevailing tariff regimes, biased estimates of trade liberalization effects are likely to be obtained. Contrary to the existing literature, we took this into account by looking at preferential exports which de facto entered Switzerland under the GSP.

[3]Additional 19 percent of LDCs' preferential textile and clothing exports are captured by Nepal and Cambodia. While Cambodia was able to increase its preferential textile and clothing exports to Switzerland during 2000 to 2011, we observed an opposite trend for Nepal. Nevertheless, in sum, LDCs preferential textile and clothing exports to Switzerland increased during 2000 to 2011. Corresponding figures are available upon request.

(Keane and te Velde, 2008; Hong Kong Trade Development Council, 2013). Furthermore, employment in the textile and clothing sector accounts for 75 percent of total employment in manufacturing. According to the Hong Kong Trade Development Council (Hong Kong Trade Development Council, 2013) "GSP preferential treatment has given Bangladesh a clear competitive edge over a number of other countries, notably Vietnam and India." The EU and US account for 84 percent of Bangladesh's textile and clothing exports, while Switzerland accounts only for one percent. Nevertheless, as a small, open and rich economy, Switzerland is an interesting market for LDCs such as Bangladesh (Hong Kong Trade Development Council, 2013; Rahman, 2014). Due to the temporary suspension of Bangladesh's US GSP privileges in 2013 and the resulting high tariffs on relevant exports, DFQFMA providing countries with initial low export potentials such as Switzerland, Japan or Australia are gaining more relevance (Hong Kong Trade Development Council, 2013).

The remainder of this article is organized as follows: First, Section 7.2 gives an overview of the relevant literature. Next, Section 7.3 presents the empirical strategy including the counterfactual state and its core assumptions (Subsection 7.3.1), the interrupted time series analysis (Subsection 7.3.2) for a single unit (Subsection 7.3.2.1) and for multiple units (Subsection 7.3.2.2) and, finally, the synthetic control method in combination with interrupted time series analysis (Subsection 7.3.3). Section 7.4 discusses the results for the interrupted time series analysis (Subsection 7.4.1) and the synthetic control method in combination with interrupted time series analysis (Subsection 7.4.2). To conclude, the essential findings of this article are summarized in Section 7.5.

7.2 Related Literature

So far, the existing literature on ex-post evaluation of unilateral trade liberalization for LDCs via the EU EBA or the US' AGOA granted to African LDCs has mainly referred to economic gravity models. Studies based on the gravity approach used either aggregated trade data in combination with trade arrangement specific dichotomous dummy variables, or disaggregated trade data in combination with preference margins estimating the effects on LDCs' exports. Estimated effects on LDCs' exports ranged from positive to negative. For instance, Aiello and Cardamone (2011) estimated the effects of the EU EBA on LDCs' exports by means of the gravity approach. The authors found positive but also inconclusive effects, depending on the products included in the study. While results indicated a positive impact on exports of crustaceans and vanilla, for coffee, cloves and molluscs the results were inconclusive. Gradeva and Martinez-Zarzoso (2015) evaluated the impact of the EU EBA on exports of the African, Caribbean and Pacific Group of States (ACP) by means of a gravity model. The authors found that the effect of the EU EBA on the ACP was quite limited or non significant. Zanebe et al.

(2015) investigated the impact of the US AGOA on Sub-Saharan African agricultural exports likewise by means of a gravity model. Results indicated that trade preferences did not have a statistically significant positive impact on agricultural exports of Sub-Saharan African countries. Undeniably, the gravity approach yields valuable findings concerning determinants of trade, but the potential endogeneity bias of the preferential trade agreement (PTA) variable caused fragile and ambiguous results for the effects of PTAs on beneficiaries' exports (Baier and Bergstrand, 2007).

Another strand in evaluating the effectiveness of PTAs such as the DFQFMA for LDCs focused rather on distributional effects. PTAs allow products to be exported at a reduced rate of duty or completely free of duty. This causes a difference between the price under the normal rate (MFN tariff) and the price under the preferential tariff rate. This difference (e.g., the tariff reduction) first of all represents the preferential tariff rent of the importer. If the exporter raises the price of a particular product, its share of the preferential rent also increases. Olarreaga and Özden (2005) analyzed effects of the US AGOA by considering the increase in prices received by apparel exporters under the AGOA. Results indicated that AGOA exports captured only one third of the preferential tariff rent. The enforceability of a price increase, however, depends on the market power of the importer and the bargaining power of the exporter. Cirera (2014) used a tariff pass-through model to investigate the preferential tariff rent of preferential exports to the EU under the GSP for DCs and the EBA. His results likewise indicated that the preferential tariff rent was only partially appropriated. The estimated pass-through coefficients ranged from 0.17 to around 0.28 on average.

Studies estimating the effects of unilateral free trade on LDCs' exports using methods of causal inference and emphasizing the exogenous nature of unilateral free trade were rather scarce. Ito (2013) evaluated the impact of the DFQFMA provided by Japan. *Inter alia*, the author applied a triple difference-in-differences estimator and found in general that LDCs did not benefit from the DFQFMA provided by Japan, although LDCs' total exports to Japan have shown an increasing trend. Frazer and van Biesebroek (2010) likewise applied triple difference-in-differences analysis to estimate the effect of the US AGOA on LDCs' exports. The authors found that the AGOA had a positive and robust effect on apparel, agricultural and manufactured products. Ritzel and Kohler (2016b) used the quasi-experimental setup of the 2007 100 percent tariff cut to estimate the causal effect of trade liberalization on LDCs' preferential agro-food exports. Using the synthetic control method in combination with difference-in-differences analysis, the authors found that preferential agro-food exports increased by between 80 and 160 percent through the 100 percent tariff cut in 2007.

To our knowledge, none of the existing studies took the effects of the progressively introduced tariff cuts of the DFQFMA for LDCs into account. We were thus able to observe if preferential exports (trade flows) reacted according to progressive tariff cuts in 2004 and 2007.

In this context we expected a rather modest increase in preferential exports due to the first tariff cut in 2004 (55-75 percent) and a steeper increase due to the second tariff cut in 2007 (100 percent). Consequently, this article fills the gap in the literature by providing unbiased ATTs of progressively introduced free trade using methods of causal inference.

7.3 Empirical Strategy

7.3.1 The counterfactual approach of causality and its core assumptions

The main idea of causal inference is based on the concept of the counterfactual state (Roy, 1951; Rubin, 1974). In our case study the counterfactual state is the size of Bangladesh's preferential textile and clothing exports if Switzerland had *not* provided the progressively introduced DFQFMA. Because the counterfactual state can never be observed, we could only analyze the difference in preferential textile and clothing exports between a country which had been affected by the treatment (Bangladesh) and those countries that had not been affected by the treatment (GSP-benefiting DCs from Asia).

In principle, this difference is confounded by selection bias. In a randomized and controlled study the random allocation of the treatment eliminates selection bias. In this case study, we analyzed a quasi-experiment, namely the non-reciprocal, voluntary and progressively introduced DFQFMA in 2004 and 2007. We argue that the treatments in 2004 and 2007 were given exogenously to GSP-benefiting countries. In other words, countries did not select themselves into the status of an LDC or DC at the times of multiple interventions. Although the allocation of the treatment was not strictly random, we observed the conditions on which the treatment was allocated. We therefore argue that based on these observed conditions, the treatment was as good as random. This approach should eliminate selection bias. Furthermore, the conditions that determine whether a country is included in or has graduated from the Swiss GSP scheme are based on the following three criteria defined by The United Nations Committee for Development Policy and The United Nations Department of Economic and Social Affairs (2015): Gross National Income (GNI) per capita, Economic Vulnerability Index (EVI) and Human Assets Index (HAI). Whereas data availability for GNI per capita and the EVI was suitable, data availability for the HAI with filled gaps was scarce. To avoid losing too many control units (note: the applied method only considers strongly balanced panel data) we instead used the Human Development Index (HDI)[4] as a proxy for UN LDC status criteria to control for inclusion in or graduation

[4]The scale of the HDI ranges from 0 (low human development) to 1 (very high human development). The HDI is calculated as the geometric mean of the following three indices: a health index, an education index and an index based on GNI per capita. UN LDC status criteria and the HDI comprise similar indicators to assess the development stage of a nation. For instance, UN LDC status criteria and the HDI use GNI per capita to capture economic growth effects and 'soft factors' concerning education and health. Therefore, countries which are defined as LDCs based on UN LDC status criteria end up with a middle or low HDI within the HDI ranking (The United

from the DFQFMA for LDCs. In our opinion, the choice of the HDI as a proxy for LDC status criteria reduces the potential confounding bias significantly[5] .

To estimate an unbiased causal ATT, the following two core assumptions of the counterfactual approach to causality must be satisfied (see e.g., Meyer, 1995; Morgan and Winship, 2007): First, the stable unit treatment value assumption (SUTVA) which implies that potential outcomes (aggregated annual preferential textile and clothing exports) are entirely influenced by the treatment status of the prevailing observation unit, and not by the treatment status of other observation units. In our case study, the SUTVA refers to the non-existence of trade diversion from control units (Asian GSP-benefiting competitors) to Bangladesh during post-treatment periods (2004-2006 and 2007-2011). Second, the common trend assumption (CTA) which ensures a same trend concerning the outcome of interest for treatment and control units before the implementation of the first intervention (pre-treatment period from 2000 to 2003). To gain a first impression of whether or not the core assumptions are satisfied, we provided the trend of preferential textile and clothing exports for Bangladesh and its nine Asian GSP-benefiting competitors during 2000 to 2011 in Figure 7.1. The vertical bars in the graph indicate the progressively introduced DFQFMA in 2004 and in 2007.

In our case study, preferential textile and clothing exports of treatment and control units mainly followed a constant and common trend. In general, we observed a constant trend in preferential textile and clothing exports of Asian GSP-benefiting DCs throughout the entire observation period. This phenomenon can be considered as evidence that market access via the GSP for DCs has not changed systematically due to the introduction of the 2004 and 2007 DFQFMA for LDCs. For most of the comparative variations we observed no indications of trade diversion. Preferential textile and clothing exports of GSP-benefiting DCs remained more or less constant and mainly followed a similar trend as in the pre-treatment period. However, we observed two minor exceptions: India and Indonesia. While India showed in general a volatile trend, Indonesian preferential textile and exports showed a decreasing trend only in the pre-treatment period (afterwards the trend remained constant) we were confident that there was no significant interaction between Bangladesh and its Asian competitors. Therefore, the two core assumptions of the counterfactual approach of causality are satisfied. Consequently, we were able to provide an unbiased and consistent estimate of the causal effect of a progressively

Nations Development Programme, 2015a).

[5]We applied pairwise correlations between the HDI and GNI per capita, between the HDI and the EVI, and, finally, between the HDI and the HAI by means of Spearman's rank correlation coefficient to check whether the HDI can be considered as a suitable proxy for individual LDC status criteria. Results indicated the expected positive and statistically significant correlation between the HDI and GNI per capita (correlation coefficient: 0.837), the expected negative and statistically significant correlation between the HDI and the EVI (correlation coefficient: -0.327), and, finally the positive and statistically significant correlation between the HDI and the HAI (correlation coefficient: 0.895). Detailed results including corresponding scatter plots are available upon request.

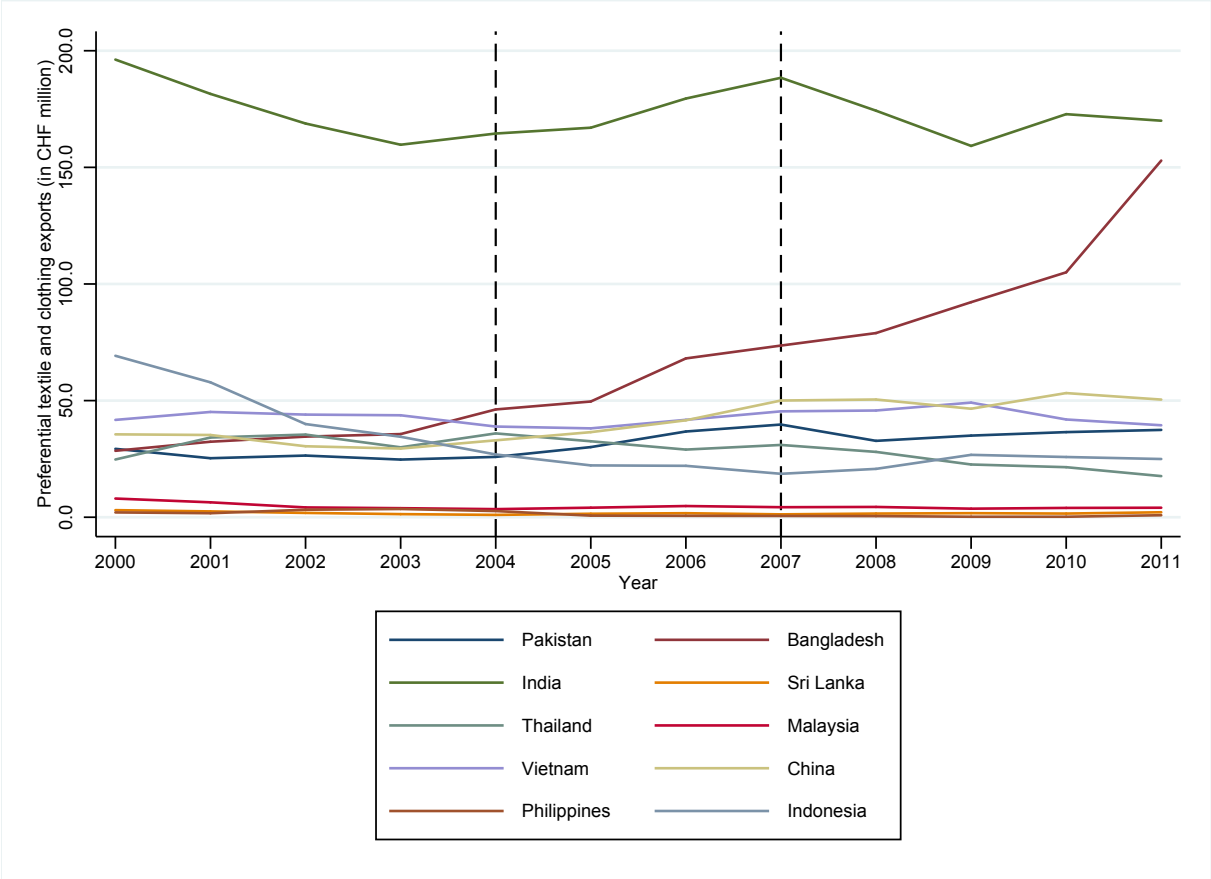

Figure 7.1: Trends of preferential textile and clothing exports during 2000 to 2011 (Source: Swiss Customs Administration, 2015)

introduced DFQFMA on Bangladesh's preferential textile and clothing exports.

7.3.2 Interrupted time series analysis

Statistical inference must take into account autocorrelated data. Literature on ITSA suggests the following two commonly used models dealing with autocorrelation. First, ITSA based on integrated moving-averages models (see e.g., Box and Tiao, 1975; McDowall et al., 1980), and, second, Ordinary Least Squares (OLS) regression models adjusting for autocorrelation (see e.g.,Crosbie, 1993; Velicer and McDonald, 1991). The ITSA provided by Linden (2015) relies on OLS rather than on regression techniques based on autoregressive integrated moving-average models, because OLS is more flexible and well applicable in a context with multiple interventions. In our case study, interrupted time series refers to the progressively introduced DFQFMA in 2004 and 2007. The effects of the interventions in 2004 and 2007 on Bangladesh's preferential textile and clothing exports can be evaluated by using (i) the single unit analysis with multiple interventions where there is only Bangladesh under study (Subsection 7.3.2.1), and, by using (ii) the multiple units analysis with multiple interventions where one or more

control units (GSP-benefiting DCs) are available (Subsection 7.3.2.2).

7.3.2.1 Interrupted time series analysis for single units and multiple interventions

For estimating an ITSA based on only one unit (the treatment unit Bangladesh) with multiple interventions in 2004 and 2007, the baseline ITSA regression model takes the following functional form:

$$Y_t = \beta_0 + \beta_1 T_{2000} + \beta_2 X_{2004} + \beta_3 (T_{2000} \times X_{2004}) + \beta_4 X_{2007} + \beta_5 (T_{2000} \times X_{2007}) + \varepsilon_t \quad (7.1)$$

where Y_t represents the aggregated outcome (Bangladesh's aggregated preferential textile and clothing exports to Switzerland) measured at each annually spaced time point t. T_{2000} depicts the year since the start of our study in 2000. X_{2004} and X_{2007} are dummy variables representing the two treatments in 2004 and 2007, with post-treatment periods taking the value one, and pre-treatment periods the value zero. $(T_{2000} \times X_{2004})$ and $(T_{2000} \times X_{2007})$ are interaction terms. β_0 represents the intercept, or the starting level of the outcome variable. β_1 is the slope of the outcome variable until the first treatment in 2004. β_2 and β_5 represent the change in the outcome variable occurring in the periods after the introduction of the treatments in 2004 and 2007. β_3 and β_6 represent the differences between post- and pre-treatment slopes of the outcome variable. ε_t represents the residual term for unobserved characteristics[6].

Average treatment effects on the treated Bangladesh (ATTs) of the interventions in 2004 (ATT_{2004}) and 2007 (ATT_{2007}) can be identified by calculating the linear combination of estimators. The ATT of the first intervention in 2004 can be identified by

$$ATT_{2004} = \beta_1 T_{2000} + \beta_2 X_{2004} \quad (7.2)$$

whereas the ATT for the second intervention in 2007 can be identified by

$$ATT_{2007} = \beta_1 T_{2000} + \beta_2 X_{2007} \quad (7.3)$$

[6]When random error terms follow a first-order autoregressive AR(1) process,

$$\varepsilon_t = \rho \varepsilon_{t-1} + u_t$$

where ρ represents the correlation coefficient between adjacent error terms, such that $|\rho| < 1$, and the disturbances u_t are independent N(0, σ^2). Testing for a AR(1) process we used the Arellano-Bond test for autocorrelation (Arellano and Bond, 1991). According to Roodman (2012), the Arellano-Bond test for autocorrelation (ABAR) can be applied to OLS regressions. Furthermore, ABAR is appropriate for both, time-series and cross-section time-series (panel) regressions.

Note: the ITSA single-unit approach has no counterfactual control units consisting of GSP-benefiting DCs. Therefore, the pre-treatment trend (2000-2003) projected into the post-treatment periods serves as the counterfactual trend, if Switzerland had not granted the progressively introduced DFQFMA to Bangladesh.

7.3.2.2 Interrupted time series analysis for multiple units and multiple interventions: causal inference by matching on covariates

When one or more control units are available as counterfactuals, the ITSA regression model in (7.1) is expanded by including six additional terms. Accordingly, the ITSA regression model for multiple-units takes the following functional form:

$$\begin{aligned} Y_{it} = \beta_0 + \beta_1 T_{2000} + \beta_2 X_{2004} + \beta_3 (T_{2000} \times X_{2004}) + \beta_4 X_{2007} + \beta_5 (T_{2000} \times X_{2007}) + \\ \beta_6 Z + \beta_7 (Z \times T_{2000}) + \beta_8 (Z \times X_{2004}) + \beta_9 (Z \times T_{2000} \times X_{2004}) + \\ \beta_{10} (Z \times X_{2007}) + \beta_{11} (Z \times T_{2000} \times X_{2007}) + [\gamma_V] + \varepsilon_{it} \end{aligned} \quad (7.4)$$

Notations of the variables for the baseline ITSA regression model are the same as in equation (7.1). Z is a dummy variable which depicts treatment assignment, taking the value of one for Bangladesh, and zero for counterfactual control units consisting of GSP-benefiting DCs. $(Z \times T_{2000})$, $(Z \times X_{2004})$, $(Z \times X_{2007})$, $(Z \times X_{2007} \times T_{2000})$ and $(Z \times X_{2007} \times T_{2000})$ are all interaction terms referring to previously described variables. V is a vector of controls containing the HDI which serves as a proxy for LDC status criteria and GDP per capita which represents the supply capacity or productivity of a given country (note: the ITSA regression model for a single unit was estimated without further controls, because, at best, they only varied over time. A detailed description of the data can be found in Appendix 7.6). In this context, Angrist and Pischke (2009) argued that the causal interpretation of a regression coefficient is based on the conditional independence assumption. The conditional independence assumption states that the covariates that affect the treatment assignment and the outcomes of the treatment are observable. In our case study, we observed the HDI which serves as a proxy for LDC status criteria, as a covariate which affects treatment assignment and consequently the outcome of the treatment. Therefore, both matching and ITSA are control strategies that enabled us to use regression as a particular kind of weighted matching estimator. Controls are integrated stepwise, to check whether the causal effect of the progressively introduced DFQFMA on Bangladesh's preferential textile and clothing exports remains robust. The coefficients β_0 to β_5 represent the control unit, while the coefficients β_6 to β_{11} represent values of the treatment unit. In particular, β_6 represents the difference in the levels (intercepts) of the outcome variable between the treatment and control unit before the first intervention in 2004. β_7 represents the difference in the slopes of

the outcome variable between treatment and control units before the first intervention in 2004. The coefficients β_8 and β_{10} indicate the difference between treatment and control units in the level of the outcome variable after the introduction of the intervention in 2004. The coefficients β_9 and β_{11} represent the difference between the treatment and control unit in the slope of the outcome variable in the post-treatment periods (2004-2006 and 2007-2011) compared with the pre-treatment period (2000-2003). If the ITSA regression model for multiple-units follows an AR(1) process, the random error term ε can be defined as in equation (1)[7].

Similar to the ITSA regression model for a single-unit, ATTs for 2004 and 2007 can be identified by calculating the linear combination of estimators. The ATT of the first intervention in 2004 can be identified by:

$$ATT_{2004} = E(Y_1|DFQFMA_{2004} = 1) - E(Y_0|DFQFMA_{2004} = 0) \tag{7.5}$$

where $E(Y_1|DFQFMA_{2004} = 1)$ corresponds to the expected average outcome of Bangladesh during 2004 to 2006 ($DFQFMA_{2004} = 1$), and $E(Y_0|DFQFMA_{2004} = 0)$ corresponds to the counterfactual state (DCs still benefiting from the ordinary GSP, $DFQFMA_{2004} = 0$). The expected average outcome for Bangladesh during 2004 to 2006 can be identified by

$$\begin{aligned} E(Y_1|DFQFMA_{2004} = 1) = \beta_1 T_{2000} + \beta_7 (Z \times T_{2000}) + \\ \beta_3 (T_{2000} \times X_{2004}) + \beta_9 (Z \times T_{2000} \times X_{2004}) \end{aligned} \tag{7.6}$$

whereas the expected average outcome for the counterfactual state during 2004 to 2006 can be identified by:

$$E(Y_0|DFQFMA_{2004} = \beta_1 T_{2000} + \beta_3 (T_{2000} \times X_{2004}) \tag{7.7}$$

Accordingly, the ATT of the second intervention in 2007 can be identified by:

$$ATT_{2007} = E(Y_1|DFQFMA_{2007} = 1) - E(Y_0|DFQFMA_{2007} = 0) \tag{7.8}$$

where $E(Y1|DFQFMA2007 = 1)$ corresponds to the expected average outcome of

[7]When autocorrelation is present at lag 1, Linden (2015) suggests estimating a Prais-Winston AR(1) regression model with robust standard errors which is especially designed to fit an AR(1) model (note: corresponding results are not directly comparable with those of the standard model which are produced by using OLS with Newey-West standard errors). In cases, where we observed autocorrelation at lag 1, we applied the alternative Prais-Winston AR(1) regression model with robust standard errors.

Bangladesh during 2007 to 2011 ($DFQFMA_{2007} = 1$), and $E(Y_0|DFQFMA_{2007} = 0)$ corresponds to the counterfactual state (DCs still benefiting from the ordinary GSP during 2007 to 2011, $DFQFMA_{2007} = 0$). The expected average outcome for Bangladesh during 2007 to 2011 can be identified by

$$E(Y_1|DFQFMA_{2007} = 1) = \beta_1 T_{2000} + \beta_7 (Z \times T_{2000}) + \beta_3 (T_{2000} \times X_{2004}) + \beta_9 (Z \times T_{2000} \times X_{2004}) + \beta_5 (T_{2000} \times X_{2007}) + \beta_{11} (Z \times T_{2000} \times X_{2007}) \quad (7.9)$$

whereas the expected average outcome for the counterfactual state during 2007 to 2011 can be identified by:

$$E(Y_0|DFQFMA_{2007} = 0) = \beta_1 T_{2000} + \beta_3 (T_{2000} \times X_{2004}) + \beta_5 (T_{2000} \times X_{2007}) \quad (7.10)$$

To estimate ATTs for our baseline ITSA regression model for multiple units and interventions, we constructed the counterfactual state by considering the following comparative variations (i) estimating the (difference-in-differences in slopes) average difference between the outcome of each individual Asian GSP-benefiting DC and Bangladesh's outcome, (ii) estimating the average difference between the average outcome of a sample consisting of Asian GSP-benefiting DCs which showed a similar level (intercept) of preferential textile and clothing exports in 2000 and Bangladesh's outcome[8], (iii) estimating the average difference between the average outcome of a sample consisting of Asian GSP-benefiting DCs and Bangladesh's outcome, and, finally, (iv) estimating the average difference between the average outcome of all GSP-benefiting DCs and Bangladesh's outcome.

7.3.3 Synthetic control method in combination with interrupted time series analysis

If achieving balance on covariates is an important factor, Linden (2015) suggests considering the synthetic control method (Abadie and Gardeazabal, 2003; Abadie et al., 2010) in combination with ITSA. For this purpose, we constructed a synthetic control unit (a synthetic Bangladesh) consisting of GSP-benefiting DCs, which had not been affected by the treatments in 2004 and

[8]To find comparable control units out of a pool of potential candidates, Linden (2015) suggests finding comparable control units via an iterative process in which each non-treated unit is compared separately with the treatment unit using the ITSA regression model defined in equation (7.4). Those units which have p-values greater than 0.05 on both β_2 and β_3 can be selected as controls for inclusion in the final model. Because most of the model variations from variant (i) met this criterion, we do not strictly follow this suggestion and, therefore, we maintained our strategy in analyzing the potential effects of the progressively introduced DFQFMA.

2007. All potential control units were assigned a weight between 0 and 1, with all weights of the individual control units summing up to 1. Individual control units were then pooled to a synthetic control unit (a synthetic Bangladesh constructed from GSP-benefiting DCs). Weights of the individual control units within the synthetic control unit were chosen in accordance with a common trend (CTA) concerning the outcome variable and/or covariates in the pre-treatment period (2000-2003). To control for potential unobserved determinants of the outcome variable, Abadie et al. (2010) suggested including the outcome variable in the matching procedure. Further, calculated weights of the synthetic control unit were used to estimate the hypothetical development of the outcome variable for the treatment unit, which would have been realized without the treatment (Abadie and Gardeazabal, 2003; Abadie et al., 2010). In consequence, differences concerning the outcome variable between Bangladesh and the synthetic Bangladesh in the post-treatment periods could be attributed to the treatment and can therefore be regarded as the treatment effect. To construct a synthetic Bangladesh we used the outcome variable (aggregated preferential textile and clothing exports under HS chapters 50-67), the HDI and GDP per capita. According covariates were averaged prior to the first intervention in 2004. After running the synth-command, Stata produces a dataset consisting of annual preferential textile and clothing exports of Bangladesh and the synthetic Bangladesh for the years 2000 to 2011, which can then be used to perform an ITSA with according interventions in 2004 and 2007. For this purpose we estimated equations (7.4) to (7.10).

7.4 Results

7.4.1 Interrupted time series analysis

Table 7.1 presents ATTs for the ITSA regression model. Model (1) refers to the baseline model without covariates, model (2) was augmented by the HDI and model (3) was augmented by the HDI and GDP per capita. Column 2 refers to the single-unit approach where only Bangladesh (BGD) was under study. Columns (3) to (11) refer to the multiple-unit approach where BGD was compared separately to its individual counterfactuals Malaysia (MYS), Vietnam (VNM), Pakistan (PAK), India (IND), Sri Lanka (LKA), Thailand (THA), China (CHN), Philippines (PHL) and Indonesia (IDN). Out of this pool we constructed the counterfactual state based on GSP-benefiting DCs with the same level (intercept) of preferential textile and clothing exports in 2000. These are: Vietnam, Pakistan, China and Thailand (column 12). Column (13) refers to all Asian competitors and column (14) to the complete sample of GSP-benefiting DCs. For model variations where we observed autocorrelation we estimated the alternative model by using the Prais-Winston AR(1) regression model with robust standard errors. This was the case for model variations presented in columns 12, 13 and 14. ATT_{2004} and ATT_{2007} were estimated

based on equations (7.4) to (7.10). Graphical outputs of the baseline ITSA regression models can be found in Appendix 7.7. Corresponding detailed ITSA regression results are available upon request.

For most of the model variations the ATTs remained constant even if further covariates were added to the baseline model. The only exception is the model variation with Vietnam as a counterfactual, where the extension of the model by the HDI and GDP per capita led to an unexpected decrease in ATTs. For all model variations we identified positive and predominantly statistically significant ATTs. For the case of the single-unit approach, where the pre-treatment trend (2000-2003) was projected into the post-treatment periods, we identified positive and statistically significant ATTs, for both, the intervention in 2004 and in 2007. The ATT_{2004} amounted to CHF 10.9 million, while the ATT_{2007} amounted to CHF 18.5 million. For cases, where we used Bangladesh's Asian GSP-benefiting competitors individually as potential counterfactuals, the ATT_{2004} for model (1) ranged between CHF 3.5 million and CHF 14.4 million, whereas the ATT_{2007} for model (1) ranged between CHF 18.1 million and CHF 22.3 million. For model variations where we applied the alternative model, ATTs remained consistent but lost efficiency. Especially, for the variant where we constructed the counterfactual state based on GSP-benefiting DCs with the same level (intercept) of preferential textile and clothing exports in 2000, none of the ATTs were statistically significant. Similarly, model variations where the counterfactual state consisted of all Asian competitors and of all GSP-benefiting DCs, ATTs remained consistent but lost efficiency due to the application of the alternative model. However, most of the ATTs were statistically significant.

Nevertheless, the progressively introduced DFQFMA can evidently be considered as a success story for Bangladesh. The progressive tariff cuts in 2004 and 2007 significantly increased market integration for Bangladesh's preferential textile and clothing exports to Switzerland. Here, it is worth mentioning, that magnitudes of ATT_{2004} and ATT_{2007} in general nearly perfectly portrayed the progressive tariff cuts in 2004 and 2007. While Bangladesh's preferential textile and clothing exports remained constant during the pre-treatment period (2000-2003), especially the 100 percent tariff cut in 2007 boosted Bangladesh,Äôs preferential textile and clothing exports even more compared to the 55-75 percent tariff cut in 2004.

For most of the model variations, preferential textile and clothing exports of Bangladesh's counterfactuals remained constant after the introduction of the treatments in 2004 and 2007. This implies that, if Switzerland had not granted the progressively introduced DFQFMA to Bangladesh, we would not have observed the sharp increase in Bangladesh's preferential textile and clothing exports to Switzerland, which in turn implies that the Swiss DFQFMA treatment has given Bangladesh a clear competitive advantage over its Asian GSP-benefiting competitors. From a development economics view point, unilateral GSP trade preferences and resulting increased exports are an important contribution to Bangladesh's economic development.

Table 7.1: ATTs for the ITSA regression model

(1) Baseline	BGD	MYS	VNM	PAK	IND	LKA	THA	CHN	PHL	IDN	β_0	Asia	DCs
ATT_{2004}	10.9***	10.3***	9.5***	5.5	3.5	10.6***	14.4***	6.7**	12.0***	13.4***	7.9	9.3*	10.5*
ATT_{2007}	18.5***	18.5***	20.0***	18.5***	22.3***	18.3***	21.8***	18.1***	18.4***	16.7***	15.4	16.6	12.4
(2) HDI		MYS	VNM	PAK	IND	LKA	THA	CHN	PHL	IDN	β_0	Asia	DCs
ATT_{2004}		10.6***	9.9***	4.9*	3.5	10.8***	14.1***	6.7**	12.2***	13.4***	7.8	9.7**	10.6**
ATT_{2007}		18.5***	20.3***	18.8***	20.0***	18.5***	21.7***	17.7***	18.4***	16.7***	15.4	15.9*	12.3
(3) HDI & GDPpc		MYS	VNM	PAK	IND	LKA	THA	CHN	PHL	IDN	β_0	Asia	DCs
ATT_{2004}		11.0***	1.6	5.3*	10.6**	9.8	12.6**	6.0	11.5*	11.1***	6.9	9.2*	10.5*
ATT_{2007}		18.8***	9.9	18.8***	28.2'***	17.2**	20.4***	16.4*	17.9**	13.1**	15.2	15.8	12.3
No. obs.	12	24	24	24	24	24	24	24	24	24	60	120	600
Alternative model	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes

*** p < 1%, ** p < 5%, * p < 10%
Estimators in CHF million

Table 7.2: Results for the construction of a synthetic Bangladesh
(averaged values for 2000 to 2003)

Covariate	Bangladesh	Synthetic Bangladesh
Preferential exports (in CHF million)	32.8	32.5
GDP per capita (in current USD)	403.8	558.8
HDI	0.5	0.5

Weights: Pakistan (0.96); India (0.04)

However, the wide range in ATTs clearly demonstrates the necessity of constructing a suitable counterfactual state based on covariates. For this purpose, we constructed a synthetic control unit (a synthetic Bangladesh) out of a pool consisting of GSP-benefiting DCs, based on preferential textile and clothing exports (outcome variable), the HDI and GDP per capita.

7.4.2 Synthetic control method in combination with interrupted time series analysis

Table 7.2 presents results for the construction of a synthetic control unit (synthetic Bangladesh). As mentioned above, we constructed a synthetic Bangladesh based on the outcome variable (preferential textile and clothing exports), the HDI and GDP per capita. Covariates were averaged prior to the first intervention in 2004.

According matching results indicate a decent fit concerning the average outcome and the average HDI during 2000 to 2003. The average GDP per capita which serves as a measure for the supply capacity or productivity of a given country is higher for the synthetic Bangladesh. A slight deviation was to be expected, because we compared countries or, country groups at a different stage of socioeconomic development. The weights reported in Table 7.2 indicated that trends concerning matching covariates prior to the first intervention in 2004 were best reproduced by a combination of Pakistan and India. This result confirmed the more or less intuitive choice of using Asian GSP-benefiting DCs as potential counterfactual control units. Furthermore, by choosing countries from Asia as potential counterfactuals, we implicitly control for the bilateral distance to Switzerland which serves as a proxy for transport costs. Even though GDP per capita was not perfectly balanced, we used the matching results for the quantification of the ATTs to check if significant differences concerning the ATTs existed. Although we did not excessively use matching covariates, our exercise showed how difficult it was to construct an adequate control unit in the context of international trade liberalization.

Figure 7.2 presents the output of the synth-algorithm which corresponds to matching results of Table 7.2. The vertical bars in the graph indicate the progressively introduced DFQFMA in 2004 and 2007.

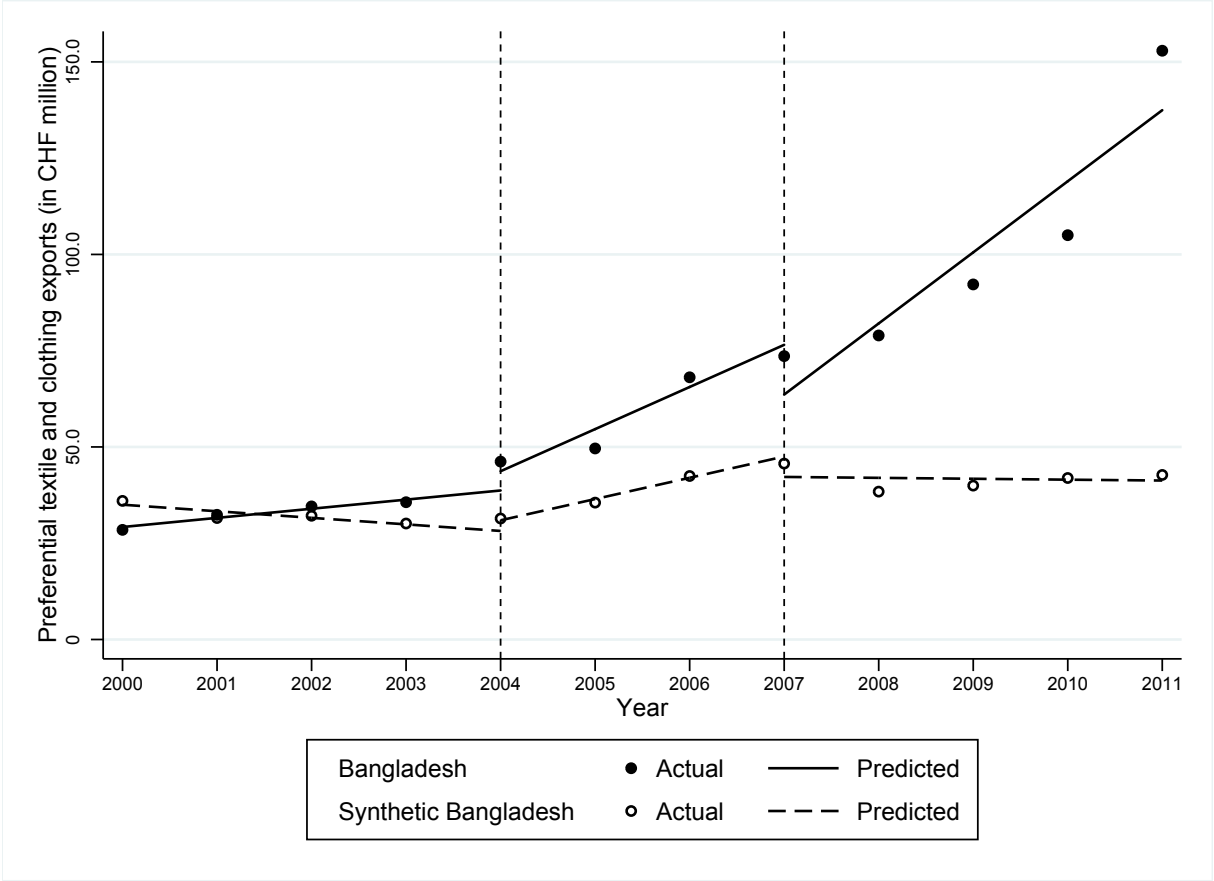

Figure 7.2: Output of the synth-algorithm

Here, it is important to check, whether the core assumptions in estimating causal effects, namely the CTA and the SUTVA, are satisfied. Keep in mind that the CTA refers to a common trend in the outcome variable during the pre-treatment period (2000-2003). First, Bangladesh's preferential textile and clothing exports accounted on average for CHF 32.8 million, while preferential textile and clothing exports of the synthetic Bangladesh accounted on average for CHF 32.5 million (see Table 7.2). Second, a visual inspection of Figure 7.2 likewise indicated a common and steady trend in preferential textile and clothing exports of the synthetic Bangladesh. In our case study, the SUTVA refers to the non-existence of trade diversion from the synthetic Bangladesh to Bangladesh during post-treatment periods (2004-2006 and 2007-2011). A visual inspection of Figure 7.2 likewise indicates the non-existence of trade diversion. While preferential textile and clothing exports of the synthetic Bangladesh showed a slight increase during 2004 to 2006, preferential textile and clothing exports remained more or less constant during 2007 to 2011. Consequently, the core assumptions in estimating causal effects are satisfied, so that we were able to quantify the causal ATTs for the interventions in 2004 and 2007 by using the ITSA regression model for multiple units and interventions by estimating equations (7.4) to (7.10).

We identified positive and statistically significant ATTs for both, the intervention in 2004 and in 2007. The ATT_{2004} amounted to CHF 5.3 million, while the ATT_{2007} amounted to CHF 18.7 million. These monetary values correspond to a 16 percent increase in preferential textile and clothing exports due to the first intervention in 2004, and to a 57 percent increase due to the second intervention in 2007. In other words: if Switzerland had not granted DFQFMA to Bangladesh, its preferential textile and clothing exports would have been lower by on average CHF 5.4 million between 2004 to 2006, and by on average CHF 18.7 million between 2007 to 2011 (relative to the pre-treatment period). Magnitudes and statistical significance of ATT_{2004} and ATT_{2007} are nearly the same compared to the baseline ITSA regression model augmented by the HDI and GDP per capita, where we used Pakistan as a potential counterfactual (see Subsection 7.4.1). This implies, that in the absence of the progressively introduced DFQFMA, Bangladesh's preferential textile and clothing exports to Switzerland would have developed like those of Pakistan. Here again, the different magnitudes for the ATT_{2004} and the ATT_{2007} perfectly portray the progressively introduced DFQFMA with its corresponding progressive tariff cuts in 2004 and 2007. Especially the 100 percent tariff cut in 2007 boosted Bangladesh's preferential textile and clothing exports even more compared to the 55-75 percent tariff cut in 2004.

7.5 Conclusions

The progressively introduced DFQFMA in 2004 and 2007 allowed us to estimate a consistent and unbiased effect of unilateral and non-reciprocal free trade on Bangladesh's preferential textile and clothing exports. In contrast, estimates of the effects of bilateral FTAs are often confounded by a selection bias leading to fragile and contradictory results ranging from negative to positive. While trade partners select themselves into the status of an FTA, there was no self-selection in case of the progressively introduced DFQFMA. Although the allocation of the treatment was not perfectly random, we observed the conditions on which the treatment was allocated. Using the HDI as a proxy for LDC status criteria, we were able to reduce the potential confounding bias significantly. We identified one GSP-benefiting DC, namely Pakistan, as Bangladesh's counterfactual state. In the absence of the treatments in 2004 and 2007, Bangladesh's preferential textile and clothing exports would have developed like those of Pakistan. Consequently, if Switzerland had not granted DFQFMA to Bangladesh, its preferential textile and clothing exports would have been lower by on average 16 percent between 2004 and 2006, respectively by on average 57 percent between 2007 and 2011. Our modeling approach consisting of modern policy evaluation techniques, perfectly portrayed the positive effects of the progressive tariff cuts in 2004 and 2007 on Bangladesh's preferential textile and clothing exports. While we observed a rather modest increase in preferential textile and clothing exports

after the introduction of the first intervention in 2004 (55-75 tariff reduction), we observed a steep increase after the introduction of the complete DFQFMA in 2007 (100 percent tariff cut).

However, case studies in this vein have their disadvantages. The greatest disadvantage is the lack of generalization. In contrast to studies estimating the potential effects of unilateral free trade for several countries, we were not able to generalize our results based on a single case. Nevertheless, we can generalize our results to the reaction of an emerging LDC like Bangladesh to unilateral free trade granted by an industrialized economy. From a development economics view point we addressed an important question: Does unilateral free trade improve market access for the world's poorest countries? In a case study of Bangladesh's preferential textile and clothing exports to Switzerland, we can answer this question unequivocally with 'yes' for market access to a small and open economy such as Switzerland's. However, signing bilateral FTAs is actually Switzerland's dominant strategy in international trade policy. In the framework of a bilateral FTA concessions can be more tailored to the export structure of a given DC or LDC. Obviously, this strategy cannot be extended to all trade partners. Therefore, unilateral trade preferences under the GSP are still a useful supplement to duty-free market access under the multilateral WTO regime.

7.6 Appendix: Description of the data

Table 7.3: Description of the data

Variable	Source	Note
Preferential textile and clothing exports	Swiss Customs Administration (2015)	Trade data were available on disaggregated HS 8 digit level. We aggregated data on HS 2 digit level according to the prevailing country, year and tariff scheme. Preferential trade flows under the GSP are coded '330' (zero tariff) and '230' (reduced tariff). We used HS chapters 50-67 'textiles, footwear & headgear'. The GSP country status was taken from several ordinances concerning preferential tariffs for developing countries between the years 2000 to 2011. Since the SCA changed the methodology of foreign trade statistics from producing country to country of origin in 2012, years from 2012 onwards were excluded from the analysis to ensure comparability of the results.
Human Development Index	The United Nations Development Programme (2014)	Data on the UNDP website are incomplete. Therefore, missing data were compiled based on various Human Development Reports. The corresponding data set is available upon request.
GDP per capita	The World Bank (2016)	GDP per capita is gross domestic product divided by midyear population. Data are in current US dollars.

7.7 Appendix: Graphical outputs of the baseline ITSA regression models

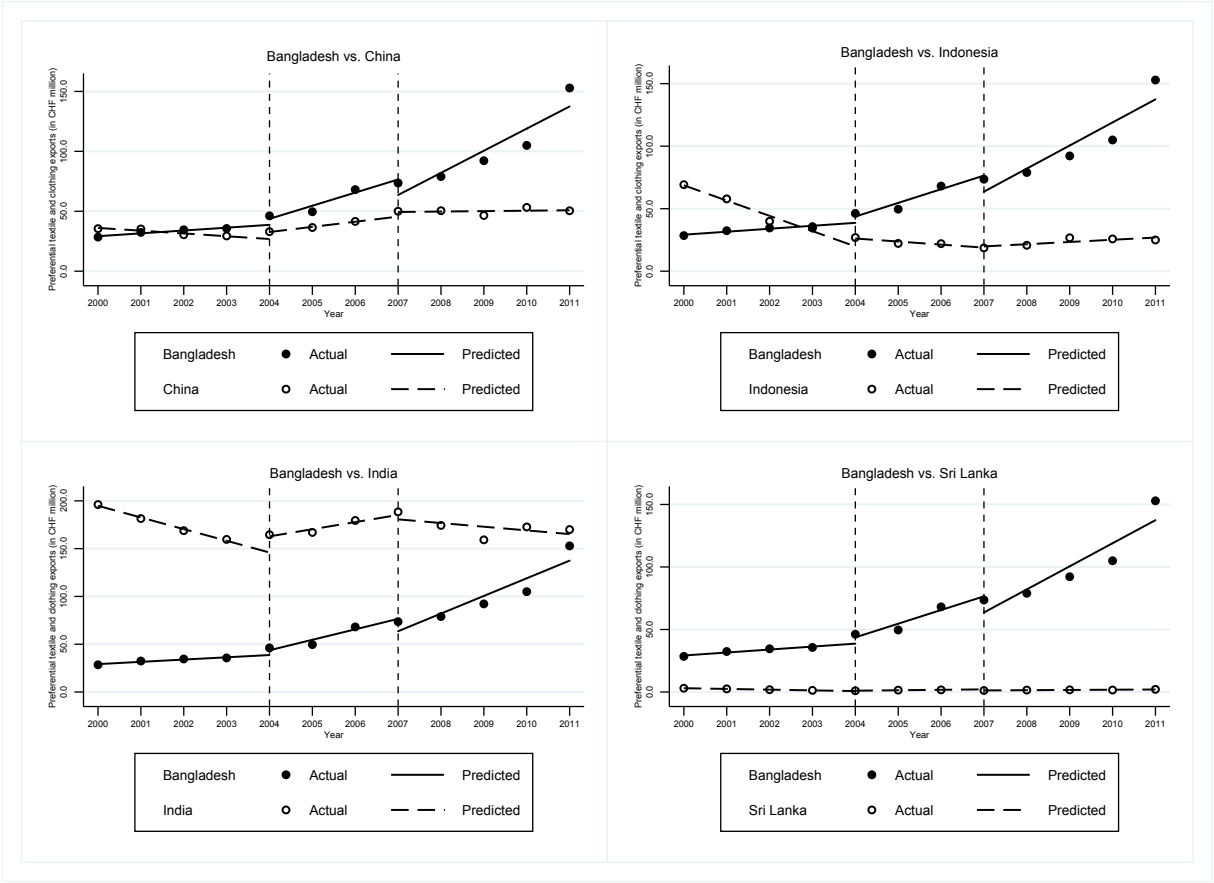

Figure 7.3: Graphical output of the baseline regression models (Part 1)

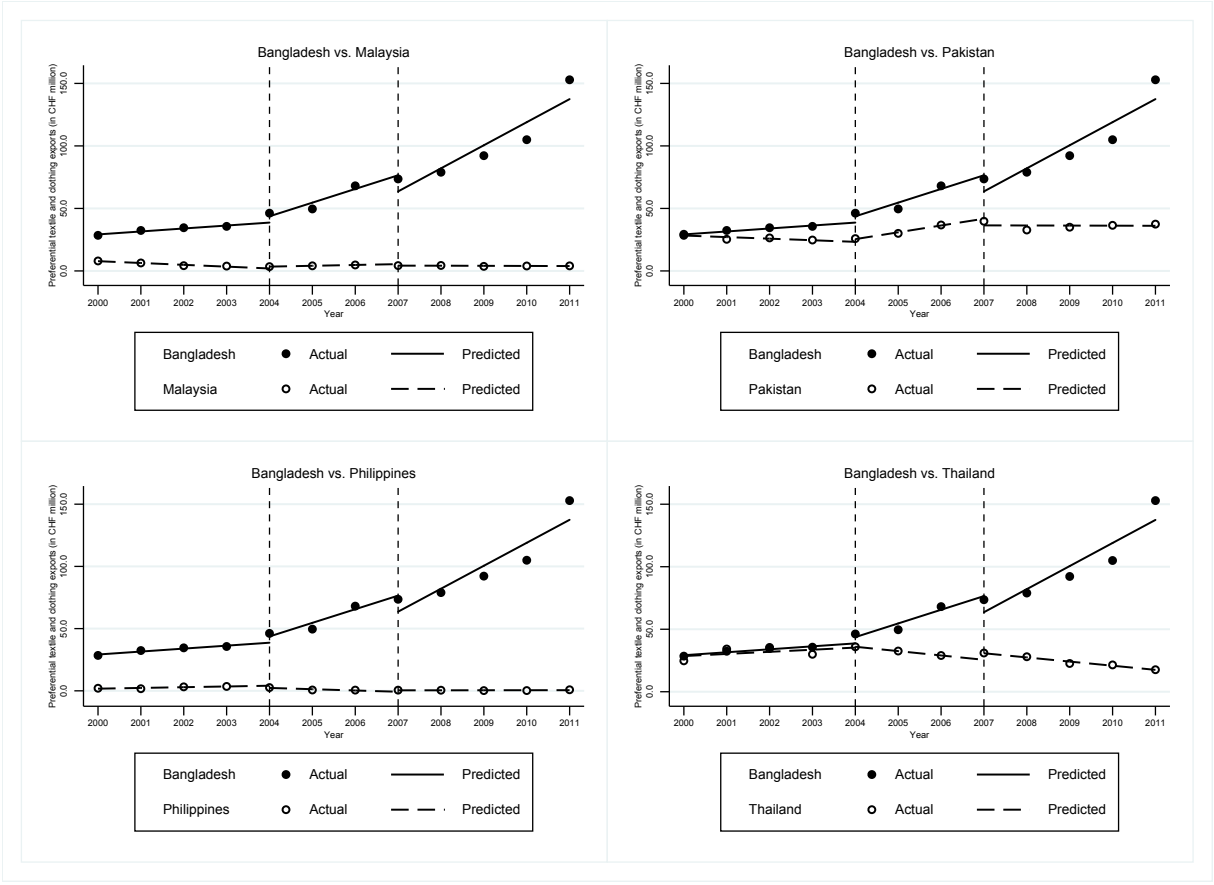

Figure 7.4: Graphical output of the baseline regression models (Part 2)

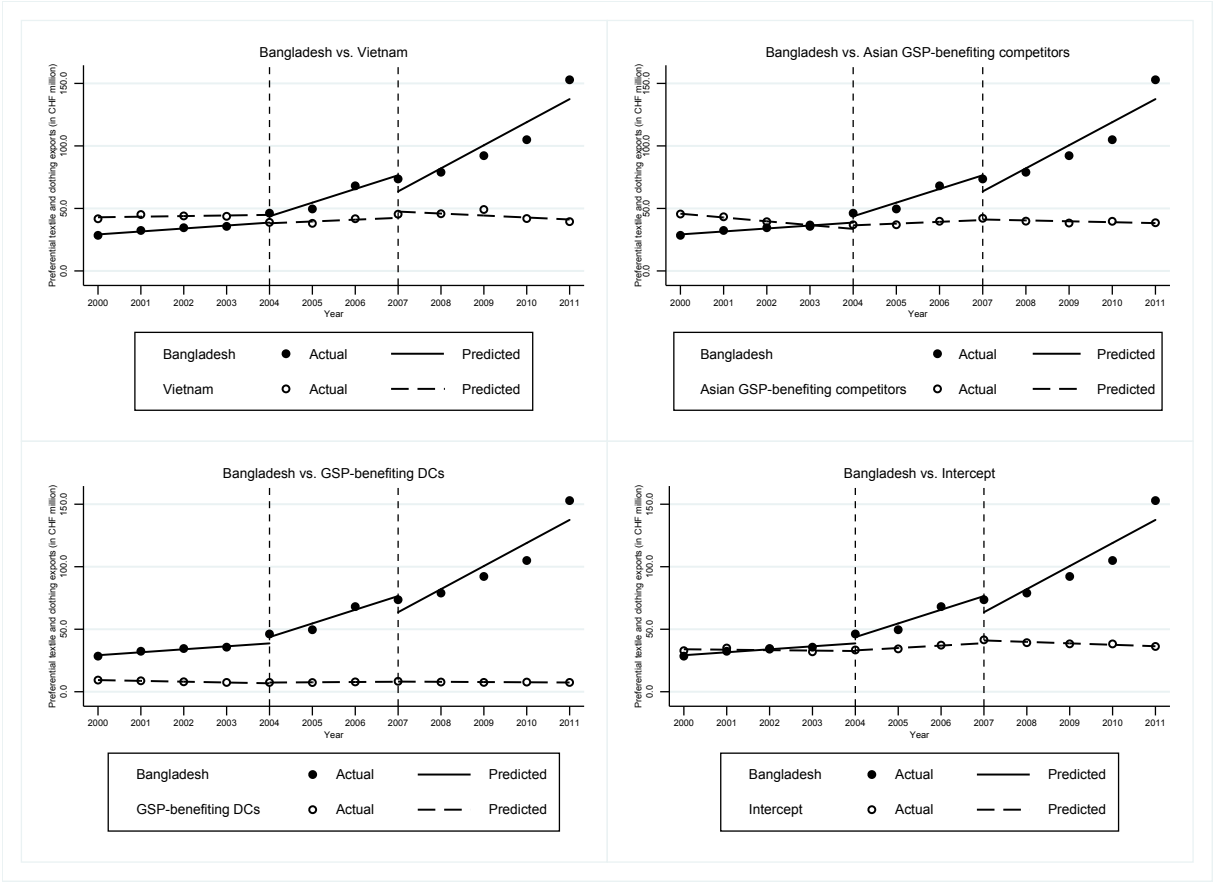

Figure 7.5: Graphical output of the baseline regression models (Part 3)

8 Integrating developing countries into the world economy: A Tunisian case study

Joint work with Andreas Kohler and Stefan Mann

8.1 Introduction[1]

While unilateral preferential trade agreements such as the Generalized System of Preferences (GSP) have mostly shown mediocre performance (OECD, 2005; European Commission, 2011), the number of bilateral free trade agreements (FTAs) between the global North and South is constantly increasing (Joerchel, 2006). According to the World Trade Organization (2016a), 625 regional FTAs were notified to the GATT/WTO in 2016. Negotiating and ratifying FTAs with developing countries (DCs) is becoming the dominant route for the USA and European Union (EU), as well as the European Free Trade Agreement (EFTA) including Switzerland (Joerchel, 2006).

Because trade preferences under the Swiss GSP are offered to the country group of DCs as a whole, non-reciprocal trade preferences are not tailored to the export structure of a particular DC. Consequently, by switching from non-reciprocal to negotiated reciprocal trade preferences, DCs such as Tunisia expect to negotiate terms which are tailored to their export structure and better conditions than competitors from countries which are still beneficiaries of the GSP (Joerchel, 2006). For instance, an export-hit of Tunisian 'raw olive oil in bottles' was not covered for preferential treatment under the GSP for DCs. However, a concession for 'raw olive oil in bottles' is granted under the bilateral FTA with Switzerland (State Secretariat for Economic Affairs, 2005).

From an economic development viewpoint, we investigate if, and to what extent, Tunisia's 2005 switch from non-reciprocal to reciprocal trade preferences created trade, and more generally, if bilateral FTAs are more beneficial to poor countries than unilateral trade preferences. This question was particularly central to WTO's 'Doha Development Round' in 2001. While there was broad agreement that DCs and Least Developed Countries (LDCs) should secure a share in the growth of world trade, there was disagreement on how to reach this goal (Conconi and Perroni, 2009). To shed some light on this issue we apply Propensity-Score Matching

[1] A version of this article is published in International Journal of Development Issues, 2017, Vol. 16(3), pp. 300-316 (Emerald Group Publishing).

(Leuven and Sianesi, 2003) and, as an additional robustness check, Nearest-Neighbor Matching (Abadie et al., 2004) to estimate the annual average treatment effect on the treated (ATT). Corresponding matching covariates were chosen based on the theoretically founded economic gravity equation (Shepherd, 2013). Furthermore, to depict the institutional quality of a nation and the resulting stage of human development, we use the Human Development Index (HDI) as an additional matching covariate.

In this case study we investigate the potential benefits of Tunisia's 2005 switch from unilateral (non-reciprocal) GSP preferences granted by Switzerland to bilateral (and reciprocal) FTA preferences under the EFTA. We analyze Tunisia's exports to Switzerland under the Harmonized System (HS), chapters 01-97, during 2000 and 2011. In particular, we conduct an analysis of agro-food exports (including fishery) under HS chapters 01-24 and textile exports under HS chapters 50-67. Additionally, to provide a more detailed picture we conduct a sectoral analysis on HS 2 digits level to identify potential advantages or disadvantages of a FTA compared to the GSP.

While several case studies on Tunisia focused on olive oil exports (e.g. Angulo et al., 2011; Larbi and Chymes, 2010) or on macroeconomic determinants potentially boosting exports (e.g. Cadot et al., 2012; Masmoudi and Charfi, 2013), literature on evaluating bilateral FTAs using econometric matching techniques is rather scarce. Baier and Bergstrand (2009b) were the first to try to provide empirical evidence for causal effects of FTAs. They apply nonparametric matching techniques to estimate the causal long-run effect of FTAs on bilateral international trade flows as well as on long-run effects of membership of the European Economic Community and Central American Common Market between 1960 and 2000. Using the same techniques, Baier and Bergstrand (2010) evaluated the impact of the 2002 bilateral FTA between Switzerland and Mexico. They found that this Swiss-Mexico FTA increased bilateral trade by about 37 percent after only four years in place.

To our knowledge, ours is the first study to investigate explicitly the switch from non-reciprocal to reciprocal trade preferences using econometric matching techniques. Furthermore, we also take different aggregation levels of trade flows into account. In practice, preferential trade agreements such as the GSP or FTAs are never fully utilized due to bureaucratic obstacles in the form of export certificates (e.g. certificates of origin and direct shipment). Failure to differentiate between prevailing tariff regimes, can produce biased estimates of trade liberalization effects.

The remainder of this paper is organized as follows: First, Section 8.2 provides an introduction to the 2005 FTA between Switzerland and Tunisia. Next, Section 8.3 describes the underlying data. Section 8.4 goes on to present stylized facts on Tunisia's exports to Switzerland. Section 8.5 presents the empirical strategy including information concerning the concept of causal inference, the selection bias which is related to the evaluation of FTAs (8.5.1), and

a specification of the econometric matching techniques used (8.5.2). Section 8.6 presents and discusses the results for overall, agro-food and textile exports (Section 8.6.1), and the results of a sectoral analysis on HS 2 digits level (Section 8.6.2). To conclude, the essential findings of this article are summarized in Section 8.7.

8.2 Swiss trade policy and the case of Tunisia

As a small and rich economy, Switzerland is an interesting market for DCs. According to information provided by the International Monetary Fund (2013), Switzerland occupies fourth place worldwide for per-capita Gross Domestic Product (GDP) and has higher producer and consumer prices for foods than its European neighbors Germany, France, Austria and Italy (Federal Office for Agriculture, 2013). Overall, Switzerland is around 60% self sufficient in food production (Swiss Federal Statistical Office, 2014). The level of subsidy for ensuring the multifunctionality of Swiss agriculture (OECD, 2013) and the tariff protection level are high in international terms (Häberli, 2008). Swiss trade policy rests upon five main pillars: World Trade Organization membership, bilateral agreements with the European Union, bilateral agreements with non-EU members, the multilateral European Free Trade Agreement, and unilateral trade preferences via the Generalized System of Preferences (GSP) for Developing Countries and Least Developed Countries (Ritzel and Kohler; 2016b). No other nation has signed more bilateral and multilateral free trade agreements than Switzerland. In 2016, a total of 28 bilateral and multilateral FTAs are in force and nine FTAs are currently under negotiation (State Secretariat for Economic Affairs, 2016).

Tunisia is viewed as an African DC which is the most open towards Europe and, as a former French colony, its people speak French (Hamel, 2011). The presence of at least one official language facilitates trade, especially with regard to overcoming bureaucratic obstacles in the form of export certificates (e.g., certificates of origin and direct shipment) (Manchin, 2006). Besides having a favorable geographic location (the distance between Bern and Tunis is about 1,150 km), Tunisia witnessed constant annual percentage growth in per capita GDP during our observation period and underwent a political transition, overcoming political deadlock to adopt a new constitution, and holding both parliamentary and presidential elections (The World Bank, 2015; The World Bank, 2016).

The excellent political and economic relationship between the two countries was corroborated by the launch of a Tunisian-Swiss friendship group in 2016 (The Federal Department of Economic Affairs, Education and Research, 2016). While the EU27 is Tunisia's most important trading partner, Switzerland ranks seventh on the list of its ten top trading partners (European Commission, 2016a). Furthermore, Switzerland is one of the leading investors in Tunisia. Swiss companies are active in the Tunisian textiles, clothing and agro-food (including fishery) sectors

(The Federal Department of Foreign Affairs, 2016b).

Since June 1, 2005, the FTA between Switzerland and Tunisia under the EFTA is in force. Consequently, unilateral and non-reciprocal preferences granted to Tunisia under the GSP are replaced by multilateral, respectively bilateral and reciprocal preferences under the FTA (State Secretariat for Economic Affairs, 2005). The FTA is constructed on an asymmetric basis to take account of structural differences in economic development between the EFTA members and Tunisia. Apart from a few products relevant in terms of agricultural policy, the EFTA members have cut tariffs completely for industrialized and fishery products since the entry into force of the FTA. In return, Tunisia grants the same preferences on industrialized products as those granted to the EU. This means that the tariff cut by Tunisia takes place in the ninth year of the twelve-year transition period (The Federal Council, 2006). The FTA also contains substantive provisions on intellectual property, competition and dispute settlement and covers certain aspects of services, investment and government procurement. Furthermore, the FTA – in contrast to the GSP – contains a 'modern' protocol on the 'rules of origin', which permits regional cumulation within the European-Mediterranean area (State Secretariat for Economic Affairs, 2005). Basic agricultural products are covered by a separate bilateral FTA between Switzerland and Tunisia, whereas industrial products, including fish and other marine products, as well as processed agricultural products are covered by the multilateral EFTA (State Secretariat for Economic Affairs, 2009). While areas of special interests to DCs such as agro-food and/or textiles are often excluded from such FTAs (Joerchel, 2006), the bilateral FTA between Switzerland and Tunisia explicitly covers Tunisian export-hits such as 'raw olive oil in bottles', 'citrus fruits', 'dates', 'almonds', 'melons' and 'pomegranates' (State Secretariat for Economic Affairs, 2005). The agro-food and fishery sector in particular, as well as the textile and clothing sector, are of key importance for Tunisia. The agro-food and fishery sector employs around 16 percent of the working population and accounts for around 12 percent of total Tunisian exports (The World Bank, 2016; National Institute of Statistics Tunisia; 2016). On the other hand, the textile and clothing sector employs around 30 percent of the working population and represents around 28 percent of total Tunisian exports (Agency for the Promotion of Industry and Innovation, 2016; National Institute of Statistics Tunisia; 2016). Combined, the two sectors account for 40 percent of total Tunisian exports.

8.3 Data

We calculate annual aggregated total and preferential trade flows based on the Swiss-Impex database provided by the Swiss Customs Administration (Swiss Customs Administration, 2015) for the years 2000 to 2011. We use all products in HS chapters 01-97. Because Swiss Customs Administration (2015) changed its methodology from producing country to country of origin in

2012, our analysis excludes observations after 2012 to ensure comparability of the results.

Gross domestic product in current USD and population were taken from The World Bank World Development Indicators (2016). Bilateral distances to Switzerland are provided by the French Centre d'Études Prospectives et d'Informations Internationales (Mayer and Zignago, 2011). Economic Remoteness was calculated based on Baier and Bergstrand (2009a) using bilateral distances for pairs of countries (Mayer and Zignago, 2011) and GDP in current USD.

The HDI is published by The United Nations Development Programme (2014). The scale ranges from 0 (low human development) to 1 (very high human development). The HDI is calculated as the geometric mean of the following three indices: a health index, an education index and an index based on Gross National Income (GNI). The HDI covers 186 countries.

8.4 Stylized facts

Figure 8.1 presents the evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-97. We distinguish between total (solid line) and preferential exports (dashed line). While total exports comprise the entire rates of tariffs (e.g., most-favored-nations tariffs under the GATT/WTO), preferential exports merely comprise preferential tariffs under the GSP in the pre-treatment period from 2000 to 2004, and preferential tariffs under the FTA in the post-treatment period from 2005 to 2011. Accordingly, the vertical dotted line indicates the treatment in the form of switching from non-reciprocal to reciprocal trade preferences.

Preferential tariffs under the GSP and the FTA are split into 'reduced' and 'duty-free'. Because utilizing trade preferences under the GSP and under the FTA involves overcoming bureaucratic obstacles in the form of 'certificates of origin and of direct shipment', we aggregated all preferential exports and therefore do not distinguish between preferential exports under 'reduced' and 'duty-free' tariffs.

Figure 8.1 suggests a positive treatment effect for Tunisia of switching from non-reciprocal to reciprocal trade preferences. This holds for overall exports under HS chapters 01-97. Total and preferential exports under HS chapters 01-97 rose continually from 2000 to 2011. The percentage share of preferential exports in total exports (the utility rate) for overall exports did not change significantly due to the switch from unilateral to bilateral trade preferences. The utility rate for overall exports under the GSP (pre-treatment period) was about 50 percent, as was the utility rate for overall exports under the FTA (post-treatment period). Even though corresponding utility rates did not change due to the switch, signing and ratifying an FTA seems to stimulate Swiss and Tunisian market actors.

Figure 8.2 presents the evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-24 (upper graph), and under HS chapters 50-67 (lower

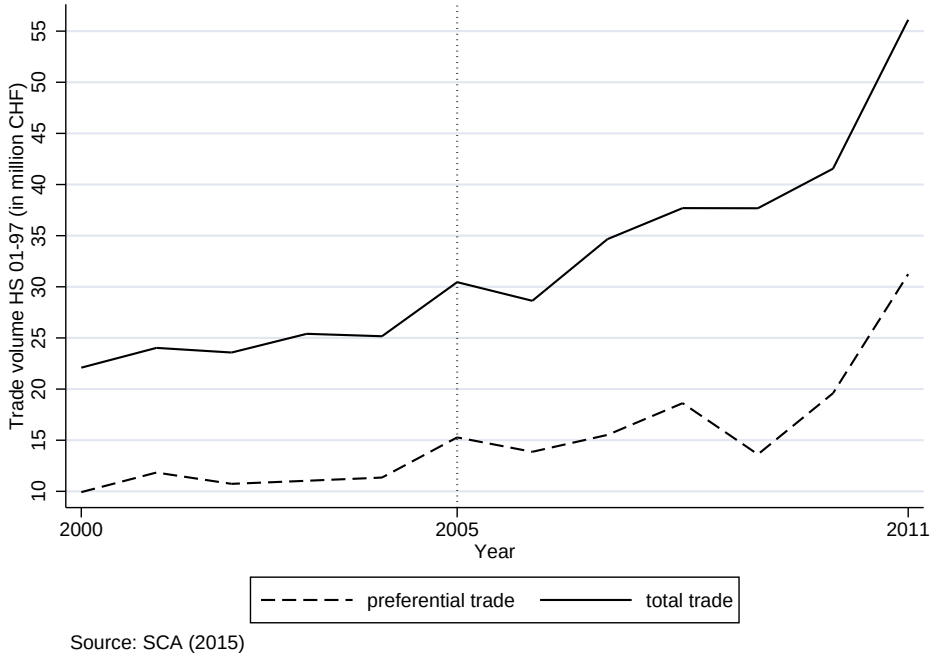

Figure 8.1: Evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-97 (Source: Swiss Customs Administration, 2015)

graph). Processing of the data and the associated interpretation of the graphs is the same as for Figure 8.1.

Figure 8.2 indicates a positive treatment effect for Tunisia of switching from non-reciprocal to reciprocal trade preferences for agro-food exports (including fishery) under HS chapters 01-24. While total and preferential exports under HS chapters 01-97 rose continually from 2000 to 2011, total and preferential agro-food exports suffered a decline in 2001 and 2002, but rose continually from 2003 on. The utility rate for agro-food exports under the GSP (pre-treatment period) was about 50 percent, as was the utility rate for agro-food exports under the FTA (post-treatment period). In contrast, total and preferential textile exports under HS chapters 50-67 decreased during the pre-treatment period. While total textile exports fell continually until 2010 and then jumped back to the initial levels from 2000 and 2001 in the last year of our observation period, preferential textile exports resumed their upward climb from 2005 on. The utility rate for textile exports under the GSP (pre-treatment period) was about 35.0 percent, while the utility rate for textile exports under the FTA (post-treatment period) was about 50 percent. Even though textile exports do not indicate a positive treatment effect on total trade level, a positive treatment effect on preferential trade level can nevertheless, be observed.

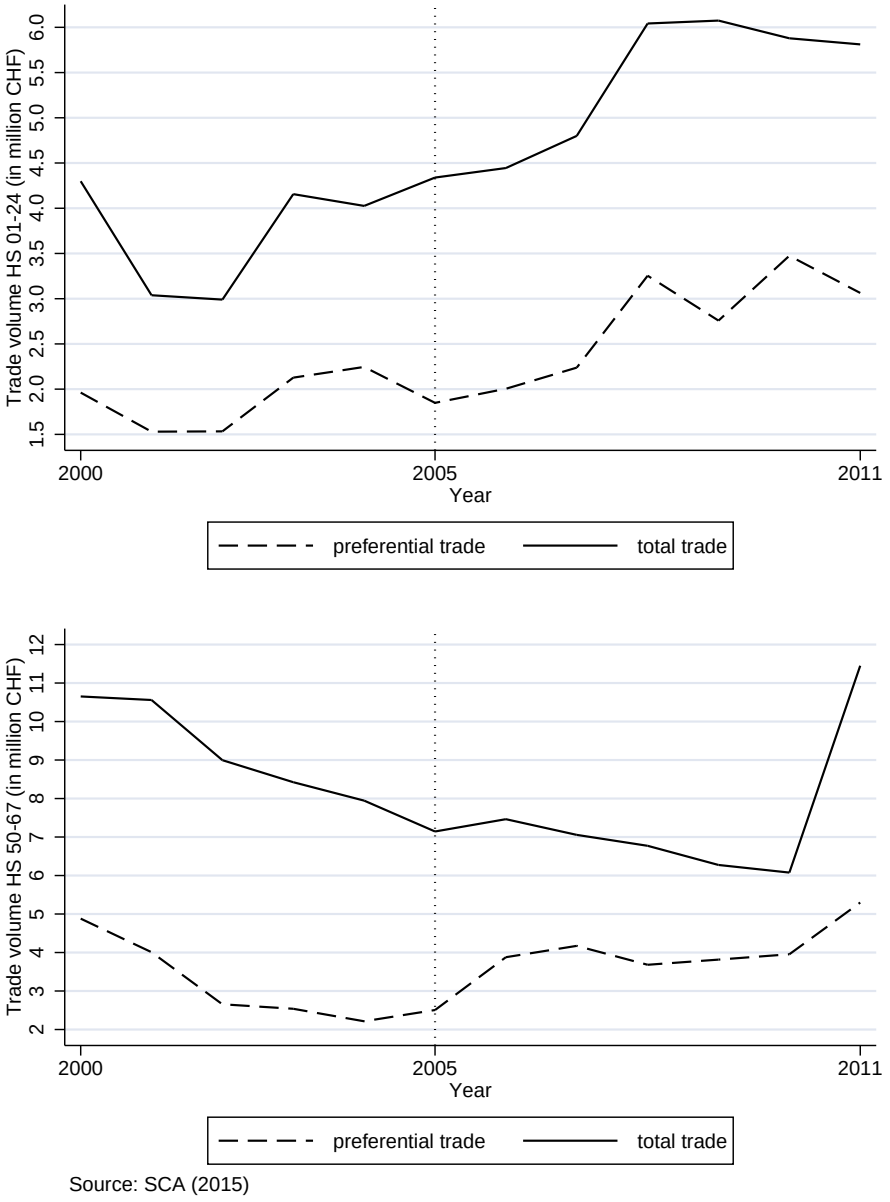

Figure 8.2: Evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-24, and under HS chapters 50-67 (Source: Swiss Customs Administration, 2015)

8.5 Empirical strategy

8.5.1 Free trade and selection bias

Our study relates to the idea of causal inference which is based on the concept of the counterfactual state (Roy, 1951; Rubin, 1974). Because the counterfactual state can never be observed, we

can only analyze the difference in (total and preferential) exports between the country affected by the treatment in the form of signing a bilateral FTA with Switzerland (Tunisia) and those countries, not affected by the treatment (GSP benefiting countries). The difference between the factual and counterfactual state is the treatment in the form of signing a bilateral FTA with Switzerland in 2005. The strategy used by the Swiss Federal Council to select prospective FTA partners is based inter alia on the current and potential economic importance of a partner and other considerations such as the expected contribution of an FTA towards the economic stabilization and development of a potential FTA partner or, in general, compatibility with Swiss foreign policy objectives (State Secretariat for Economic Affairs, 2016). In this context, Swiss foreign policy holds to the following values: helping to alleviate poverty and hardship in the world, respecting human rights, promoting democracy, promoting the peaceful coexistence of peoples, and conserving natural resources. Accordingly, the Swiss Federal council's considerations for selecting prospective FTA partners are based on economic, trade and development policy related aspects. Therefore, the FTA with Tunisia is seen as contributing to political stability and economic development (The Federal Department of Foreign Affairs, 2016a).

Evaluation of bilateral FTAs is plagued by selection bias. A cutback of tariff barriers on trade in the framework of bilateral and multilateral FTAs is not randomized, since countries select themselves into FTAs. Further, self-selection into FTAs is associated with transaction costs (e.g., for extensive negotiations) (Baier and Bergstrand, 2007; Baier and Bergstrand, 2010). We construct a control unit out of GSP benefiting DCs and LDCs which had not signed an FTA with Switzerland during our observation period. To construct a suitable control unit for Tunisia, we use basic variables of the theoretically founded gravity equation (GDP per capita, bilateral distance and economic remoteness) to depict the trade performance of a country. Furthermore, we use the HDI to depict the institutional quality of a nation and the resulting stage of human development. By considerung FTAs, which are the outcome of negotiations, using nonparametric matching techniques is a limited strategy controlling for selection bias. Baier and Bergstrand (2009b) acknowledge this: "we note that our matching estimates do not address explicitly selection bias on unobservables." Thus, for many products (sectors) where domestic businesses have political clout tariffs are not eliminated. In other words, the variation in FTAs they consider may still not be exogenous, regardless of the method used for analyzing them. We are likewise aware of this problem, but in our view, compared to ordinary regression (e.g., by means of the economic gravity model), matching econometrics is able to construct a counterfactual state. Nevertheless, we are confident that the choice of matching covariates which depict the trade performance as well as institutional quality and the resulting stage of human development covers at least partly main factors which affect Switzerland's selection with regard to DCs. Therfore, based on observed socioeconomic conditions (gravity variables and the HDI), we can observe an average treatment effect on the treated (ATT) unit Tunisia.

8.5.2 Matching econometrics

To check the robustness of our results, we use the following two econometric matching techniques. First, we apply Propensity-Score Matching (PSM) based on Leuven and Sianesi (2003). As a baseline we use the most common PSM algorithm – the one-to-one pair matching algorithm (or Nearest-Neighbor Matching). As an additional robustness check, we gradually extend our analysis by the one-to-two and one-to-three matching algorithm (two and three nearest neighbors).

The propensity score (PS) represents the probability of treatment assignment conditional on observed factors (in our case study differences in trade performance depicted by basic variables/covariates of the gravity equation and the institutional quality of a nation depicted by the HDI) (Austin, 2011). In a first step, the PSM algorithm estimates the conditional probability (PS) of signing an FTA based on variables of the gravity equation and the HDI by means of the following probit model (see Rabe-Hesketh and Skrondal, 2012):

$$P(X) = Pr(FTA = 1|X = x) = \phi(x'\beta) \tag{8.1}$$

where $P(X)$ is a binary dependent variable, representing the probability of switching from the GSP to a bilateral FTA conditional on X. X depicts a vector of basic variables of the basic gravity equation (GDP per capita, bilateral distance and economic remoteness) as well as the institutional quality of the FTA member Tunisia and GSP benefiting countries (depicted by the HDI). ϕ represents the distribution function of a standard-normal distribution. The coefficient β is estimated by means of the Maximum-Likelihood-Method (note: estimation results of the probit model are not interpreted. However, corresponding estimation results can be found in Appendix 8.8).

The PSM needs to hold the following two key assumptions (see Rosenbaum and Rubin, 1983). The first assumption is the conditional independent assumption (CIA):

$$(Y_0, Y_1) \perp FTA|X \tag{8.2}$$

The observed factors X (basic variables of the gravity equation and institutional quality) make the switch from non-reciprocal to reciprocal trade preferences of Tunisia (FTA) independent of the potential outcomes Y_0, Y_1 (aggregated total and preferential trade volumes). Therefore, the CIA ensures that the switch from non-reciprocal to reciprocal trade preferences is as good as random.

The second assumption is the common support assumption (CSA):

$$0 < Pr(FTA = 1|X = x) < 1 \tag{8.3}$$

Here, $Pr(x)$ represents a continuous variable ranging between 0 and 1. This term describes the range of value, where the PS for the treatment and control unit shows a similar density. Accordingly, the proportion of Tunisia and GSP benefiting countries is greater than 0 for any given value of the vector of X. If that is not the case, matching and the estimations of average annual treatment effects based on matching are not possible.

In a second step, the PSM algorithm searches for a GSP benefiting country with a PS similar to Tunisia. After balancing observable factors of the basic gravity equation, we obtain the average treatment effect on the treated (ATT), which can be formalized as follows (see Imbens, 2004):

$$\tau_{ATT} = E[Y(1)|FTA = 1] - E[Y(0)|FTA = 0] \tag{8.4}$$

where τ_{ATT} represents the average treatment effect on the treated. FTA depicts a binary treatment variable, which takes the value of one for the FTA member Tunisia, and zero for GSP benefiting countries. $E[Y(1)|FTA = 1]$ corresponds to the expected exports of the FTA member Tunisia, and $E[Y(0)|FTA = 0]$ corresponds to the expected exports of the counterfactual state (countries still benefiting from the GSP). Consequently, the ATT estimates the (annual) average difference between average aggregated exports of the FTA-member Tunisia and average aggregated exports of a counterfactual GSP benefiting country conditional on X.

Next, we apply Nearest-Neighbor Matching (nnmatch) based on Abadie et al. (2004) to identify the annual ATT. This approach is similar to PSM but with the substantial difference that nnmatch does not estimate the probability of treatment participation, known as PS. Instead, nnmatch uses weighted distances between covariate patterns to define 'nearest'. Other measures are also used, but these details are less important than the costs and benefits of nnmatch dropping the functional-form assumptions (e.g. probit or logit) used in the PSM estimator (Huber, 2015).

8.6 Results and discussion

8.6.1 Results for overall, agro-food and textile exports

Table 8.1 presents results for (1) Propensity-Score Matching and (2) Nearest-Neighbor Matching for different aggregation levels of trade flows. We distinguish between total and preferential trade, and between overall exports under HS chapters 01-97, agro-food exports under HS chapters 01-24 and textile exports under HS chapter 50-67. Column 3 contains results for one-to-one,

Table 8.1: Results for different matching estimators (in CHF million)

Empirical Strategy	Aggregation Level	one-to-one	one-to-two	one-to-three
(1) PSM	total exports HS 01-97	-86.1*	-34.3	-31.2
		(54.0)	(30.0)	(23.6)
	pref. exports HS 01-97	12.8***	8.9***	9.7***
		(2.8)	(3.5)	(2.9)
	total exports HS 01-24	3.8***	3.5***	3.7***
		(0.6)	(0.5)	(0.5)
	pref. exports HS 01-24	1.8***	1.6***	1.8***
		(0.3)	(0.4)	(0.4)
	total exports HS 50-67	6.4***	5.5***	5.4***
		(0.7)	(0.9)	(0.9)
	pref. exports HS 50-67	3.5***	3.3***	3.3***
		(0.3)	(0.3)	(0.3)
(2) nnmatch	total exports HS 01-97	-86.5	-121.0**	-119.0***
		(80.1)	(47.9)	(43.1)
	pref. exports HS 01-97	17.7***	17.8***	15.6***
		(1.8)	(3.5)	(3.3)
	total exports HS 01-24	4.2***	4.3***	4.3***
		(0.4)	(0.4)	(0.4)
	pref. exports HS 01-24	2.1***	2.1***	2.1***
		(0.3)	(0.3)	(0.3)
	total exports HS 50-67	7.5***	7.5***	6.5***
		(0.8)	(1.3)	(1.1)
	pref. exports HS 50-67	3.9***	3.9***	3.8***
		(0.3)	(0.3)	(0.3)

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors for nnmatch in parentheses

column 4 results for one-to-two and column 5 results for one-to-three matching. The estimator of the annual ATT corresponding to the individual matching technique is expressed in million CHF.

For all aggregation levels of trade flows (overall, agro-food and textile) and counterfactual variations (one-to-one, one-to-two and one-to-three), we can reject the null hypothesis that the means of covariates for the treatment and control unit are not the same. This implies that covariates are balanced perfectly between treatment and control unit (corresponding covariate balancing can be found in Appendix 8.9).

PSM and nnmatch indicate consistent and robust results concerning signs and magnitudes of the estimators of the annual ATT. The sole exception is estimation results for total exports under HS chapters 01-97. In case of PSM the annual ATT increases, but remains negative and not statistically significant when compared to two (-34.3) and three (-31.2) nearest counterfactuals. In contrast, estimation results for nnmatch indicate a decreasing and statistically significant negative annual ATT when compared to two (-121) and three (-119) nearest counterfactuals. In general, the annual ATT for total exports under HS chapters HS 01-97 is negative and in three out of six cases statistically significant, while the annual ATT for preferential exports under HS

chapters HS 01-97 is positive and statistically significant for all counterfactual variations (one-to-one, one-to-two and one-to-three). This clearly shows that studies evaluating the effects of FTAs which do not distinguish between total and preferential trade flows may produce results which underestimate the potential positive effect of an FTA. Nevertheless, this corresponds to a 125 percent increase in preferential exports under HS chapters 01-97.

The analysis of agro-food exports indicates a positive annual ATT for total and preferential agro-food exports for all counterfactual variations. However, the annual ATT for total and preferential exports in case of PSM decreases slightly when compared to results for two and three nearest counterfactuals, whereas the annual ATT in case of nnmatch remains more or less constant. Consequently, if Tunisia had not switched from non-reciprocal to reciprocal trade preferences in 2005, Tunisia's annual preferential agro-food exports (total agro-food exports) would have been around CHF 2 million (CHF 4 million) lower, which corresponds to an increase of around 100 percent in total and preferential agro-food exports.

The analysis of textile exports shows a positive and statistically significant annual ATT for all aggregation levels of exports and counterfactual variations. The annual ATT for total and preferential exports in case of PSM decreases slightly when compared to results for two and three nearest counterfactuals, whereas the annual ATT in case of nnmatch remains more or less constant. In this case too, the switch from non-reciprocal to reciprocal trade preferences triggered a positive effect for total and preferential exports compared to the counterfactual GSP benefiting countries. Accordingly, if Tunisia had not switched from unilateral to bilateral trade preferences in 2005, its annual preferential exports under HS chapters 50-67 (total exports under HS chapters 50-67) would have been around CHF 3.5 million (CHF 6.5 million) lower. Accordingly, Tunisian preferential textile exports increased by 100 percent, while total textile exports increased by only 70 percent.

8.6.2 Results for sectoral analysis

To provide a better overview for sectoral PSM estimations on HS 2 digits level, we conducted a rough thematic division of all HS chapters in which we observed positive Tunisian exports. Corresponding HS chapters on 2 digits level were we observed virtually no, or zero exports during our observation period were excluded from the analysis. Accordingly, the rough thematic division resulted in seven export sectors (the corresponding thematic division and a detailed presentation of PSM estimators on HS 2 digits level with their prevailing significance levels can be found in Appendix 8.10). Here, 53 out of 97 HS chapters showed constant positive total exports, while only 43 out of 97 HS chapters showed constant positive preferential exports during our observation period.

Because utilizing trade preferences involves overcoming bureaucratic obstacles in the form of export certificates (e.g., certificates of origin and direct shipment), and because considering

total instead of preferential exports may produce results which underestimate (or overestimate) the potential positive effect of an FTA (see Section 8.6.1), the following presentation of sectoral PSM estimation results considers preferential exports only. For this purpose we apply PSM with one nearest neighbor (one-to-one), because the variance between different matching estimators (PSM vs. nnmatch) and counterfactual variations (one-to-one, one-to-two and one-to-three) is not tremendous. Again, we can reject the null hypothesis that the means of covariates for the treatment and control unit are not the same. Accordingly, Figure 8.3 presents the frequency distribution of PSM estimators for preferential exports on HS 2 digits level.

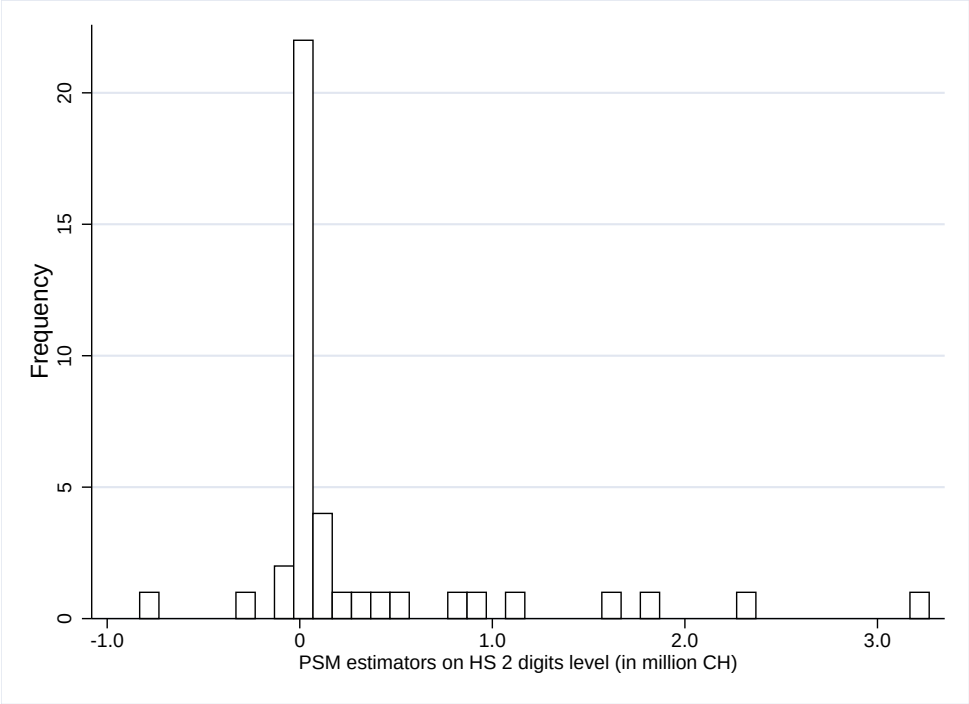

Figure 8.3: Frequency distribution of PSM estimators for preferential exports on HS 2 digits level

Figure 8.3 clearly indicates that a significant proportion of PSM estimators are close to zero. While only a few annual ATTs are negative, however, selectively we obtain positive annual ATTs of switching from non-reciprocal to reciprocal trade preferences. This implies that switching from non-reciprocal to reciprocal trade preferences gains advantages in export sectors where Tunisia has comparative cost advantages. Therefore, Figure 8.3 can be considered as a reflection of negotiated tariff concessions of the FTA.

Figure 8.4 shows a sectoral plot of PSM estimators for preferential exports on HS 2 digits level. As mentioned above, we conducted a rough thematic division of HS chapters on HS 2 digits level which resulted in seven export sectors. Figure 8.4 allows us to identifiy HS chapters within a particular sector, where the positive annual ATT of switching from non-reciprocal to reciprocal trade preferences is most pronounced.

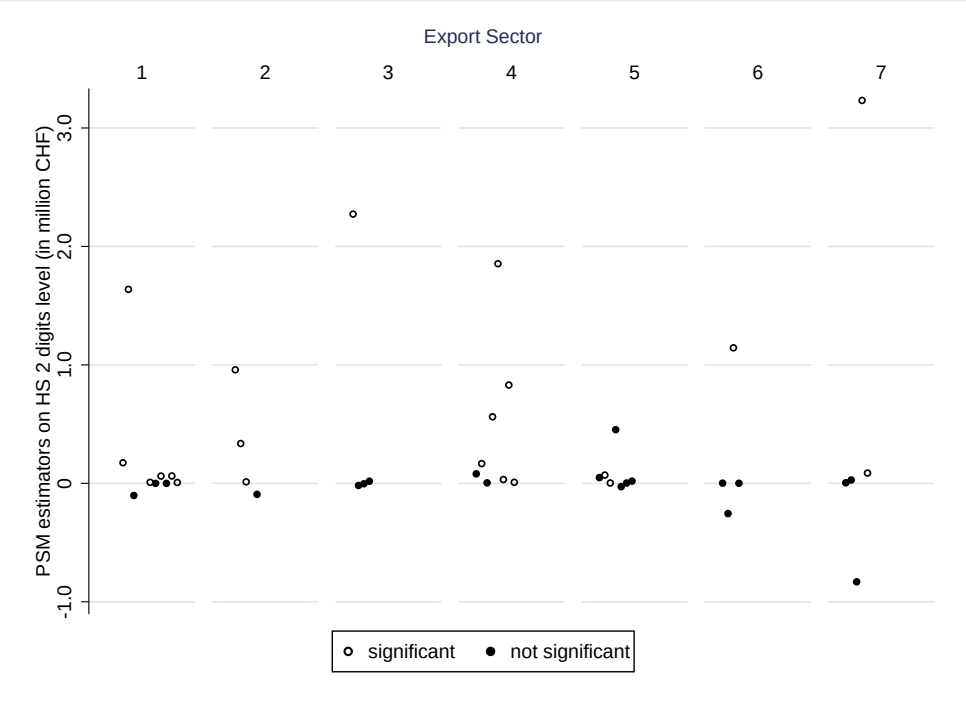

Figure 8.4: Sectoral plot of PSM estimators for preferential exports on HS 2 digits level

A detailed analysis of sector 1 (‘Agro-Food & Fishery’ HS 01-24) shows that the advantage vis-á-vis remaining in the GSP is relatively small. Despite the fact that the EFTA members have cut tariffs completely for fishery products since the entry into force of the FTA, we obtained no preferential exports within HS chapter 03 ‘Fish & Crustaceans’. Clear and statistically significant advantages can be obtained only in HS 07 ‘Edible Vegetables’ and HS 08 ‘Edible Fruits’. During the pre-treatment period from 2000 to 2004, we observed virtually no Tunisian exports to Switzerland under HS 07. However, with a lag of one year, exports under HS 07 increased rapidly from 2006 on. Accordingly, vegetable exports increased by 880 percent, while fruit exports rose by 90 percent. Annual ATTs of switching from non-reciprocal to reciprocal trade preferences within the remaining HS chapters in sector 1 tend to be close to zero, or slightly negative but not statistically significant in the case of HS chapter 09 ‘Coffee & Tea’.

Sector 2 (‘Chemicals, Plastics & Rubbers’ HS 28-40) indicates a clear advantage vis-á-vis remaining in the GSP. Positive and statistically significant annual ATT can be obtained in HS chapter 31 ‘Fertilizers’ and HS chapter 33 ‘Essential oils & resinoids’. In measurable terms, preferential fertilizer exports increased by 500 percent and preferential exports of essential oils and resinoids by 100 percent. A negative but not statistically significant annual ATT can be obtained for HS chapter 39 ’Plastics’.

Sector 3 (‘Natural Materials & Products thereof’ HS 41-49) indicates a strong positive annual ATT of switching from non-reciprocal to reciprocal trade preferences within HS chapter 42 ‘Articles of leather’, which corresponds to increased exports of 140 percent. The remaining HS

chapters within this sector indicate statistically not significant annual ATTs which are generally close to zero.

Sector 4 ('Textiles' HS 50-67) indicates the most pronounced advantage vis-á-vis remaining in the GSP. Especially HS chapter 62 'Apparel (not knitted or crocheted)', HS chapter 64 'Footwear', HS chapter 61 'Apparel (knitted or crocheted)' and HS chapter 57 'Carpets' indicate strong and statistically significant positive annual ATT compared to a counterfactual GSP benefiting country. For instance, carpet exports increased only by 13 percent, while apparel exports (not knitted or crocheted) rose by 500 percent. Within this wide span, footwear exports are boosted by 80 percent and apparel exports (knitted or crocheted) by 120 percent. Likewise, HS chapters 52 'Cotton' and 63 'Other made up textile articles' show positive annual ATTs but not at such a high level, and in the case of HS chapter 52 the positive annual ATT is not statistically significant. The annual ATTs of the remaining two HS chapters within sector 4 tend to be close to zero.

Within sector 5 ('Stone, Glass & Metals' HS 68-83) most of the annual ATTs are positive but tend to be close to zero. The only exception is HS chapter 70 'Glass & glassware'. Here, we obtain a strong positive annual ATT. However, this positive effect is not statistically significant.

Sector 6 'Machinery & Transportation' (HS 84-89) and sector 7 'Miscellaneous' (HS 90-97) show only one HS chapter each, where the positive annual ATT is most pronounced. These are HS chapter 85 'Electrical machinery & equipment' (sector 6) and HS chapter 95 'Toys, games & sport requisites' (sector 7). HS chapter 95 indicates the highest annual ATT and therefore triggers the strongest advantage vis-á-vis remaining in the GSP, which corresponds to a 250 percent increase in exports. While annual ATTs for HS chapters 84 'Machinery' and 94 'Furniture' are negative but not statistically significant, the remaining HS chapters within sectors 6 and 7 tend to be close to zero.

8.7 Conclusions

The case study of Tunisian exports to Switzerland yields a detailed picture of a politically and economically emerging DC switching from unilateral to bilateral trade preferences. In contrast to studies which estimate the potential effects of trade liberalization on trade flows for several countries on an aggregated level, the structure of trade data used in this case study enabled us to distinguish between total and preferential exports. We were therefore able to detect potentially biased estimates of trade liberalization effects. In concrete terms, the annual ATT for total exports under HS chapters 01-97 was negative and in three out of six cases statistically significant, while the annual ATT for preferential exports under HS chapters 01-97 was positive and statistically significant for all counterfactual variations. Furthermore, the Tunisian case study provided a more detailed picture of the modalities of signing and ratifying an FTA between a

DC and an industrialized country. However, case studies in this vein have their disadvantages. The greatest disadvantage is the lack of generalization. In contrast to studies estimating the potential effects of an FTA for several countries, we are not able to generalize our results based on a single case.

Nevertheless, from an economic development viewpoint, our case study addresses an important question: How can DCs (and LDCs) best be integrated into the world economy to reduce the existing discrepancies and polarities in terms of income and wealth? In this context, we found a positive annual ATT of switching from non-reciprocal to reciprocal trade preferences. Overall, preferential exports increased by 125 percent after the entry into force of the FTA in 2005. Preferential agro-food and textile exports likewise increased by 100 percent. However, a detailed analysis on HS 2 digits level showed, that a significant proportion of PSM estimators are close to zero. Selectively we obtained positive annual ATTs of switching from non-reciprocal to reciprocal trade preferences. This implies that switching from non-reciprocal to reciprocal trade preferences yields advantages in export sectors where Tunisia has comparative cost advantages. This is especially true for the textile sector and partly so for the agro-food sector.

In the case of Tunisia, the seemingly trivial question of whether DCs should invest scarce resources in negotiations to switch from non-reciprocal to reciprocal trade preferences can unequivocally be answered with 'yes'. Based on the switch from non-reciprocal to reciprocal trade preferences, Tunisia gains trade benefits compared to counterfactual countries still benefiting from the GSP. Accordingly, if Tunisia had not switched in 2005, the volume of preferential exports in particular would have been lower.

8.8 Appendix: Propensity Score Matching probit estimation results

Note: The probit model estimates the probability of 'FTA=1' ($P(X) = Pr(FTA = 1|X = x) = \phi(x'\beta)$) given a particular value for each of the independent variables. Therefore, the probit estimations are the same for different aggregation levels of trade flows (total vs. preferential trade flows as well as for HS 01-97, HS 01-24 and HS 50-67) and different variations of nearest neighbors, since we use the same pool of GSP benefiting countries as potential counterfactuals.

Table 8.2: PSM probit estimation results

Independent Variable	
GDP per capita	-0.0004012
	(0.0004354)
Bilateral distance	-0.0048264*
	(0.0029132)
Economic Remoteness	14.32063*
	(8.017982)
HDI	-2.519485
	(9.242058)
_cons	-110.2754*
	(63.99812)
Observations	759
$PseudoR^2$	0.6646

*** p < 1%, ** p < 5%, * p < 10%
Standard errors in parentheses

8.9 Appendix: Propensity Score Matching covariate balancing

Note: Results for PSM covariate balancing are the same for different aggregation levels of trade flows, since we use the same pool of GSP benefiting countries as potential counterfactuals.

Table 8.3: PSM covariate balancing for one-to-one matching

Covariate	Treated	Control	%bias	t	p-value	V(T) / V(C)
GDP per capita	3,784.5	3,457.8	10.7	1.15	0.285	1.33
Distance	1,149.1	1,132.0	0.8	0.33	0.749	0.00*
Remoteness	8.27	8.26	9.1	0.61	0.558	0.20
HDI	0.72	0.73	-11.4	-0.49	0.634	0.55

Table 8.4: PSM covariate balancing for one-to-two matching

Covariate	Treated	Control	%bias	t	p-value	V(T) / V(C)
GDP per capita	3,784.5	3,338.8	12.9	0.82	0.438	0.25
Distance	1,149.1	1,097.8	2.3	0.48	0.642	0.00*
Remoteness	8.27	8.24	17.2	0.98	0.355	0.14
HDI	0.72	0.74	-13.1	-0.49	0.638	0.36

Table 8.5: PSM covariate balancing for one-to-three matching

Covariate	Treated	Control	%bias	t	p-value	V(T) / V(C)
GDP per capita	3,784.5	3,254.5	17.3	1.02	0.338	0.21
Distance	1,149.1	1,167.3	-0.8	-0.14	0.890	0.00*
Remoteness	8.27	8.26	7.4	0.43	0.679	0.14
HDI	0.72	0.72	-2.0	-0.07	0.944	0.32

8.10 Appendix: Propensity Score Matching estimators on Harmonized System 2 digits level

Table 8.6: PSM estimators for preferential exports on HS 2 digits level (in CHF)

HS	Description	Estimator	Sector	Description
07	Edible Vegetables	173,909**	1	Agro-Food & Fishery
08	Edible Fruits	1,637,709***	1	Agro-Food & Fishery
09	Coffee & Tea	-102,768	1	Agro-Food & Fishery
15	Fats & Oils	8,675**	1	Agro-Food & Fishery
17	Sugars	-189	1	Agro-Food & Fishery
19	Preperations of cereals	61,368***	1	Agro-Food & Fishery
20	Preperations of vegetables	-113	1	Agro-Food & Fishery
21	Miscellaneous edible preparations	62,040***	1	Agro-Food & Fishery
22	Beverages	7,255***	1	Agro-Food & Fishery
31	Fertilizers	958,518**	2	Chemicals, Plastics & Rubbers
33	Essential oils & resinoids	336,042***	2	Chemicals, Plastics & Rubbers
34	Washing preparations	12,487*	2	Chemicals, Plastics & Rubbers
39	Plastics	-93,040	2	Chemicals, Plastics & Rubbers
42	Articles of leather	2,273,012***	3	Natural Materials & Products thereof
44	Wood	-17,982	3	Natural Materials & Products thereof
48	Paper & paperboard	-3,947	3	Natural Materials & Products thereof
49	Printed books	17,790	3	Natural Materials & Products thereof
52	Cotton	80,315	4	Textiles
57	Carpets	166,495***	4	Textiles
58	Special woven fabrics	4,122	4	Textiles
61	Apparel (knitted or crocheted)	561,780**	4	Textiles
62	Apparel (not knitted or crocheted)	1,854,024***	4	Textiles
63	Other made up textile articles	32,058***	4	Textiles
64	Footwear	830,143***	4	Textiles
65	Headgear	8,877**	4	Textiles
68	Articles of stone	48,431	5	Stone, Glass & Metals
69	Ceramic products	70,107***	5	Stone, Glass & Metals
70	Glass & glassware	2,827**	5	Stone, Glass & Metals
71	Natural or cultured pearls	453,070	5	Stone, Glass & Metals
73	Articles of iron or steel	-28,180	5	Stone, Glass & Metals
74	Copper	2,830	5	Stone, Glass & Metals
76	Nickel	18,962	5	Stone, Glass & Metals
83	Miscellaneous articles of base metal	1,637	6	Machinery & Transportation
84	Machinery	-255,115	6	Machinery & Transportation
85	Electrical machinery & equipment	1,144,216**	6	Machinery & Transportation
87	Vehicles other than railway or tramway	420	6	Machinery & Transportation
90	Optical apparatus	4,592	7	Miscellaneous
91	Clocks & watches	28,365	7	Miscellaneous
94	Furniture	-831,368	7	Miscellaneous
95	Toys, games & sports requisites	3,232,578***	7	Miscellaneous
96	Miscellaneous manufactured articles	86,970***	7	Miscellaneous

*** p < 1%, ** p < 5%, * p < 10%

9 Who benefits from the high-price segment in commodity markets?

Joint work with Stefan Mann

9.1 Introduction[1]

Conventional microeconomic models rest on the homogeneity of goods. Even economists know, of course, that this assumption is not realistic for all items. Therefore, a distinction is made between commodities and non-commodities as summarized by Vatn (2002; 319): "Ordinary commodities are homogeneous in quality. These goods are 'non-specific' in Williamson's terms. At the other end of the scale, we have goods that are 'idiosyncratic'; that is, goods that are specific to the transaction such as the construction of a new building or the creation of a park."

This mental model has given room to a comfortable division of work in academics: While marketing researchers were concerned with exploiting advantages by idiosyncratic creations, microeconomists could construct supply- and demand-functions solely dependent on a good's price. However, grey zones exist between the two groups in real-world markets. The focus on locality, for instance, can turn a commodity into a unique product (Hambrusch, 1998), and a few product categories, like wine, have idiosyncratic properties but still have a segment being treated as a commodity (Insel, 2014).

This contribution challenges the notion of 'commodities' more radically. Although both vegetable oil in general (Trostle, 2008; Harri et al., 2009) and coconut oil specifically (Brunner, 2002; Commodity Research Bureau, 2015b) are usually considered as examples of typical commodities, we use trade statistics to check systematic differences in price ranges, depending on country of origin and quantities traded. We then analyze perceptions of the actors in two market segments and finally draw conclusions on the validity of the commodity concept.

Consumption of vegetable oils in Switzerland has remained constant between 20 and 25 kg per head and year since many decades (Schmid et al., 2012). Vegetable oil is among the food products with the broadest variety of uses. Particularly soybean and sunflower oil are consumed directly, in catering coconut and peanut oil are used to fry food, the industry uses

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different vegetable oils for producing margarine and cosmetics. The use of vegetable oil as fuel plays a smaller role in Switzerland than in most industrialized countries.

While all the different uses of vegetable oil have been described in the literature before (Tarrago-Trani et al., 2006; Carter et al., 2007; Gunstone, 2011), to our knowledge this is the first study to explore the structure of vegetable oil prices in depth.

9.2 Method

The question whether a high-price segment exists requires careful observations and descriptions. It is probably most promising to carry out this observation in a rather rich country. Poor consumers are not a likely base for building a high-price segment. Therefore, we chose Swiss import data as the case to study. The Swiss Customs Administration (SCA) provided vegetable oil import data for the year 2011 with all single import cases including product category, country of origin, quantity, price and recipient. In a subsequent section, we used an econometric dataset to explain the observed price differences.

Many factors influencing the price of coconut oil can be taken, of course, from the literature. Among them is the fact that quantities traded generally influence the price, low amounts trading for a higher price than larger quantities (Easley and O'Hara, 1987; Feakins, 2004). Likewise, it is well known that organic qualities trade for a higher price than conventional items (Park and Lohr, 1996; Krystallis et al., 2006; Götze et al., 2016). It is also fair to assume that the mode of transportation may play a role for price generation (Teravinthorn and Raballand, 2009) and that using the oil for food or other purposes might also play a role.

To understand both the background of the data and the perceptions of actors, we interviewed a few recipients of vegetable oil. The method best suited to make intensive use of texts, to understand mental structures behind the specific case and to read "between the lines" is objective hermeneutics (Reichertz, 2004). It is increasingly used beyond the sphere of private environments, particularly for marketing (Wagner et al., 2010) and policy issues (Mann and Schweiger, 2009). This method does not use the entire interview, but one or a few sequences are analyzed thoroughly to identify specific patterns. As it thoroughly attempts to identify lingual patterns that explain the (perceived) reality better than any codes as used in most other qualitative techniques, it provides a colorful and dense reflection on the case looked at.

While the technique of theoretical sampling originates from grounded theory (Draucker et al., 2007), it was considered as helpful, in our case, "to include variety for contrasts of relevant categories" (Barth, 2013; 169). After having shown that, for example in the case of coconut oil, one bulk market and one specialty market segment exists, it seemed appropriate to look at one sequence each from partners in both cultures.

9.3 Price Analysis

Figure 9.1 depicts monthly average Swiss import prices (without tariffs) of four standard raw vegetable oils for human consumption (HS 1511.1090 palm oil, HS 1513.1190 coconut oil, HS 1508.1090 peanut oil and HS 1512.1190 sunflower oil) in the year 2011 and distinguishes imports from Least Developed Countries (LDCs) and other countries. At least three important patterns can be identified: First, prices for inputs from LDCs are systematically below import prices from other countries. This pattern can most easily be identified for coconut oil but also holds for the imports of palm oil and peanut oil. For sunflower oil, this pattern only emerges over recent years, not being visible until 2010.

The second emerging pattern is the level of variation, which is much lower for imports from LDCs than for imports from other countries. This pattern applies to all four vegetable oils in the figure, even though it is clearest for coconut oil. A third pattern is the development over time. The occurrence of high average prices in other countries (blue line) rises, indicating a development towards a high-price segment and being most visible in the case of palm oil.

Particularly the first pattern is the opposite of what could have been expected from an economic perspective. Since 2007, LDCs have the privilege of a complete duty-free and quota-free market access under Switzerland's General System of Preferences (Roitinger, 2001), whereas all other countries have to pay a considerable tax of 1.50 Swiss Francs (CHF) per kilogram. Cirera (2014) found that the price advantages that preferential trading partners enjoy are usually divided between exporter and importer. This would result in a higher equilibrium price for imports (without tariffs) from LDCs compared with imports from other countries.

We selected coconut oil as a case study because it best reflects the two patterns observed for all oils. Coconut oil is mainly used as an ingredient for chocolate production but also plays a role for industrial purposes (Canapi et al., 2005; Gunstone, 2011). Around 5,000 metric tons per year are imported to Switzerland. The Commodity Research Bureau (2015a) cites FOB prices between 0.81 and 1.66 US$/kg for the year 2011, which translates into prices between 0.72 and 1.47 CHF/kg. The CIF prices at a Rotterdam base are provided by Index Mundi (2016) and, for 2011, ranged between 1.21 and 2.26 US$/kg, translating into 1.07 to 2.00 CHF/kg.

These prices are visible on the left side of Figure 9.2, which sorts average border import prices (excluding tariffs) of coconut oil for 2011 by exporting country. Only two LDCs exported their coconut oil to Switzerland, namely, Cote d'Ivoire and Mozambique, both in the 'correct' price range according to the statistical figures. Some non-LDCs exported in this price range as well, of which Indonesia and Malaysia are major producing countries of coconut oil. The Netherlands, of course, are only a re-exporter of coconut oil in this low-price segment, i.e., the origin of the coconut oil that is traded here is either unknown or without importance.

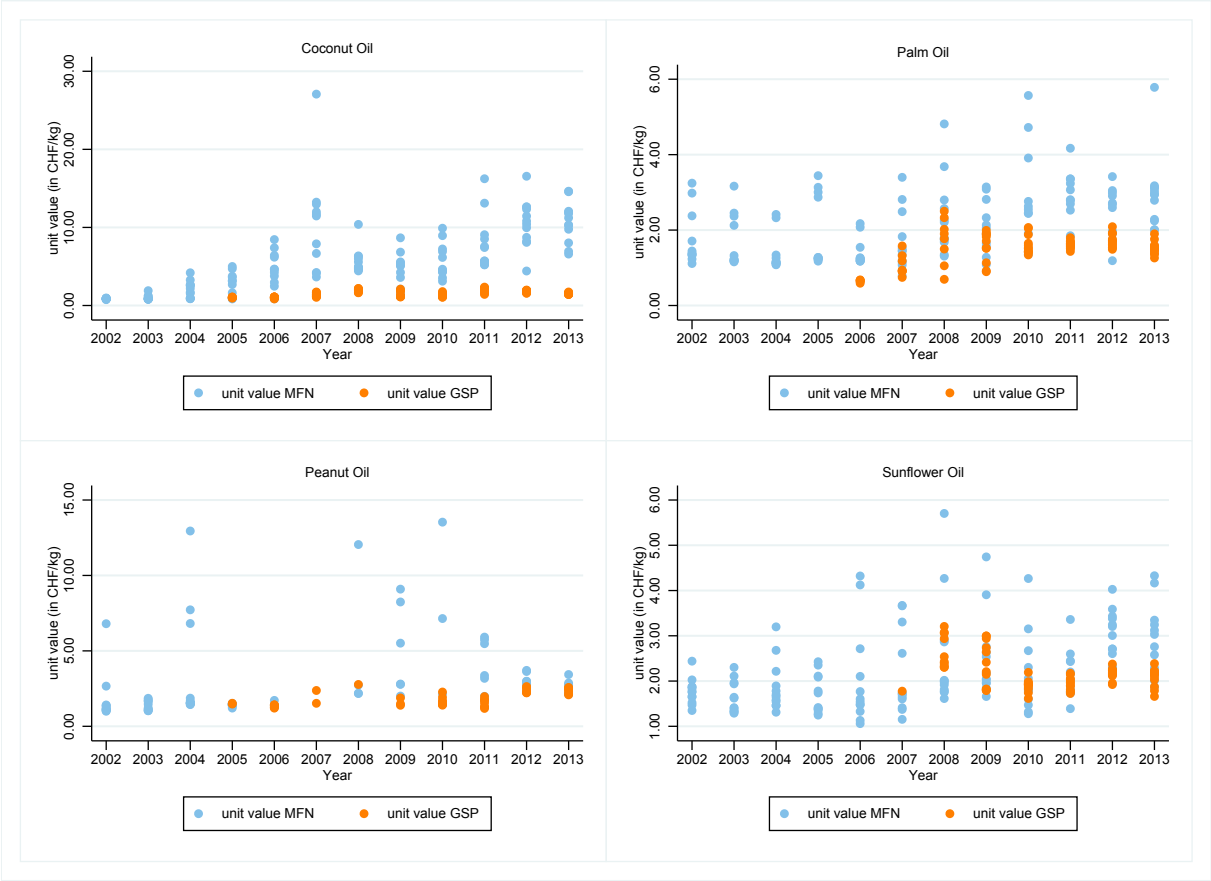

Figure 9.1: Prices of Swiss vegetable oil imports from LDCs (orange) and other countries (blue)

On the right side of Figure 9.2, prices emerge that are far above the prices published in the trade statistics cited above. Although the Philippines, described as the dominant exporter in older publications (Bautista, 1977; Buschena and Perloff, 1991), already received prices well above official commodity prices, some producing countries like Sri Lanka and Thailand obtained even higher margins in excess of the 'world market price'. The highest-priced coconut oil imports came from re-exporting countries, namely, Austria and Germany. However, the value added in these countries cannot originate from additional processing of the oil because the whole dataset relates exclusively to raw coconut oil (HS 1513.1190).

The large price differences seen in Figures 9.1 and 9.2 obviously raise the question about the underlying reasons. Why would importers be willing to pay more than 10 CHF/kg if they can buy the product for 2 CHF/kg or less? A first, albeit partial, answer can be taken from Figure 9.3, in which the logarithmized quantities (in kg) are plotted in relation to the price paid (in CHF). It clearly can be seen that coconut oil at high prices is usually imported in quantities up to 1,000 kg, whereas imports at the prices as connoted by official price statistics usually occur in bulk above 10,000 kg. Taken together, 39 percent of all coconut oil was imported at

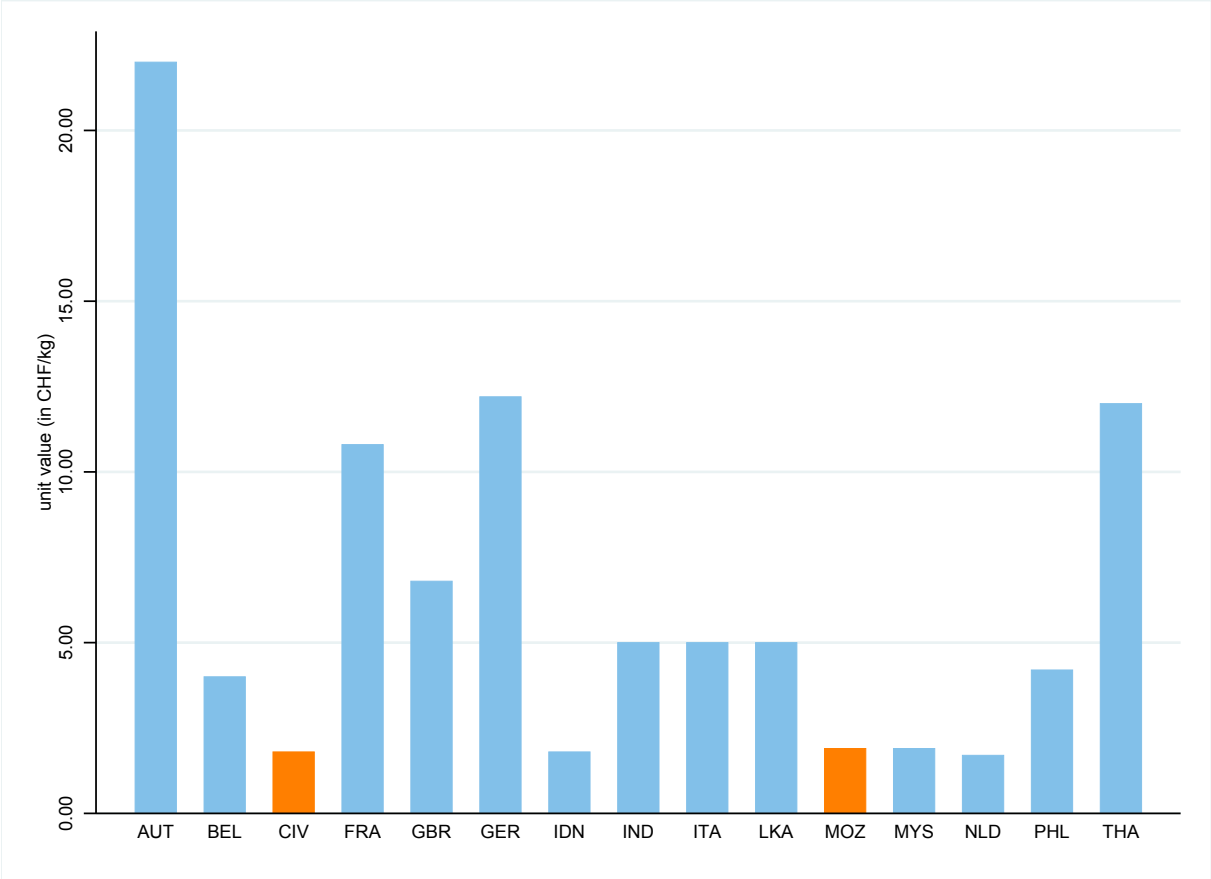

Figure 9.2: Swiss coconut oil import prices 2011 by country

prices above 2 CHF/kg, including 0.6 percent of the entire coconut oil import quantities being imported at prices above 3 CHF/kg.

The analysis indicates that there is indeed a considerable high-price segment for raw vegetable oils in general and for raw coconut oil in particular. A major share of raw coconut oil imports get a price margin of several cents per kilogram, possibly due to organic or fair trade labels. However, there is a large number of importers beyond the price of 3 CHF/kg and even in the range between 10 and 15 CHF/kg. Although the quantities imported at these prices are usually small, the question arises whether and why the recipients are not satisfied with the products provided by the bulk importers and opt for direct imports at much higher prices instead.

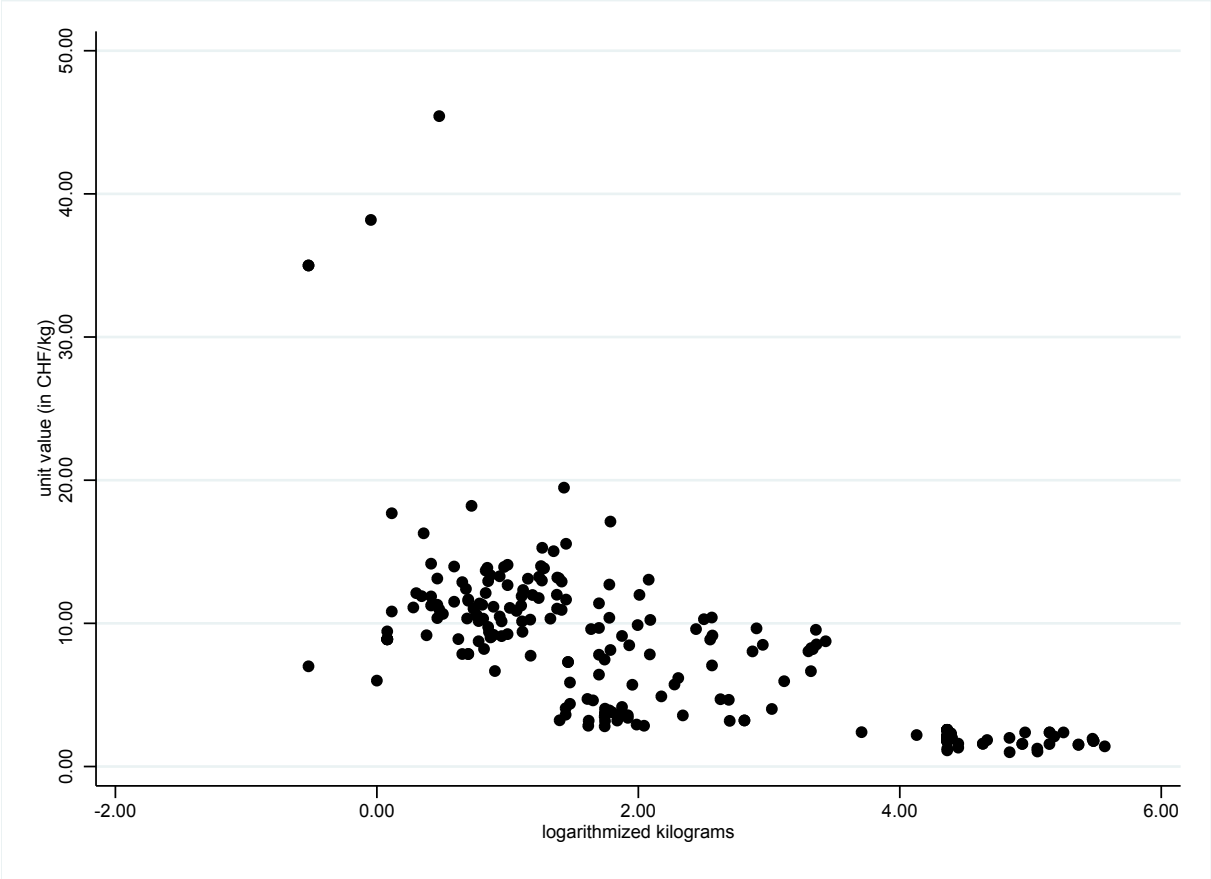

Figure 9.3: Swiss coconut oil imports by imported quantities (logarithmized kilograms) and price (CHF/kg)

9.4 Econometric Analysis

This section provides an econometric analysis of the main determinants influencing the price for raw coconut oil paid at the Swiss border. The extreme price variations of products within the same HS code as depicted in Section 9.3 can be considered as a first indicator of quality differentials.

For the econometric analysis, we used monthly panel data on importer level from the SCA for the years 2011 to 2013. Besides providing ordinary trade statistics (value and quantity of trade), the dataset allows for a rough qualitative product differentiation of raw coconut oil. Thereby, it is possible to distinguish between intended usages of the product (human consumption vs. other usages such as technical, medical or cosmetic usage) and to differentiate between conventional and organic coconut oil. In some cases, it is possible to identify qualitative differences via the product description. In cases where the product description is not sufficient, descriptions of the importer or exporter allow for a general identification of organic and conventional quality. For 1,264 out of 1,329 observations, an unequivocal differentiation between conventional and organic raw coconut oil imports was possible.

Because this dataset has a panel structure, we modeled the price of a given raw coconut oil import as a function of the quantity traded (net mass), the applied specific tariff, the route of transportation (e.g., ship, plane or train), the designated usages (human consumption or cosmetics) and the influence of quality (organic vs. conventional) using Ordinary Least Squares (OLS). We used only variables that were included in the dataset and therefore added no further control variables to the model. In consequence, we got the following equation:

$$logP = \beta_0 + \beta_1 logX + \beta_2 log(T+1) + \beta_3 Organic + \theta\, Transport + \delta\, Usages + A_t + A_c + \varepsilon \tag{9.1}$$

where P represents the price (unit value at the border) of a given coconut oil import in CHF per kg including CIF. X is the quantity (net mass) traded measured in kg. We expected a negative sign for this variable because descriptive analysis indicated a negative correlation between the net mass traded and the price. $(T+1)$ represents the applied specific tariff for a given coconut import (Olarreaga and Özden, 2005; Cirera, 2014). The bulk of raw coconut oil imports enter Switzerland under preferential duty-free conditions from LDCs, whereas imports from other countries face a considerable specific tariff in the amount of 1.50 CHF/kg. From a neoclassical viewpoint, we should expect a negative sign for this variable, as oil imports with a high tariff would face a price disadvantage on the Swiss market otherwise. *Organic* is a dummy variable that takes the value of one if a given coconut oil import includes organic certification, and zero for conventional coconut oil imports. We expected a positive sign for this variable because the literature (Pearson and Henryks, 2008) indicates higher prices for organic than for conventional food. $Transport$ is a vector of dummy variables indicating the route of transport. Dummy variables were included separately for postal shipping as well as for railroad, ship, truck and air transport. We expected that the influence of each dummy variable reflects the costs associated with a particular route of transport. We excluded the truck transport dummy variable as the base category from the regression equation since this approach allows us to compare costs associated to postal shipping, railroad, ship and air transport in relation to truck transport. Likewise, $Usages$ represents a vector of dummy variables containing the designated usages of a given coconut oil import (human consumption vs. others). Here again, we excluded the human consumption dummy variable from the regression equation as the base category to estimate the price for other usages in relation to the price for human consumption. A_c are country fixed effects (FE) and A_t are time FE. Country FE allow to control for time-invariant geographical characteristics like sharing a common border or being an island. Time FE allow to control for time-related events that may have an impact on all coconut-exporting countries (e.g.,

Table 9.1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.
logP	2.26	1.05	-0.19	7.07
logX	4.72	3.50	-2.30	12.82
log(T + 1)	3.75	1.99	0.00	4.86
Organic	0.68	0.47	0.00	1.00
Human consumption	0.88	0.33	0.00	1.00
Other	0.12	0.33	0.00	1.00
Postal shipping	0.11	0.31	0.00	1.00
Railroad transport	0.04	0.20	0.00	1.00
Ship transport	0.12	0.33	0.00	1.00
Truck transport	0.72	0.45	0.00	1.00
Air transport	0.01	0.09	0.00	1.00

financial crisis or crop failure due to extreme weather conditions). ε represents the error term for unobserved effects influencing the price. This term is assumed to be independent and to have the same distribution over time, and is normalized to have mean zero. Summary statistics are shown in Table 9.1.

Table 9.2 presents regression results for OLS without FE (column 2) and for OLS with country and time FE (column 3). Adding FE to the model did not cause significantly higher explanatory power, the R^2 increasing merely from 0.855 to 0.873. Therefore, we are confident that most of the explanatory power of our model is captured by the choice of the independent variables. The variables that are estimated in log can be interpreted as elasticities. Here, we primarily present and interpret estimation results for the OLS FE model.

The variable Quantity traded (Quant) shows the expected negative sign and is highly significant. An increase in the net mass traded by 1% leads to a decrease in the price by 0.13%. Contrary to conventional assumptions, the effect of the applied specific tariff (Tariff + 1) on the price is positive and highly significant. An increase in the applied specific tariff by 1% causes an increase in the price by 0.07% in the model variation OLS without FE and by 0.14% in the model variation where country and time FE are included. Apparently, the underlying background variable is origin, and high-quality coconut oil can only be imported from advanced countries, being connected with a high tariff.

The variable Organic shows the expected positive sign and is highly significant. Our results indicate that the product attribute 'organic' establishes a high-price segment for raw coconut oil, which is a small niche market for eco-conscious consumers with a high income. The unweighted average import price of raw organic coconut oil is above 20 CHF/kg.

Results concerning the distinction of designated Usages (human consumption vs. others) are slightly ambiguous. Whereby results for OLS with FE indicate that the price for raw coconut oil for non-food ('other') usages is on average 0.18 CHF per kg significantly cheaper than the price for human consumption, results with FE indicate no significant differences. Even though

adding FE to the model does not significantly enhance the explanatory power of our model, time-related and time-invariant country-specific effects seem to have a particular impact on the prices related to the various usages. Controlling for these effects seems to increase the prices for non-food usages. For instance, higher prices for medical or cosmetic usage may arise from more stringent requirements concerning the purity of raw coconut oil. Considering the small size of the coefficients compared to the wide range of prices for raw coconut oil we can conclude that the price difference between other usages and human consumption is negligible.

Changing magnitudes and signs of the estimators can likewise be observed for the vector of the dummy variables Route of transport. Truck transport is used as reference. Whereas results for OLS without FE indicate that ship transport is more expensive than truck transport, whereby the impact on the price is not significant, results with FE indicate that ship transport is 0.21 CHF per kg cheaper than truck transport. Likewise, railroad transport is on average 0.16 CHF per kg cheaper than truck transport. Postal shipping indicates a slight cost advantage compared to truck transport, but this effect is not significant. Finally, as one might expect, the strongest and clearest effect on the price can be observed for air transport. The results unequivocally show that air transport is the most expensive route of transport and it is on average 0.61 CHF per kg more expensive than truck transport.

Table 9.2: OLS regression results with the dependent variable $logP$

Independent Variable	OLS	OLS FE
$logX$	-0.128***	-0.119***
	(0.009)	(0.011)
$log(T+1)$	0.074***	0.146***
	(0.016)	(0.030)
Organic	1.022***	0.939***
	(0.171)	(0.086)
Human consumption	0.171**	0.522***
	(0.087)	(0.150)
Other usages	-0.004	0.593***
	(0.149)	(0.254)
Postal shipping	0.303***	0.300***
	(0.058)	(0.094)
Railroad transport	0.314***	0.199***
	(0.097)	(0.117)
Ship transport	0.339***	0.148
	(0.103)	(0.118)
Truck transport	0.316***	0.355***
	(0.051)	(0.089)
Air transport	0.495**	0.969***
	(0.197)	(0.174)
Time FE	No	Yes
Country FE	No	Yes
Observations	1,264	1,264
R^2	0.855	0.873

*** p < 1%, ** p < 5%, * p < 10%
Robust standard errors in parentheses

9.5 Text Analysis

As qualitative rather than quantitative analyses appeared to better address our question, we interviewed representatives from importing companies. Two sequences were selected for a detailed analysis. The first sequence is taken from an interview with the person in charge at one of the bulk importing companies. The interviewer (I) had just confronted the interview partner (P1) with Figure 1, and in the sequence, the representative struggles to digest this information:

P1: You have a non-LDC price, which generally is without tariffs. Just the base. As you see there. 800 Dollars up to maybe 1,500 Dollars. This is the base. And on top of that, you have some logistic costs, so from Rotter ...

I: Yes, I should add that these already include transport costs.

P1: Yes, yes, but if you now have 1,500 Dollars, which is 150 [Dollars per 100 kg]. Let's assume 1:1, [conversion of currency]for simplicity, right? Then add some logistic costs to it, and this would be the border price, wouldn't it?

I: Mhm.

P1: For refined oil.

I: No, unrefined, this is raw oil.

P1: Raw.

I: Raw, yes. Raw coconut oil.

P1: OK, this gets. You can add 20 Francs, in the very best case. And this is without tariff on it or with tariff?

I: This is without tariff.

P1: Then you are always, always, always under 200 Francs, which is 2 Francs per, always. Simply always. This is not possible.

At the beginning of this sequence, P1 paraphrases the information displayed by the blue graph of Figure 1 (raw coconut oil), interpreting the values. Interestingly, he correctly repeats the meaning of the blue line but fails to relate it to the values displayed on the Y-axis. Although it is correct that the blue line displays raw coconut oil import prices without tariffs, he ignores both the scale and the values of the price axis, which suggests averages between 5 and 15 CHF/kg in the last years. Instead, P1 apparently uses the prices from his own experience, similar to the official commodity prices cited in Section 3, framed in Dollars per ton.

The interviewer ignores the values coined by P1 (the 'yes' appears to have more affirmative than factual content) and gives supplementary information. Concerned that P1 adds transport costs as mentioned to the depicted price, the interviewer emphasizes that this element is already included in the shown values.

P1 responds with a doubled 'yes', generally used to indicate that the dialogue partner is missing the most important point. Apparently, P1 is now in the process of integrating the

information on the Y-axis in his mind, as indicated by the 'if' clause that he begins but does not finish. Instead, he carries out a number of conversions, from the price per ton to the price per 100 kg (very much an insider unit), and from US Dollars to Swiss Francs. With additional checks, he tests the validity of the chart's information, concerning the issues of freight and processing. After being answered by the interviewer, P1 seems almost ready to conclude ('OK, this gets') but still remains unfinished. Only when the interviewer confirms for a second time that prices without tariffs are displayed, P1 seems to be certain what the displayed average prices represent.

It is probably no coincidence that P1's last two lines in the sequence contain the word 'always' five times. Having excluded all possibilities of different bases or other misunderstandings, it is of high importance to the representative to indicate that prices for raw coconut oil, excluding tariffs, never leave the range between 0.8 and 2 CHF/kg. This seems to be a universal law from which deviations are 'not possible'.

The second sequence represents a completely different environment, although another importer of raw coconut oil is interviewed. It comes from an interview with a CEO of an organic food wholesaler, being part of the high-price segment identified in Sections 9.3 and 9.4. His company's range of products is equally composed of Swiss food and imports. Coconut oil makes up 5 percent of the imports, being virgin coconut oil bottled by a German company (hence, the imports can be found in the 'Germany' column of Figure 2) and traded to organic retailers. As reported by Shilhavy (2015), the concept of virgin coconut oil dates back to the beginning of the 21st century and describes raw coconut oil with a particularly low level of refining.

I: What is now, for the consumer, particularly interesting about virgin coconut oil?

P2: Yes, firstly the very low processing.

I: OK

P2: So that there are all associated substances in it. We especially have the well-known lauric acid.

I: Mhm.

P2: Which makes the oil particularly valuable. And, of course, the flavor.

I: Ah OK.

P2: This is, of course, a, somewhat a difference. And the origin being Solomon Islands, as far as I know, we are the only ones in Switzerland. Today are most of all the Philippines (.) and Sri Lanka. And you will that, and this firstly is a big price difference

I: Mhm.

P2: Because the quantities are much smaller, of course.

I: Sure.

P2: And the second also is the flavor, it is much more intense. So, people who usually buy the Philippine, they often call us, we have noticed that as well, particularly after the Philippine

came on the market, they have said ours is bad, regarding flavor. Because it is so intense.

(.) - one second pause

The interviewer's question could be taken from a commercial ad, providing the opportunity for the entrepreneur to eloquently outline all strengths of his product, and therefore is welcomed with an affirmative 'yes' by P2. However, choosing 'interesting' as a criterion, the interviewer directs the attention rather to cognitive than to sensual characteristics of the product. This choice may have influenced the immediate reaction of P2. Among the credentials of the whole food movement is that 'minimal processing' (Stolz et al., 2010) preserves as much as possible of the precious contents of a natural product. This cognitive pattern is therefore used to identify the first strength of the virgin coconut oil. P2, when referring to lauric acid, makes an implicit reference ('well-known') to the literature praising the effect of lauric acid in coconut oil (Enig, 2002). P2 dwells on this aspect by referring to the value that lauric acid adds. The sentence structure gives the impression that the ingredient takes an active role in enhancing the oil. After the respondent has done justice to the question about 'interesting' aspects, he mentions the sensory component of the product, which he introduces as something that is self-explanatory ('of course'). It is noteworthy that 'of course' is used twice in a row. Apparently, this is no aspect that P2 would be willing to discuss, even though the difference to other brands is only 'somewhat' noticeable. Indeed, at this stage, the difference that the flavor or other sensory characteristics are making is not specified at all.

After the valuable content and a general reference to the flavor have been stated as 'interesting' aspects of the virgin coconut oil, origin seems to qualify as another interesting aspect. Admittedly, the Solomon Islands are both far away and small, and according to P2, the company seems to be the only Swiss importer from that place. Hence, this qualification may be justified, an aspect that P2 stresses by referencing more ordinary countries of origin of virgin coconut oil.

'And you will that', an unfinished phrase by P2, leaves open what exactly the interviewer will do or experience, but it most probably refers to a direct encounter with virgin coconut oil that the interviewer may receive later. However, P2 interrupts himself to now enter the monetary aspect. An apparently new chapter is opened as, again, a first point ('firstly') is raised. It can be assumed that the 'big price difference' does not refer to the 'ordinary' coconut oil market, but to the difference between Solomonian and, for example, Philippine virgin coconut oil. P2 seems to be aware of the economies of scale, as he justifies the higher price by lower quantities. Subsequently, the respondent comes back to the issue of flavor. This time, he goes beyond mentioning that there is a difference, referring to its high intensity. This is taken as a base for the subsequent narrative. P2 uses customer complaints as a case in point to illustrate the exceptional strength of flavor. This indicates that the primary objective of the narrative is not to convince the interviewer of the high quality but rather of the clear distinction of his own product.

The comparison between the two sequences indicates the existence of two distinct subsectors, existing more or less independently from each other. Whereas P1 is convinced that the whole coconut oil trade takes place within a pre-defined price range, it is P2's mission to segment the market as strongly as possible. It becomes clear that, for him, it is not sufficient to establish a niche for virgin coconut oil within the coconut oil market. It is important to him to define a distinction between virgin coconut oil from the Solomon Islands and more ordinary virgin coconut oil, not for the sake of enjoyment, but for attributes like a strong flavor.

9.6 Conclusions

The empirical evidence answers the question whether commodities have a high-price segment unequivocally with yes. Although a large amount of vegetable oil is imported for world market prices, sometimes of undisclosed origin, segments within the vegetable oil market are increasingly formed. The segment of organic vegetable oil can almost be called traditional by now, but it still is gaining market shares; the segment of fair trade products has emerged more recently and also is gaining importance. Many prices displayed in Section 3, however, are still too high to be explained with these classical segments. They require further distinctive characteristics, and a few of them are explained by P2: Although virgin coconut oil could be established as a niche market (its organic quality being taken for granted), he struggles to establish virgin coconut oil from the Solomon Islands as a separate niche. Such niches require separate middlemen to upgrade and market the oil adequately; therefore, the chains (including the countries of origin) will systematically differ from the chains for bulk ware.

Abandoning the concept of commodity markets would generate a huge challenge for microeconomic theory, which is still largely resting on the existence of homogeneous goods. So far, it would be mere speculation to forecast that the bulk market for agricultural commodities is going to vanish and economic science needs a new epistemological framework. However, the analysis above shows that, in a prospering world, the high-price segment takes an increasing share of many markets. Old niches are expanding into mainstream markets and new niches are arising, each challenging the concept of commodity markets where joint qualities and joint prices are assumed initially. A glance at the current market situation shows that different qualities and product attributes such as organic or fair trade are nowadays more frequently demanded by consumers than ever. An intensified shift of the demand from conventionally to organically produced products is therefore not only a phenomenon of processed products, where product differentials are most likely, but also a phenomenon of commodity markets where homogeneity is initially assumed. In our case study, nearly 99% of total raw coconut oil imports are captured by two major Swiss importers distributing conventional vegetable oils. In contrast, the market for organic raw coconut oil is a small and diverse market with a large number of market play-

ers. The microeconomic assumption of the existence of a market clearing price would rather fit reality conditions if markets for supposed homogenous commodities are separated according to their product quality.

From a scientific point of view, national trade statistics would be improved if they considered at least a rough distinction for products that are manufactured under ecological or fair trade conditions. Providing such data, for instance at the HS 11 digits level (digits 9, 10 and 11 can be used for such information), would put researchers in a position to deal more appropriately with outliers in trade statistics.

Finally, the "division of labor" between least developed countries and developing countries is somewhat unfortunate. Importers from LDC should receive higher prices than DC-importers due to their tariff exemption. Instead, the high-price segment firmly seems to be in the hands of better-off countries. Development service programs might want to draw their attention to the ability to cover the high-price segment of commodity markets.

10 Conclusions

10.1 Main findings

The progressively introduced DFQFMA for LDCs has a positive effect on the size of LDCs' preferential exports to Switzerland. Consequently, the DFQFMA has considerably improved market access for the world's poorest countries. Eliminating tariffs (progressively) causes preferential agro-food and textile exports of LDCs to rise substantially. However, it has to be remarked that the success of the DFQFMA is limited to the agro-food and textile sectors and to a few countries. The descriptive analysis of agro-food exports indicates that trade liberalization is a success story merely for a few LDCs, namely Tanzania, Ethiopia, Côte d'Ivoire, Mozambique, Malawi, Senegal and Uganda. Those seven countries capture a total share of nearly 80 percent of LDCs' agro-food exports to Switzerland. In the textile sector we observe an even higher degree of market concentration concerning LDCs' preferential exports. Here, three countries, namely Bangladesh, Cambodia and Nepal, account for 98 percent of LDCs' preferential textile exports.

It also can be noted that the GSP is a useful supplement to 'duty-free tariffs' (duty-free market access) under the WTO regime. For instance, 100 percent of LDCs' agro-food exports from 2002 to 2011 entered Switzerland under reduced or duty-free tariffs. However, the share of preferential exports under the GSP was on average only 36 percent. In this context, the preference margin, which represents the main incentive to export under preferential conditions, compensates the costs of compliance associated with the GSP and yields an additional benefit for the importer has a consistent and positive effect on the level of the utilization rate. In particular, the application of the Heckman selection model in article no. 1 makes clear that once trade contracts are established and an exporter has overcome bureaucratic obstacles in the form of proof of origin and proof of direct shipment, the 'preference margin' appears as the main incentive to export under preferential conditions granted by the GSP. While the effect of the size of 'GSP eligible trade' has a positive and significant effect in the case of the PPML estimations, the effect turned negative when the sample was restricted to positive values of the utilization rate in the case of the outcome equation of the Heckman selection model. This finding encourages our confidence that the 'preference margin' acts as the main incentive for exporting under preferential conditions. However, to benefit from these preferential tariffs, the institutional quality of a given DC or LDC is of crucial importance.

Additionally, we address the question of whether reciprocal trade preferences are more beneficial for DCs compared to non-reciprocal trade preferences. Because trade preferences under the Swiss GSP are offered to the country group of DCs as a whole, non-reciprocal trade preferences are not tailored to the export structure of a particular DC. Consequently, by switching from non-reciprocal to negotiated reciprocal trade preferences, DCs such as Tunisia expect to negotiate terms which are tailored to their export structure and better conditions than competitors from countries which are still beneficiaries of the GSP. The Tunisian case study reveals that the switch from the GSP to an FTA causes no significant advantage in most of the export sectors. This implies that switching from non-reciprocal to reciprocal trade preferences yields advantages in export sectors where Tunisia has comparative cost advantages. This is especially true for the textile sector and partly so for the agro-food sector.

10.2 Policy implications

Empirical findings indicate that the DFQFMA for LDCs can be seen as a success story. Especially with regard to results of article no. 1, which reveals that the institutional quality of a given LDC or DC significantly increases the probability that the GSP is utilized, Switzerland and other industrialized countries should additionally engage in the assistance of building trade capacity in said countries. The ability in overcoming NTBs could cause higher levels of utilization of PTAs. The competitive advantage, which results from preferential tariffs (reduced or duty-free), could in turn lead to an improved integration of LDCs and DCs into the world markets. However, policymakers' – like U.S. President Donald J. Trump – striving for a new era of protectionism might not only hurt the world's poorest countries but could also be bad news for industrialized economies and their businesses. A new era of protectionism might fundamentally jeopardize economic development of LDCs. Especially, access to agro-food and textile markets of industrialized countries is vital for their economic development. We show that restricting LDCs' access to those markets could cut almost half their preferential exports. Lower exports translate into lower incomes and thus, lower savings and investments. Lower investments, in turn, reduce their economic growth (potential). It is essential for policymakers to know if and by how much cutting tariffs really causes trade to increase. Thus, a key message of our analysis to policymakers is: do not go back to protectionism!

To ease the problem of the complex RoO, one solution could be the establishment of a modern protocol on the RoO, covering more country groups eligible for regional cumulation. In Switzerland, only the Association of Southeast Asian Nations is covered by regional cumulation. Here, the EU's GSP could be a template for the future establishment of more country groups eligible for regional cumulation. For instance, Switzerland could establish a further country group within the textile sector under HS chapters 50-67. The countries which could

be covered are Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka (European Commission, 2016b). As a further suggestion, Switzerland could likewise grant DFQFMA to very poor DCs such as Pakistan, Vietnam, Nigeria or North Korea. These countries show a very low per capita income and are also underdeveloped with regard to 'soft' factors such as health and education but are not considered as LDCs.

Furthermore, Switzerland could grant additional trade preferences for products processed under ecological and social standards to provide an incentive to promote sustainable development of DCs. For instance, Switzerland could match its GSP system with the EU's GSP+. Additionally, there is the option of signing bilateral FTAs with DCs which have shown exemplary economic and political development during e.g. the past two decades. Thereby, trade preferences can be more tailored to the export structure of a given DC. Here, the Tunisian case study indicated that the switch from non-reciprocal to reciprocal trade preferences yields selectively higher preferential exports compared to counterfactual GSP benefiting countries. Even if trade preferences tailored to the export structure of a given DC would be desirable, signing bilateral FTAs is a strategy which cannot be extended to all DCs, because according negotiations on trade concessions would cause extensive transaction costs. Therefore, as mentioned above, the GSP is still a useful supplement for DCs and LDCs to the duty-free market access under the WTO regime.

10.3 Applied methods

The main issue of policy analysis is estimating causal effects. By using ordinary regression techniques (e.g., Chow test and time related interactions) we are not able to confirm the positive effect of the 2007 DFQFMA indicated by descriptive analysis. Methods of causal inference are even more appropriate. By applying methods of causal inference (e.g., synthetic control method in combination with DiD analysis) we are able to fill a gap in the existing trade related literature. We consider the DFQFMA as a quasi-experiment and are therefore able to provide an unbiased effect of trade liberalization. Especially the transparency of the synthetic control method compared to propensity score-matching is a major advantage of this method. While the synthetic control method provides comprehensive information on covariate balancing and the counterfactual state (a synthetic control unit), the latter information is not provided by propensity score-matching. Furthermore, the synthetic control method provides a data set based on which a subsequent regression analysis can be performed (e.g., DiD analysis or ITSA). A further difference with regard to these methods is the matching period. While the synthetic control method averages values of covariates prior to the treatment, propensity score-matching averages values of covariates after the introduction of the treatment. Therefore, propensity score-matching estimates the simple annual difference of the outcome variable between the treatment and control

unit. However, compared to ordinary regression techniques (e.g., by means of the economic gravity model), matching econometrics is able to construct a counterfactual state based on observed conditions. Undeniably, the Tunisian case study yields valuable findings, however, we are not able to control for selection bias.

A further issue of this work is to deal with data where zero values – especially with regard to the dependent variable – are frequent. From a methodological perspective the PPML estimator seems to be more robust than the Heckman selection model. Even if Heckman's selection model provides an intuitive way to deal with zero values, for instance implementing and interpreting interaction terms is more sophisticated compared to the PPML model. Nevertheless, the Heckman selection model provides a suitable robustness check for PPML results so that this requirement is met. In this context, logistic regression likewise induces valuable findings concerning determinants influencing the probability of utilizing the GSP.

The combination of quantitative and qualitative research methods likewise yields valuable findings regarding our case study on Swiss coconut oil imports. To understand both the background of the data and the perceptions of actors, we interviewed Swiss importers of coconut oil. The method best suited to make intensive use of texts, to understand mental structures behind the specific case and to read "between the lines" is objective hermeneutics. After having shown that, in the case of coconut oil one bulk market and one specialty organic market segment exists, we are able to transfer this knowledge onto our econometric analysis by *inter alia* considering quality and usages related dummy variables. Consequently, the combination of quantitative and qualitative research methods allows us to get a partially deeper understanding of the fundamental functionality of commodity markets.

10.4 Outlook

This work is exclusively focusing on the potential positive effects of the Swiss GSP including the DFQFMA for LDCs. It would be promising to apply methods used in articles no. 3 and 4 on all DFQFMA providing countries (e.g., EU's EBA initiative and/or the US AGOA). A comprehensive analysis based on these approach could gain unbiased effects on LDCs' exports – something that could be of high interest for policymakers. Likewise, the question of how DCs should be best integrated into the world economy is actually not answered unequivocally. Therefore, it would be promising to analyze all switches of DCs from non-reciprocal to reciprocal trade preferences during e.g. the last two decades. Here again, useful decision bases for policymakers could be derived.

To analyze the DFQFMA treatment intensity (or effectiveness) caused by progressive tariff cuts, the application of dose-response-functions would be promising. The original application of this method is the medical field. Here, scientists investigate the effects different levels of a

given dose of medicine on changes in effects of an organism. For instance, this method can be transferred to the progressively introduced DFQFMA for LDCs. Hereby, the dose refers to changing levels of tariffs (respectively tariff cuts) and the response refers to according changing levels in preferential exports (trade flows). This method could be applied to overall analyses and to sectoral analyses.

The success of the Swiss DFQFMA is limited to a few products and LDCs. On a global scale it would be interesting to investigate if and to what extent the DFQFMA provided by other industrialized countries caused an increase in the number of exporting LDCs and in LDCs' export diversification. Especially an increasing export diversification could reduce the economic vulnerability of said countries. Investigating potentially increasing export diversification can be undertaken by looking at the extensive margin (the absolute number of traded goods) or by looking at concentration indices (e.g., Hirschman-Herfindahl-Index). Methods of causal inference seem to be appropriate in this context. An analysis in this vein could likewise focus on overall and sectoral exports of LDCs.

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