Integrating developing countries into the world economy: a case study of Tunisia

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Université de Fribourg
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Integrating developing countries into the world economy: a Tunisian case study

Christian Ritzel, Andreas Kohler and Stefan Mann
Agroscope, Ettenhausen, Switzerland

Abstract

Purpose – The purpose of this article is to provide empirical evidence about the potential positive effects of switching from given non-reciprocal trade preferences granted under the Swiss Generalized System of Preferences (GSP) for developing countries (DCs) to negotiated reciprocal trade preferences under a Free Trade Agreement (FTA).

Design/methodology/approach – In a case study of Tunisia's exports to Switzerland, the authors apply methods of matching econometrics, namely, Propensity-Score Matching and Nearest-Neighbor Matching. Hereby, they are able to identify the average treatment effect on the treated.

Findings – Overall preferential exports increased by 125 per cent after the entry into force of the FTA in 2005 until the end of the observation period in 2011. Additionally, an analysis of the agro-food and textile sectors likewise indicate boosting preferential exports in the amount of 100 per cent.

Research limitations/implications – 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, the authors are not able to generalize their results based on a single case.

Practical implications – 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. 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 as well as better conditions than competitors from countries which are still beneficiaries of the GSP.

Originality/value – To the authors' knowledge, this is the first study to investigate explicitly the switch from non-reciprocal to reciprocal trade preferences using econometric matching techniques.

Keywords Developing countries, Free Trade Agreement, Matching econometrics

Paper type Case study

1. Introduction

While unilateral preferential trade agreements such as the Generalized System of Preferences (GSP) have mostly shown mediocre performance (OECD, 2005; EC, 2011), the number of bilateral Free Trade Agreements (FTAs) between the global North and South is constantly increasing (Joerchel, 2006). According to World Trade Organization (2016), 625 regional FTAs were notified to the General Agreement on Tariffs and Trade (GATT)/World Trade Organization (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

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trade preferences, DCs such as Tunisia expect to negotiate terms which are tailored to their export structure as well as 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 (SECO, 2005).

From an economic development point of view, we investigate if, and to what extent, Tunisia's 2005 switch from non-reciprocal to reciprocal trade preferences caused trade creation 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 a broad agreement that DCs and least-developed countries (LDCs) should secure a share in the growth of the world trade, there was disagreement about how to reach this goal (Conconi and Perroni, 2009). To shed some light on this issue, we apply Propensity-Score Matching (PSM) and, as an additional robustness check, Nearest-Neighbor Matching 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, 2011). Furthermore, to depict the institutional quality of nation and the thereof 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 switch from unilateral (non-reciprocal) GSP preferences granted by Switzerland to bilateral (and reciprocal) FTA preferences in 2005 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 HS 50-67. Additionally, to provide a more detailed picture, we conduct a sectoral analysis on HS two-digit 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 (Angulo *et al.*, 2011; Larbi and Chymes, 2010) or on macroeconomic determinants potentially boosting exports (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 ones who tried 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 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 find that the Swiss-Mexico FTA in 2002 increased bilateral trade about 37 per cent after only four years in place.

To our knowledge, this 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. certificate of origin and certificate of direct shipment). By not differentiating between prevailing tariff regimes, one can obtain biased estimates of trade liberalization effects.

The remainder of this paper is organized as follows: First, an introduction to the FTA between Switzerland and Tunisia in 2005 is provided (Section 2). Next, the underlying data

are described (Section 3). In a following step, stylized facts of Tunisia's exports to Switzerland are presented (Section 4). Section 5 presents the empirical strategy including information concerning the concept of causal inference, the selection bias which is related to the evaluation of FTAs (Section 5.1) as well as a specification of the econometric matching techniques used (Section 5.2). Section 6 presents and discusses the results for overall, agro-food and textile exports (Section 6.1) as well as results for a sectoral analysis on HS digits level (Section 6.2). To conclude, the essential findings of this article are summarized in Section 7.

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 (FOAG, 2013). Overall, Switzerland is approx. 60 per cent self-sufficient in food production (SFSO, 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:

(1) WTO membership;

(2) bilateral agreements with the EU;

(3) bilateral agreements with non-EU members;

(4) multilateral EFTA; and

(5) finally unilateral trade preferences via the GSP for DCs and LDCs (Ritzel and Kohler, 2016).

No other nation has signed more bilateral and multilateral FTAs than Switzerland. In 2016, in total 28 bilateral and multilateral FTAs are in force and nine FTAs are currently under negotiation (SECO, 2016).

Tunisia is deemed as an African DC which is the most open toward Europe, and as a former French colony, Tunisian 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. certificate of origin and certificate of direct shipment). Besides a favorable geographic location (the distance between Bern and Tunis is about 1,150 km), Tunisia witnessed a constant annual percentage growth rate of per capita GDP during our observation period and 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 both countries was corroborated by the launch of a Tunisian-Swiss friendship group in 2016 (EAER, 2016). While the EU27 represents the most important trading partner of Tunisia, Switzerland takes the seventh rank on the list of ten top trading partners of Tunisia (EC, 2016). Furthermore, Switzerland is one of the most important investors in Tunisia. Swiss companies are active in the Tunisian textiles, clothing and agro-food (including fishery) sectors (FDFA, 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 (SECO, 2005). The FTA is constructed on an asymmetric basis to take the structural differences in economic development between the EFTA-members and Tunisia into

account. Apart from a few agricultural-policy relevant products, the EFTA-members 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 such as those granted to the EU. This means that the tariff cut by Tunisia takes place in the ninth year of the 12-year transition period (FC, 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 (SECO, 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 (SECO, 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" (SECO, 2005). Especially the agro-food and fishery sector as well as the textile and clothing sector are of high importance for Tunisia. The agro-food and fishery sector employs around 16 per cent of the working population and has a proportion of around 12 per cent of total Tunisian exports (The World Bank, 2016; NIS, 2016). On the other hand, the textile and clothing sector employs around 30 per cent of the working population and has a proportion of around 28 per cent of total Tunisian exports (API, 2016; NIS, 2016). In sum, both sectors capture 40 per cent of total Tunisian exports.

3. Data

We calculate annual aggregated total and preferential trade flows based on the Swiss-Impex database provided by the Swiss Customs Administration (SCA, 2015) for the years 2000 and 2011. We use all products in HS Chapters 01-97. Because SCA (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.

GDP in current USD and population were taken from The World Bank World Development Indicators (World Bank, 2016). Bilateral distances to Switzerland are provided by the French Centre d'Etudes 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 UNDP (2014). 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. The HDI covers 186 countries.

4. Stylized facts

Figure 1 presents the evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-97. Thereby 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 pretreatment period from 2000 until 2004, respectively, preferential tariffs under the FTA in the posttreatment period from 2005 until 2011. Accordingly, the vertical dotted line refers to the treatment in the form of switching from non-reciprocal to reciprocal trade preferences.

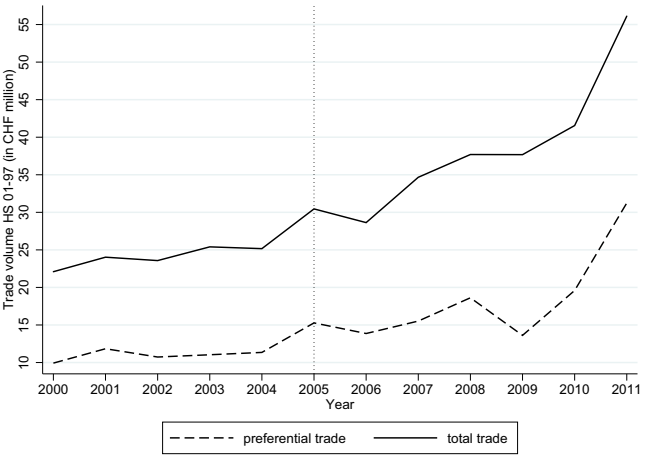

Figure 1.
Evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-97

Preferential tariffs under the GSP and the FTA are splitted into "reduced" and "duty-free". Because utilizing trade preferences under the GSP as well as under the FTA requires overcoming bureaucratic obstacles in the form of "certificate of origin" and "certificate of direct shipment", we aggregated the entire preferential exports and therefore do not distinguish between preferential exports under "reduced" and "duty-free" tariffs.

Figure 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 constantly increased during 2000 and 2011. The percentage share of preferential exports on 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 (pretreatment period) was about 50 per cent, while the utility rate for overall exports under the FTA (posttreatment period) was likewise about 50 per cent. Even if corresponding utility rates did not change due to the switch, signing and ratifying a FTA seems to stimulate Swiss and Tunisian market actors.

Figure 2 presents the evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-24 (upper graph), respectively, under HS chapters 50-67 (lower graph). Processing of the data and the associated interpretation of the graphs is the same as for Figure 1.

Figure 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 constantly increased during 2000 and 2011, total and preferential agro-food exports suffered a decline in 2001 and 2002, but increased constantly from 2003 on. The utility rate for agro-food exports under the GSP (pretreatment period) was about 50 per cent, while the utility rate for agro-food exports under the FTA (posttreatment period) was likewise about 50 per cent. In contrast, total and preferential textile exports under HS chapters 50-67 decreased during the pretreatment period. While total textile exports constantly decreased until 2010 and then jumped again to the initial levels from the years 2000 and 2001 in the last year of our observation period, preferential textile exports resumed their upward climb from 2005 on.

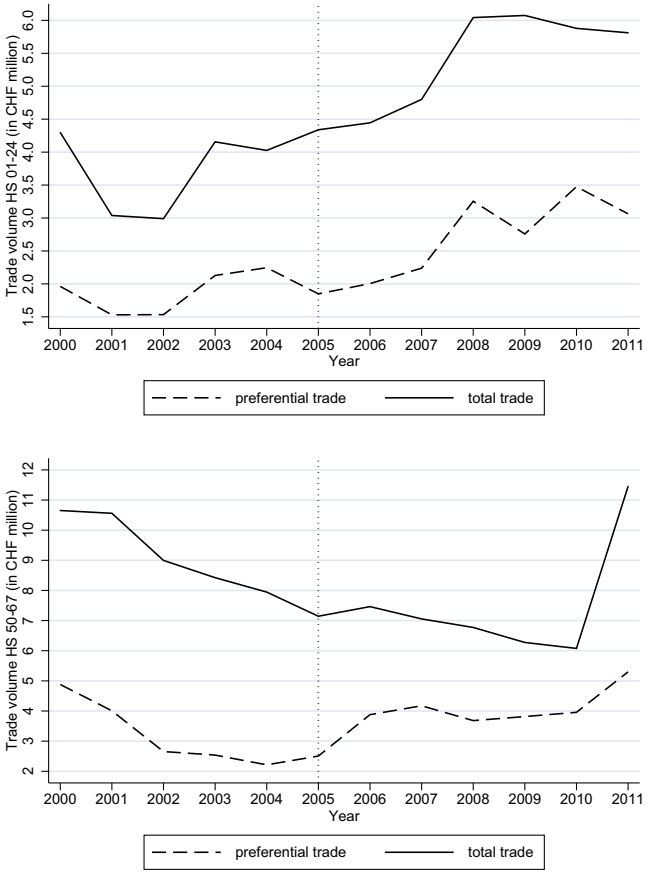

Figure 2.
Evolution of Tunisian total and preferential exports to Switzerland during 2000-2011 under HS chapters 01-24, respectively, under HS chapters 50-67

The utility rate for textile exports under the GSP (pretreatment period) was about 35.0 per cent, while the utility rate for textile exports under the FTA (posttreatment period) was about 50 per cent. Even if textile exports do not indicate a positive treatment effect on total trade level, a positive treatment effect on preferential trade level can, however, be observed.

5. Empirical strategy

5.1 FTAs and selection bias

Our study relates to the idea of the 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.

Evaluating bilateral FTAs is plagued by selection bias. A cutback of tariff barriers of 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). To overcome selection bias, we construct a control unit out of GSP benefiting DCs and LDCs which had not signed an FTA with Switzerland during our observation period.

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). By considering an FTA between Tunisia and Switzerland, which is the outcome of negotiations, using non-parametric matching techniques is a limited strategy controlling for selection bias. For instance, 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 issue. But in our view, compared to ordinary regression techniques, by using non-parametric matching techniques, we are able to construct the counterfactual state of Tunisia in the absence of signing an FTA with Switzerland. We construct a control unit (a counterfactual Tunisia) 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 (Shepherd, 2011). Furthermore, we use the HDI to depict the institutional quality of a nation and the resulting stage of human development. The strategy of the Swiss Federal Council for the selection of prospective FTA-partners is inter alia based on the current and potential economic importance of a partner and other considerations such as the expected contribution of a FTA toward the economic stabilization and development of a potential FTA-partner or in general the compatibility with Swiss foreign policy objectives (SECO, 2016). In this context, the Swiss foreign policy holds to the following values: help alleviate poverty and hardship in the world, respect human rights, promote democracy, promote the peaceful coexistence of people and conserve natural resources. Accordingly, considerations of the Swiss Federal council for the selection of prospective FTA-partners are based on economic, trade and development policy-related aspects. Therefore, the FTA with Tunisia is seen as a contribution to political stability and economic development (FDFA, 2016a). Keeping in mind that we are not completely able to address self-selection issues, we are confident that the choice of matching covariates covers at least partially factors which affect Switzerland's selection with regard to DCs. Therefore, based on observed socioeconomic conditions (gravity variables and the HDI), we can observe an average treatment effect on the treated (ATT) unit Tunisia.

5.2 Matching econometrics

To check the robustness of our results, we use the following two econometric matching techniques. First, we apply 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, 2013):

$$P(X) = Pr\,(FTA = 1 \mid X = x) = \Phi\left(x'\beta\right) \tag{1}$$

where P(X) is a binary dependent variable, which represents the probability of switching from the GSP to a bilateral FTA conditional on X. Thereby, 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 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 1).

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

$$(Y_0,\ Y_1) \perp FTA \mid X \tag{2}$$

The observed factors X (basic variables of the gravity equation and institutional quality) make the switch from unilateral to bilateral 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 unilateral to bilateral trade preferences is as good as random.

The second assumption is the common support assumption:

$$0 < Pr(FTA = 1 \mid X = x) < 1 \tag{3}$$

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 hereon based estimations of the average annual treatment effects is 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, one can obtain the ATT, which can be formalized as follows (Imbens, 2004):

$$\tau_{ATT} = E\left[Y(1) \mid FTA = 1\right] - E[Y(0) \mid FTA = 0] \tag{4}$$

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. $E[Y(1) \mid FTA = 1]$ corresponds to the expected exports of the FTA member Tunisia, and $E[Y(0) \mid FTA = 0]$ 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.

Second, 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).

6. Results and discussion

6.1 Results for overall, agro-food and textile exports

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

PSM and nnmatch indicate consistent and robust results concerning signs and magnitudes of the estimators of the annual ATT. The sole exception are estimation results for total exports under HS chapters 01-97. In case of PSM the annual ATT increases, but remains negative and statistically not significant when comparing 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 comparing 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

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

Table I.
Results for different matching estimators (in million CHF)

Notes: Robust standard errors for nnmatch in parentheses; ***denotes significance at 1% level, **at 5% level and *at 10% level

underestimate the potential positive effect of an FTA. Nevertheless, this corresponds to increased preferential exports under HS chapters 01-97 of 125 per cent.

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 slightly decreases when comparing 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 2m (CHF 4m) lower, which corresponds to increased total and preferential agro-food exports of around 100 per cent.

The analysis of textile exports shows a positive and statistically significant annual ATT for all of the aggregation levels of exports and counterfactual variations. The annual ATT for total and preferential exports in case of PSM slightly decreases when comparing to results for two and three nearest counterfactuals, whereas the annual ATT in case of nnmatch remains more or less constant. In this case as well 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, Tunisia's annual preferential exports under HS chapters 50-67 (total exports under HS chapters 50-67) would have been around CHF 3.5m (CHF 6.5m) lower. Accordingly, Tunisian preferential textile exports increased by 100 per cent, while total textile exports increased solely by 70 per cent.

6.2 Results for sectoral analysis

To provide a better overview for sectoral PSM estimations on HS two-digit level, we conducted a rough thematic division of all HS chapters in which we observed positive Tunisian exports. Corresponding HS chapters on two-digit level where 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 as well as a detailed presentation of PSM estimators on HS two-digit level with their prevailing significance levels can be found in Appendix 3). Here, 53 out of 97 HS chapters showed constant positive total exports, while solely 43 out of 97 HS chapters showed constant positive preferential exports during our observation period.

Because utilizing trade preferences is connected to overcoming bureaucratic obstacles in the form of export certificates (e.g. certificate of origin and certificate of direct shipment), and considering total instead of preferential exports may produce results which underestimate (or overestimate) the potential positive effect of an FTA (see Section 6.1), the following presentation of sectoral PSM estimation results solely consider preferential exports. 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 3 presents the frequency distribution of PSM estimators for preferential exports on HS two-digit level.

Figure 3 clearly indicates that a significant proportion of PSM estimators are close to zero. While only a few annual ATT are negative, however, selectively we obtain positive annual ATT of switching from non-reciprocal to reciprocal trade preferences. This implies that switching from non-reciprocal to reciprocal trade preferences gains advantages in exports sectors where Tunisia has comparative cost advantages. Therefore, Figure 3 can be considered as a reflection of negotiated tariff concessions of the FTA.

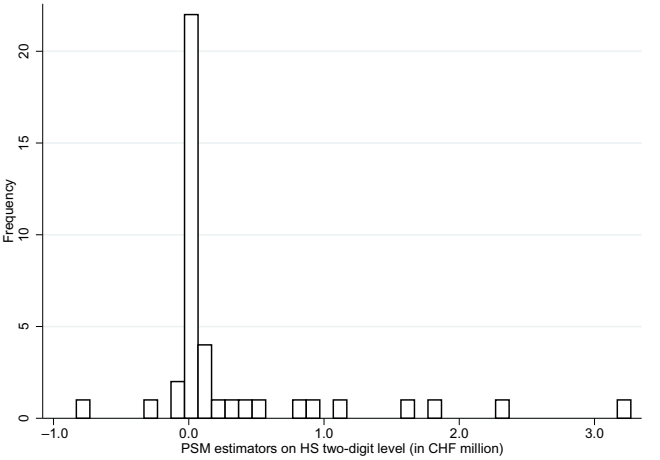

Figure 3.
Frequency distribution of PSM estimators for preferential exports on HS two-digit level

Figure 4 shows a sectoral plot of PSM estimators for preferential exports on HS two-digit level. As mentioned above, we conducted a rough thematic division of HS chapters on HS two-digit level which resulted in seven export sectors. Figure 4 allows to identify HS chapters within a particular sector, where the positive annual ATT of switching from non-reciprocal to reciprocal trade preferences is most pronounced.

A detailed analysis of sector 1 ("Agro-Food & Fishery" HS 01-24) shows that the advantage vis-à-vis remaining in the GSP is relatively small. Despite the fact that the EFTA-members 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 solely be obtained in HS 07 "Edible Vegetables" and HS 08 "Edible Fruits". During the pretreatment period from 2000 until 2004, we observed virtually no Tunisian exports under HS 07 to Switzerland. However, with a lag of one year, exports under HS 07 increased rapidly from 2006 on. Accordingly, vegetable exports increased by 880 per cent, while fruit exports increased still by 90 per cent. Annual ATT of switching from non-reciprocal to reciprocal trade preferences within the remaining HS chapters in sector 1 tend to be close to zero, or are slightly negative but statistically not significant in case of HS chapter 09 "Coffee & Tea".

Sector 2 ("Chemicals, Plastics & Rubbers" HS 28-40) indicates a clear advantage vis-à-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 per cent and preferential exports of essential oils and resinoids by 100 per cent. A negative but statistically not 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 per cent. The remaining HS chapters within this sector indicate statistically not significant annual ATT which more or less tend to be close to zero.

Sector 4 ("Textiles" HS 50-67) indicates the most pronounced advantage *vis-à-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

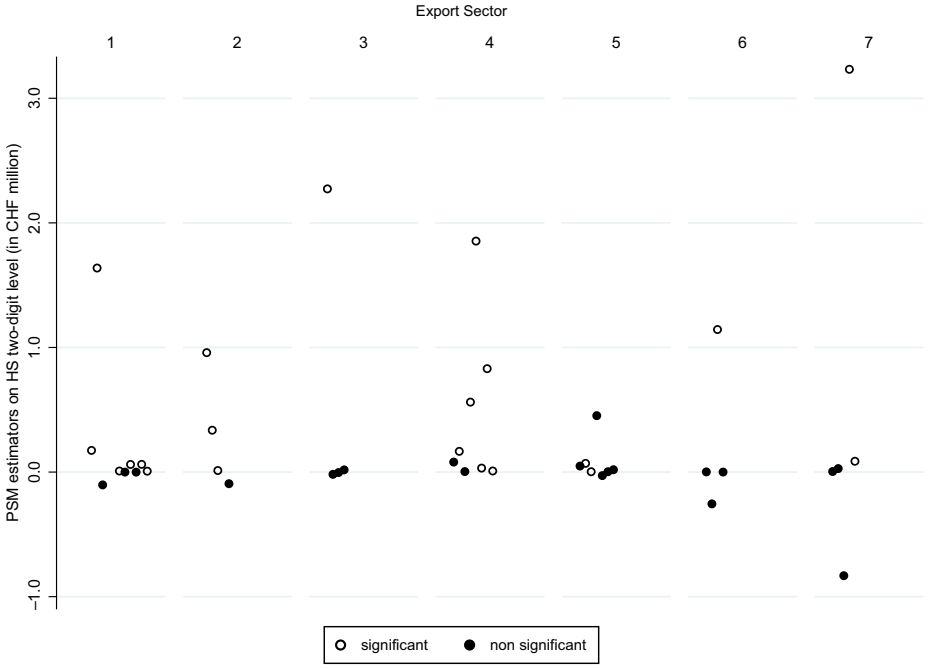

Figure 4.
Sectoral plot of PSM estimators for preferential exports on HS two-digit level

counterfactual GSP benefiting country. For instance, carpet exports increased solely by 13 per cent, while apparel exports (not knitted or crocheted) increased by 500 per cent. Within this wide span, footwear exports are boosted by 80 per cent and apparel exports (knitted or crocheted) by 120 per cent. Likewise, HS chapters 52 "Cotton" and 63 "Other made up textile articles" show positive annual ATT but which are not at such a high level, and in case of HS chapter 52 the positive annual ATT is not statistically significant. The annual ATT 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 ATT 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". Thereby HS chapter 95 indicates the highest annual ATT and therefore triggers the strongest advantage vis-à-vis remaining in the GSP, which corresponds to increased exports by 250 per cent. While annual ATT for HS chapters 84 "Machinery" and 94 "Furniture" are negative but statistically not significant, remaining HS chapters within sectors 6 and 7 tend to be close to zero.

7. Conclusions

The case study of Tunisia's exports to Switzerland allowed us to get a detailed picture of a political and economical 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. Thus, we were 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 case study of Tunisia gave us 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 point of view, our case study addresses an important question: How can DCs (and LDCs) be best integrated into the world economy to reduce the actual existing discrepancies and polarities concerning 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 per cent after the entry into force of the FTA in 2005. Preferential agro-food and textile exports likewise increased by 100 per cent. However, a detailed analysis on HS two-digit level showed that a significant proportion of PSM estimators are close to zero. Selectively, we obtained positive annual ATT of switching from non-reciprocal to reciprocal trade preferences. This implies, that switching from non-reciprocal to reciprocal trade preferences gains advantages in exports sectors where Tunisia has comparative cost advantages. In particular, this holds for the textile sector and partly 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 be univocally answered with "yes". Based on the switch from unilateral to bilateral trade preferences, Tunisia gains trade benefits compared to counterfactual countries still benefiting from the GSP. Accordingly, if Tunisia had not switched in 2005, especially the preferential export volume would have been lower.

References

Abadie, A., Drukker, D., Herr, J.L. and Imbens, G.W. (2004), "Implementing matching estimators for average treatment effects in stata", *The Stata Journal*, Vol. 4 No. 3, pp. 290-311.

Angulo, A.M., Mtimet, N., Dhehibi, B., Atwi, M., Ben-Youssef, O., Gil, J.M. and Sai, M.B. (2011), "A revisited gravity equation in trade flow analysis: an application to the case of Tunisian olive oil exports", *Investigaciones Regionales*, Vol. 21, pp. 225-239.

API. (2016). Industrial Overview, available at: www.tunisieindustrie.nat.tn/en/tissu.asp

Austin, P.C. (2011), "An introduction to propensity score methods for reducing the effects of confounding in observational studies", *Multivariate Behavioral Research*, Vol. 46 No. 3, pp. 399-424.

Baier, S.L. and Bergstrand, J.H. (2007), "Do free trade agreements actually increase members' international trade?", *Journal of International Economics*, Vol. 71 No. 1, pp. 72-95.

Baier, S.L. and Bergstrand, J.H. (2009a), "Bonus vetus OLS: a simple method for approximating international trade-cost effects using the gravity equation", *Journal of International Economics*, Vol. 77 No. 1, pp. 77-85.

Baier, S.L. and Bergstrand, J.H. (2009b), "Estimating the effects of Free Trade Agreements on trade flows using matching econometrics", *Journal of International Economics*, Vol. 77 No. 1, pp. 63-76.

Baier, S.L. and Bergstrand, J.H. (2010), "An evaluation of swiss Free Trade Agreements using matching econometrics", *Aussenwirtschaft*, Vol. 65 NO. III, pp. 239-250.

Cadot, O., Fernandes, A.M., Gourdon, J. and Mattoo, A. (2012). Are the Benefits of Export Support Durable? Evidence from Tunisia. CEPII Working Paper No. 2012-30.

Conconi, P. and Perroni, C. (2009), *Reciprocal versus Unilateral Trade Preferences for Developing Countries*, available at: www.ibrarian.net/navon/paper/Reciprocal_versus_Unilateral_Trade_Preferences_fo.pdf?paperid=15592436

EAER (2016). State visit by President Beji Caid Essebsi: launch of Tunisian-Swiss friendship group, available at: www.news.admin.ch/message/index.html?lang=en&msg-id=60724

EC (2011), "GSP Statistical Report", *Report from the Commission to the European Parliament and the Council*.

EC (2016), "European Union", Trade in goods with Tunisia, available at: www.trade.ec.europa.eu/doclib/docs/2006/september/tradoc122002.pdf

FC (2006), "Botschaft zum Freihandelsabkommen zwischen den EFTA-Staaten und der Republik Tunesien", available at: www.admin.ch/opc/de/federal-gazette/2006/1783.pdf

FDFA (2016a), "Aims and values of the FDFA", available at: www.eda.admin.ch/eda/en/home/daseda/eda-ziele-werte.html

FDFA (2016b), *Bilateral relations Switzerland – Tunisia*, available at: www.eda.admin.ch/eda/en/fdfa/representations-and-travel-advice/tunisia/switzerland-tunisia.html

FOAG (2013), *Agricultural Report 2013*, Federal Office for Agriculture, Bern.

Häberli, C. (2008), "Market access in Switzerland and the European Union for Agricultural Products from Least Developed Countries", NCCT TRADE Working Paper No. 2008/5.

Hamel, I. (2011), *Swiss in Tunisia Hopeful for the Future,* available at: www.swissinfo.ch/eng/swiss-in-tunisia-hopeful-for-the-future/29657098

Huber, C. (2015), *Introduction to Treatment Effects in Stata: Part 2*, available at: www.blog.stata.com/tag/nearest-neighbor-matching/.

Imbens, G.W. (2004), "Nonparametric estimation of average treatment effects under exogeneity: a review", *The Review of Economics and Statistics*, Vol. 86 No. 1, pp. 4-29.

International Monetary Fund (2013), *World Economic Outlook Database*, available at: http://imforg/external/data.htm

Joerchel, B. (2006), *FTA: Beneficial to Poor Countries?*, available at: www.alliancesudh/en/policy/trade/fta-beneficial-to-poor-countries

Larbi, W. and Chymes, A. (2010), "The impact of the government policies and incentives to promote the export of agricultural products in Tunisia: the case of olive oil", *Acta Agriculturae Scandinavica, Section C – Food Economics*, Vol. 7 No. 2/4, pp. 107-118.

Leuven, E. and Sianesi, B. (2003), "PSMATCH2: Stata module to perform full mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing", Statistical Software Components from Boston College Department of Economics.

Masmoudi, M. and Charfi, F. (2013), "The macro-economic determinants of export competitiveness of the Tunisian economy in a context of liberalization and crisis", *International Journal of Business and Management Invention*, Vol. 2 No. 7, pp. 36-49.

Mayer, T. and Zignago, S. (2011), "Notes on CEPII's distance measure: the GeoDist database", CEPII Working Paper.

NIS (2016), *Database from the National Institute of Statistics Tunisia*, available at: http://dataportal.ins.tn/en

OECD (2005), *Preferential Trading Arrangements in Agricultural and Food Markets: The Case of the European Union and the United States*, OECD Publishing.

OECD (2013), *Economic, Environmental and Social Statistics*, OECD Publishing, Paris.

Rabe-Hesketh, S. and Skrondal, A. (2013), *Multilevel and Longitudinal Modeling Using Stata, Volume II: Categorical Responses, Counts, and Survival*, 3rd ed., Stata Press, College Station.

Ritzel, C. and Kohler, A. (2016), "Protectionism, how stupid is this? The causal effect of free trade for the world's poorest countries: evidence from a quasi-experiment in Switzerland", *Journal of Policy Modeling*, available at: https://doi.org/10.1016/j.jpolmod.2017.05.002

Rosenbaum, P.R. and Rubin, D.B. (1983), "The central role of the propensity score in observational studies for causal effects", *Biometrika*, Vol. 70 No. 1, pp. 41-55.

Roy, A. (1951), "Some thoughts on the distribution of earnings", *Oxford Economic Papers*, Vol. 3 No. 2, pp. 135-145.

Rubin, D. (1974), "Estimating causal effects of treatments in randomized and nonrandomized studies", *Journal of Educational Psychology*, Vol. 66 No. 5, pp. 668-701.

SCA (2015), *Foreign trade statistics Swiss-Impex*, available at: www.swissimpex.admin.ch/

SECO (2005), *Anwendung des Freihandelsabkommens zwischen den EFTA-Staaten und Tunesien*, available at:www.admin.ch/cp/d/429b0dfb 2@fwsrvg.html

SECO (2009), *Free Trade Agreement Between the EFTA States and Tunisia*, SECO EFTA fact sheet.

SECO (2016), *Free Trade Agreements*, available at: www.seco.admin.ch/seco/en/home/AussenwirtschaftspolitikWirtschaftlicheZusammenarbeit/Wirtschaftsbeziehungen/Freihandelsabkommen.html

SFSO (2014), *Schweizer Landwirtschaft: Taschenstatistik*, Swiss Federal Statistical Office, Bern.

Shepherd, B. (2011), *The Gravity Model of International Trade: A User Guide*, United Nations publication ST/ESCAP/2645.

The World Bank (2015), *Tunisia Overview*, available at: www.worldbank.org/en/country/tunisia/overview

The World Bank (2016), *World Development Indicators*, available at: http://data.worldbank.org/data-catalog/world-development-indicators

UNDP (2014), *United Nations Development Programme – Human Development Report Data*, available at: http://hdr.undp.org/en/data

World Trade Organization (2016), *Regional Trade Agreements*, available at: www.wto.org/english/tratope/regione/regione.htm

Appendix 1

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

Notes: ***denotes significance at 1% level, ** at 5% level and * at 10% level; standard errors in parentheses; 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 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 AI. PSM probit estimation results

Appendix 2. PSM 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.

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 AII. 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	3,338.8	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 AIII. 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	3,254.5	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

Table AIV. PSM covariate balancing for one-to-three matching

Appendix 3

Table AV.
PSM estimators
(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 and tea	−102,768	1	Agro-Food & Fishery
15	Fats and 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 and 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 and 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 and 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 and 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 and watches	28,365	7	Miscellaneous
94	Furniture	−831,368	7	Miscellaneous
95	Toys, games and sports requisites	3,232,578***	7	Miscellaneous
96	Miscellaneous manufactured articles	86,970***	7	Miscellaneous

Notes: *** denotes significance at 1% level, ** at 5% level * at 10% level

Corresponding author
Christian Ritzel can be contacted at: christian.ritzel@agroscope.admin.ch