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The Effect of Swiss Free Trade Agreements on Agricultural Trade

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ABSTRACT

As a country highly dependent on imports, Switzerland has many free trade agreements (FTAs) that liberalise trade barriers. We assess how these agreements affect Swiss agricultural imports at different margins of trade adjustment. We estimate reduced-form gravity models using agricultural trade data for 202 partner countries from 2004 to 2022. We find that Swiss FTAs increase agricultural import values by 8.75%, decrease import prices by 3%, increase the probability of imports by 2% and reduce market exit rates by 1%. These effects are heterogeneous across products, sectors and agreements. Regarding import values and quantities, the positive effects of FTAs are mainly observed for raw products (including vegetables, fruits and nuts, coffee, tea and spices). However, the estimated effects are negative for processed products. Regarding import prices, the effects are positive whenever they are statistically significant. We also find that the number of competing agreements to which a Swiss trade partner is exposed only marginally affects Swiss imports. We extend our analysis to agricultural exports and find that FTAs increase Swiss export values by 47%, quantities by 53% and prices by 3% but do not affect export probabilities or export market exit rates. Thus, although Swiss FTAs generally boost trade on average, policymaking should consider the heterogeneities of the estimated FTA effects regarding products, agreements and time when using FTA estimates for counterfactual analysis and negotiations.

JEL Classification: F14, Q17, Q18

1 | Introduction

Economists disagree on many things, but the superiority of free trade over protection is not controversial (Rodrik 2018). A free trade agreement (FTA) allows countries to reduce barriers to imports and exports on a bilateral basis, allowing consumers to benefit from greater product variety at lower prices. This is particularly relevant for agriculture where trade barriers are traditionally higher relative to other sectors. For example, in 2015, global average tariffs were 5% for nonagricultural products and 11% for agriculture (Niu et al. 2018), highlighting the substantial potential gains from liberalizing trade in agriculture. Existing studies on FTAs, however, focus mainly on big countries, such as the European Union and the United States, and assess their economy-wide effects, leaving a knowledge gap on how FTAs affect the agricultural sector in smaller countries.[1] We address this gap using the case of Switzerland—a small, open economy in which imports account for approximately 50% of domestic consumption (Ritzel et al. 2024).

As of 2024, Swiss trade policy rests upon three main pillars: (i) World Trade Organization (WTO) membership, (ii) association agreements with the European Union (EU) and membership of the European Free Trade Association (EFTA) and (iii) bilateral agreements with other countries. WTO membership means that all Swiss imports are subject to Most-Favored-Nation (MFN) tariffs. If MFN tariffs are positive but imports originate from a country that has an FTA with Switzerland (under either of the other two pillars), the goods benefit from lower or even zero tariffs.[2] Given the trade cost reductions that come with trade liberalisation, we expect FTAs to increase bilateral trade. The same is true for FTAs that liberalise nontariff measures (NTMs) and administrative procedures. What remains an empirical question is the magnitude of the trade effect and whether the effects vary by product, agreement or over time. Furthermore, the fact that Switzerland has an FTA with its partners does not preclude the partners from signing FTAs with other countries. These third-country agreements could offer a comparable or even higher level of liberalisation to Switzerland's trade partners and divert potential exports destined for Switzerland to alternative destinations. Assessing whether and to what extent these competing third-country agreements affect Swiss imports is necessary to provide a holistic picture of the trade effects of Swiss FTAs. Based on this premise, the economic question underlying our work is how important FTAs are for Swiss agricultural trade.

Our use of Switzerland's agricultural sector as a case study is based on the stark contrast between the levels of protection in the agricultural and nonagricultural sectors. Switzerland's tariff pattern reveals high rates of MFN tariffs on agricultural imports compared with low rates on industrial goods. These high tariffs serve a politically motivated protective role for the agricultural sector, limiting opportunities for substantial concessions in reciprocal trade negotiations for domestically sensitive agricultural products. Conversely, the industrial sector faces minimal tariffs, which continue to decrease. For instance, in January 2024, Switzerland implemented a significant trade reform by autonomously eliminating all tariffs on industrial imports, irrespective of origin (Zimmermann 2023). More broadly, the higher protection levels in the agricultural sector vis-à-vis the nonagricultural sector suggest a larger trade increase in agriculture following an FTA. This expectation is consistent with Grant and Lambert (2008), who find that trade agreements increase agricultural trade by an average of 72%, compared with a 27% increase in nonagricultural trade. In Switzerland, where the disparity in protection between sectors is even more pronounced and there exists little flexibility in agricultural concessions, the impact of FTAs on Swiss trade remains an empirical question.

Our empirical assessment uses data on agricultural imports and FTAs in force between 2004 and 2022. We define two margins of import adjustments: the intensive margin (measured by import values, import quantities and import prices) and the extensive margin (measured by the probability of imports and market exit). We then estimate a reduced-form gravity model that regresses two FTA indicators—the presence of an FTA (dummy variable) and the number of third-country FTAs—on these margins. Our empirical findings show that, on average, Swiss FTAs increase import values by 8.75%, decrease import prices by 3%, increase the probability of imports by two percentage points and reduce market exit rates by one percentage point. On the effect of third-country FTAs, we observe very marginal effects. For instance, an additional third-country FTA decreases Swiss import quantities by about 0.3%, decreases import prices by 0.1% and changes import probability and market exit rates by 0.1 percentage points. Thus, although these effects are statistically significant, the magnitudes are too small to have sizeable negative impacts on Swiss imports.

To provide deeper insights into our main findings, we assess the heterogeneity of the average FTA effects across various dimensions. Swiss FTAs, aiming to achieve targeted liberalisation that aligns with Swiss agricultural policy objectives, distinguish between basic (raw) and processed agricultural products. Assessing the heterogeneity of the trade effect across this product classification, we find that FTAs increase the import values and quantities for raw products but decrease them for processed products. Similar heterogeneity is observed across different HS2-digit product sectors. Some FTAs increase imports, others decrease imports and others have no effect on imports. This pattern of heterogeneity is consistent across other import margins. To capture the dynamic effects of FTAs, we incorporate lags and leads of the FTA variable. We find no evidence of anticipation effects but find that the trade effects phase in up to 2 years after implementation.

For completeness, we extend our analyses to Swiss exports, even though agricultural exports make only a small share of total Swiss trade. We find that Swiss FTAs increase Swiss export values by 47%, quantities by 53% and prices by 3%; however, they do not affect the extensive margins of export. The magnitudes of the export-side effect that we estimate are larger than the import side effects. Given the relatively lower levels of existing Swiss agricultural exports vis-à-vis imports, the larger export-side effect of an FTA is not surprising. That Swiss FTAs increase export prices is consistent with the fact that Swiss exports are of a higher average quality and command a price premium. However, it is also consistent with the idea that the cost savings from lower tariffs may not be fully passed through to domestic consumers but are instead partially appropriated by foreign suppliers.

Our work makes two key contributions to the literature. Existing studies on the effects of Swiss FTAs on trade patterns primarily focus on the aggregate economy.[3] For instance, Bergstrand and Baier (2010) show that the Swiss–Mexico FTA of 2001 increased bilateral trade by approximately 37% after just 4 years in place. Nussbaumer's (2017) analysis of 20 Swiss FTAs using data on exports and imports from 1993 to 2014 provides descriptive evidence that points towards a general positive trade effect of FTAs, but the empirical estimates are inconclusive. According to Imhof (2021), Swiss FTAs have no effect on import quality and variety but decreases quality-adjusted prices. We contribute to this stream of findings by assessing the impact of FTAs specifically on agriculture, given the high levels of protection that typically characterise this sector. In this regard, our work is similar to Kohler (2016), who examines the effect of complete liberalisation in cheese between Switzerland and the EU on the Swiss cheese trade. Although the results in Kohler (2016) are positive, they paint a fuzzy picture and do not rule out the possibility that the FTA effect is null. There is also the work by Copenhagen Economics (2016), whose primary focus on EU FTAs offers an assessment of the effects of Swiss-EU FTAs in the agricultural sector. While relevant, this work is limited to Swiss FTAs with the EU. Our work thus differs from those of Kohler (2016) and Copenhagen Economics (2016) on two fronts: We focus on all agricultural products and consider all Swiss FTAs. Furthermore, Swiss FTAs often distinguish between basic agricultural products and processed agricultural products, a distinction that has not been incorporated into any ex post assessments. Our work fills this gap.

Our second contribution extends beyond the direct trade effects of Swiss FTAs on Swiss imports to consider the broader network of trade relationships involving Switzerland's partners. Many of Switzerland's trade partners maintain bilateral agreements with third countries outside Switzerland. For example, while Switzerland has an FTA with the EU, the EU also holds FTAs with countries such as the Mediterranean basin, Canada, Mexico, Singapore and Chile. Whether these third-country agreements enhance or divert trade away from Switzerland is an empirical question that remains underexplored in the existing literature. The increasing overlap of trade agreements presents both challenges and opportunities. Overlapping agreements can raise trade costs due to the complexity of managing multiple trade rules and regulatory standards. Conversely, countries connected through several FTAs may experience stronger integration and regulatory harmonisation, potentially reducing trade costs. In this context, our study contributes to a growing body of literature examining the interaction between overlapping FTAs and their effects on agricultural trade (e.g., Jafari et al. 2023).

Our analysis and findings hold important implications for policymaking, particularly in the agricultural sector. Historically, agriculture has been treated as a special sector, often exempt from certain provisions in trade agreements. However, recent trends suggest a shift towards integrating agriculture into broader trade frameworks. A report by the Organisation for Economic Co-operation and Development (Thompson-Lipponen and Greenville 2019) indicates that the number of trade agreements excluding agriculture has stagnated. Only a few agreements now exclude agriculture entirely, with an increasing tendency to address agricultural trade within the general provisions of agreements rather than in dedicated chapters. Given these developments, our study is timely in assessing the effectiveness of these provisions for agriculture. Furthermore, our attempt to provide evidence for the case of a highly trade-dependent economy, such as Switzerland, is important, as there may be crucial policy implications for future agreements. Moreover, our ex post analyses offer a basis for comparison with ex ante simulations conducted by government agencies, such as the Swiss Federal Office of Agriculture (FOAG). This comparison can help the FOAG evaluate whether the anticipated benefits of FTAs have been realised and identify unintended consequences or areas for policy improvement. As agriculture continues to converge with general trade policy, such evidence is critical for refining strategies to support the sector effectively.

The structure of the paper is as follows. Section 2 provides the conceptual and theoretical background that frames our analyses and aids in interpreting the empirical findings. Section 3 discusses the empirical framework employed in the study. In Section 4, we present the data and highlight the key stylised facts relevant to our analysis. We present and discuss the empirical findings in Section 5. In Section 6, we extend our analysis of Swiss imports to Swiss exports. Finally, Section 7 concludes the paper and offers policy implications based on our findings.

2 | Conceptual and Theoretical Considerations

In this section, we present the conceptual basis for our analyses. This provides structure for our work, guides our a priori expectations and helps us to discuss our empirical findings. We then present a concise theoretical overview of the gravity model, which serves as the basis for our empirical analyses.

2.1 | Conceptual Background: The Economics of Trade Agreements

Standard microeconomic theory predicts that trade agreements generate terms-of-trade gains for member countries. To illustrate this, we provide a simplified framework for analysing these effects in a small open economy within a partial equilibrium setting (see also Plummer et al. 2011). Section A.1 in the appendix offers a comprehensive discussion of the microeconomic foundations and mechanisms underlying trade agreements, including their theoretical underpinnings and the key factors that drive their effects. The small country assumption is appropriate in this context, as Switzerland's international market influence is relatively modest, accounting for just 1.67% of global merchandise imports and 2.96% of global imports of commercial services, which together represent 1.9% of total global merchandise and commercial services imports (Zimmermann 2023). Figure A1 depicts the domestic market for a specific good in a country preparing to join an FTA. In the end, two main predictions emerge from this framework and set the basis for the rest of our work: We expect the presence of an FTA to (i) increase import quantities and (ii) lower import prices. In the next subsection, we explain how we intend to test this expectation empirically.

In this paper, we focus on the direct trade creation effects of FTAs. We limit the theoretical exposition to tariff reductions, as these remain a central feature of FTAs. However, it is important to note that recent FTAs have become deeper and more comprehensive, encompassing not only tariff cuts but also the liberalisation of NTMs and administrative procedures. These broader provisions, although crucial, are outside the scope of our analysis. Another observation beyond the scope of the current paper is the effect of trade diversion, which occurs when imports previously sourced from the more efficient outsider are displaced by imports from the less efficient but now cheaper FTA partner country. The theoretical prediction that FTAs increase trade carries important welfare implications for different economic agents in the home country. As a result of lower import prices, producer welfare declines because domestic producers receive lower prices for their goods. However, the reduction in domestic prices benefits consumers, increasing their surpluses and available product varieties and making them better off. The government also loses some tariff revenue, and the net welfare effect depends on efficiency gains in other sectors of the economy. Although these nondirect effects are relevant, they are not the focus of this study. Additionally, as we focus on FTAs, which are reciprocal by definition, we exclude unilateral trade preferences granted under the Generalised System of Preferences. On reciprocal versus unilateral trade liberalisation in the Swiss context, Zimmermann (2023) offers a broad discussion, while Ritzel and Kohler (2017) provide an analysis specific to the agricultural sector.

2.2 | Theoretical Framework

Our starting point is the structural gravity equation. Gravity equations are expenditure functions that indicate how consumers allocate their spending across countries when faced with trade cost constraints. It remains the workhorse model for ex post analysis of both the partial and general equilibrium effects of trade agreements (Larch and Yotov 2024). In its basic form, the model predicts that bigger countries trade more with each other and that trade decreases with bilateral distance. For a model that was disconnected from economic theory until the 21st century, several theoretical models now yield predictions that are close to gravity. For our case, we adopt the product-specific version of the Armington-CES specification, as in Anderson and Van Wincoop (2003), as follows[4]:

$$X_{odpt} = \frac{Y_{opt} E_{dpt}}{Y_{pt}} \left(\frac{\tau_{odpt}}{\Pi_{opt} \lambda_{dpt}} \right)^{1-\sigma_{pt}} \quad (1)$$

where X_{odpt} denotes exports of product p from origin (i.e., exporter) country o to destination (i.e., importer) country d in year t. E_{dpt} is the import demand of p in d, which is usually proxied by gross domestic product (GDP). Y_{opt} is the level of domestic production in o of p. Y_{pt} is aggregate world production of p. The right-hand side of Equation (1) is a product of two ratios. The first ratio is the predicted trade flow under free trade, and the second ratio in brackets captures exogenous bilateral trade costs. The trade cost term consists of three components: (i) the numerator, τ_{odpt}, is the bilateral trade cost between o and d for product p; (ii) the denominator contains two structural terms, Π_{opt} and λ_{dpt}, that measure the ease of market access for o and d; (iii) σ_{pt} is the elasticity of substitution parameter.

Our interest lies in τ_{odpt}, as it allows us to show how FTAs modify predicted costless trade. We model τ_{odpt} as the following log-linear function of observed trade frictions, including FTAs, NTMs, bilateral tariffs and a vector Ω_{od} of time-invariant traditional gravity covariates (including bilateral distance, and dummies for sharing a common language, and sharing a common border):

$$\tau_{odpt} = FTA_{odt}^{\beta_1} \, Third\ Country\ FTA_{odt}^{\mathrm{d}\neq\mathrm{CHE},\beta_2} NTM_{odpt}^{3} Tariff_{odpt}^{\beta_4} \exp \sum_{n=5}^{7} \beta_n \Omega_{od} \quad (2)$$

3 | Empirical Application

In this section, we specify our econometric models and describe how we estimate the average and heterogeneous effects of FTAs on Swiss agricultural imports.

3.1 | Econometric Specification

To assess the average effect of Swiss FTAs and the number of competing FTAs that Swiss trade partners have with other third-countries on different margins of Swiss agricultural imports, we estimate the following generic reduced-form gravity equation:

$$\begin{aligned} X_{opt} = {} & \beta_0 + \beta_1 FTA_{ot} + \beta_2 Third\ Country\ FTA_{\mathrm{ot}}^{\mathrm{d}\neq\mathrm{CHE}} + \beta_3 \log GDP_{ot} \\ & + \beta_4 NTM_{opt} + \beta_5 \log\left(1 + Tariff_{opt}\right) + \lambda_{pt} + \Pi_{op} + \epsilon_{opt} \end{aligned} \quad (3)$$

where o is the origin country (i.e., the country of production), p is the HS6-digit product, and t is time measured in years. X_{opt} is the outcome variable, which varies depending on the import margin under consideration. FTA_{ot} is a dummy variable that takes the value 1 if there exists a FTA between Switzerland and o in year t , and 0 otherwise. β_1 captures the effect of the presence of an FTA between country o and Switzerland in year t on agricultural imports, holding constant other factors that might influence trade. Using an FTA dummy, we capture the average effect of FTAs on agricultural imports, abstracting from the complexities of specific agricultural concessions or product-level commitments. This allows us to estimate trade effects without requiring detailed product-specific data. The FTA dummy implicitly reflects the reduction in trade costs, capturing the combined effect of all trade-facilitating measures under an FTA, including, where relevant, tariff preferences, quota arrangements and reductions in nontariff barriers.[5] β_2 captures the effect of third-country FTAs that do not involve Switzerland. This accounts for such FTAs as those between the EU and South Korea, the EU and Türkiye, among others. $ThirdCountryFTA_{ot}^{d\neq\mathrm{CHE}}$ is the number of other FTAs owned by country o excluding Switzerland. GDP_{ot} is the time-varying gross domestic product of the origin country. NTM_{opt} captures the number of origin- and product-specific NTMs imposed on imports. $Tariff_{opt}$ is the applied ad valorem (bilateral) tariffs charged on imports of product p from country o in year t. λ_{pt} and Π_{op} are product–time and origin–product fixed effects that control for the multilateral resistance terms that are typical of structural gravity models. Another important distortionary trade policy tool frequently used in Switzerland is the tariff rate quota (TRQ) system (Hillen 2019). TRQs allow a pre-determined quantity of a product to be imported at lower tariffs (in-quota duty) while imposing higher tariffs on imports exceeding this quota (out-of-quota duty). They are often applied during specific periods within the year, particularly during domestic supply seasons, to protect local producers. Due to the annual nature of our dataset, however, we are unable to account for the intra-year variation in TRQs. Nevertheless, the inclusion of product–year fixed effects in our estimations accounts for their impact, as TRQs are applied on a product-specific basis. ϵ_{opt} is the error term.

Our estimation equation is a log-linearised form of Equation (1) that embeds Equation (2). However, there are a few issues that are worth highlighting, given that at first glance, Equation (3) does not look exactly like the theoretical specification in Equation (1). In our setup, Switzerland is the only importing country, so the destination index d is redundant and is dropped from the empirical specification for simplicity. For this same reason, the inclusion of origin product fixed effects Π_{op} absorbs all the time-invariant traditional gravity variables contained in the vector Ω_{od} in Equation (2). Because d is redundant, the dimensions of the country-pair variables included in vector Ω_{od} reduce to Ω_o, which is further embedded in Π_{op}. Nonetheless, bilateral fixed effects—in our case Π_{op}—are better measures of bilateral trade costs than the standard set of time-invariant traditional gravity variables (Egger and Nigai 2015; Agnosteva et al. 2019; Fiankor et al. 2021). The multilateral resistance terms Π_{opt} and λ_{dpt} in Equation (1) reduce to Π_{op} and λ_{pt} in the empirical specification. λ_{dpt} simplifies to λ_{pt} because d is redundant, but we resort to Π_{op} in the empirical estimation because allowing the origin country fixed effects to vary over time (as in Π_{opt}) would result in perfect collinearity with our variables of interest, FTA_{ot} and $ThirdCountryFTA_{ot}^{d \neq CHE}$.

3.2 | Defining Different Measures of X_{opt}

In this study, we are interested in how FTAs affect different margins of import adjustments. This is important, as different margins of trade may adjust differently when faced with trade costs. We define five different margins of imports. The first three margins come directly from our theoretical framework in Figure A1, in which we illustrate how tariffs are predicted to affect import quantities and prices. We refer to these margins as the intensive margin of import adjustment and define them as follows:

1. The value of imports in CHF of product p from country o in year t, that is, $Import\ value_{opt}$.
2. The quantity of imports in kilograms of product p from country o in year t, that is, $Import\ quantity_{opt}$.

The entry into force of an FTA reduces trade costs for partners involved in the trading relationship. The exporters in the foreign country must no longer bear the costs of tariffs and other NTMs that were liberalised as part of the FTA. In return, this may reduce the prices of imports, as producers and other actors along the value chain no longer need to bear the extra costs of production and trade. To test this prediction, we define an import price margin:

3. The price—measured as unit values in CHF/kg—of imports of product p from country o in year t, that is, $Import\ price_{opt}$.

The three outcome variables we consider focus on absolute trade values or quantities. Thus, our estimates provide insight into the size of the change in the value or quantity of Swiss imports in response to an FTA. However, it is possible that the expansion of trade may manifest not only as increased values or quantities of existing products or importers but also in other ways. For instance, new exporters may enter the Swiss import market. The reduction in trade costs as part of the FTA should also reduce the number of exporters that exit the Swiss market. These trade measures are often referred to as extensive margins. We define these margins as follows:

4. The probability of imports of product p from country o in year t, that is, $\Pr(V_{opt} > 0)$.
5. The probability that imports of product p from country o cease in year t, that is, $\Pr(Exit_{opt} > 0)$.

3.3 | Estimation Procedure

Depending on the outcome variable, we estimate Equation (3) using different estimators. On the effect of FTAs on import values and import quantities, we use the Poisson pseudo-maximum likelihood (PPML) estimator. The PPML estimator's log-linear objective function allows us to specify the estimation equation in its multiplicative form without log-transforming the dependent variable and is consistent under heteroscedasticity (Silva and Tenreyro 2006). Because import prices are never zero, we estimate the effect of FTAs on import prices using ordinary least squares (OLS). Regarding the effect of FTAs on the probability of trade and market exit, we estimate a linear probability model (LPM). We employ the LPM for practical reasons, as it allows for a straightforward interpretation of the coefficients as marginal effects and facilitates the inclusion of high-dimensional fixed effects without encountering the incidental parameter problem typical of many other nonlinear models. That notwithstanding, we also estimate both probit and logit models to ensure that the model choice does not drive our findings.

3.4 | Identification Strategy

Endogeneity has been a major obstacle in gravity models. The sources of the problem are very clear, often arising from reverse causality and/or omitted factors that simultaneously affect trade and the probability of signing an agreement.[6] Due to its intuitive appeal and easy implementation, the leading method to handle endogeneity of FTAs is that of Baier and Bergstrand (2007), who, consistent with the approach to control unobserved time-invariant heterogeneity with panel data by Wooldridge (2010), propose the use of bilateral fixed effects, thus controlling for most of the unobserved correlation between the endogenous FTAs and the error term in gravity models (Larch and Yotov 2024). In our one-country case, the origin-product fixed effects, Π_{op}, capture all bilateral variations. As such, threats to identification due to endogeneity are addressed using standard approaches in the literature. Nevertheless, we interpret our findings as associations rather than causal estimates. This is because in our single importing country setting, we cannot entirely rule out the additional effect of other origin–time specific effects, including climate change and extreme weather events. Our variable of interest is identified by the country and time variation in the agreements that entered into force during the study period.

4 | Data

Our empirical analyses depend on data from two main sources: data on Swiss FTAs and data on Swiss bilateral trade, as detailed below.

4.1 | FTAs

Our primary data source on Swiss FTAs is the State Secretary of Economic Affairs (SECO 2023). In addition to the EFTA Convention and the FTA with the European Union, Switzerland currently has a network of 33 FTAs with 43 partners. Figure 1 illustrates the network of partner countries with which Switzerland has FTAs. In contrast to FTAs concluded jointly as the EFTA bloc, agricultural concessions are often granted in separate bilateral agricultural agreements between Switzerland and its trading partners. For instance, the agreement concerning trade in agricultural products between Albania and Switzerland was concluded following the FTA between Albania and the EFTA countries. These agreements are designed to address the specificities of agricultural trade, which often involves more complex regulatory and tariff structures than trade in industrial goods. These can take the form of TRQs, rebates or price compensation mechanisms. Unlike FTAs for industrial goods, which generally ensure the full elimination of tariffs, agricultural agreements feature more nuanced concessions. Tariffs on agricultural products are significantly higher than those on industrial goods. According to the WTO, the latest ad valorem equivalents of the trade-weighted average MFN applied rates for 2021 are 24.8% for agricultural products compared with only 0.7% for nonagricultural imports (Zimmermann 2023). As these agriculture-specific agreements do not involve the same level of liberalisation, their trade effects may also be limited in comparison to industrial FTAs.

Figure 2 depicts the years in which the agreements entered into force. It also illustrates the variations that we exploit in our empirical analysis. According to the figure, different countries signed the agreements with Switzerland at different times, allowing our identification strategy to exploit this time and country variation in the entry into force of the agreements. Aside from the EFTA Convention and the agreements with the EU, which date far back to the 1960s and 1970s, the oldest agreement is the Swiss–Türkiye FTA, which has since been modernised, with the updated agreement becoming active in October 2021. FTA negotiations are currently underway with Kosovo, India, Vietnam, Malaysia and the MERCOSUR, while negotiations with the Russia–Belarus–Kazakhstan Customs Union have been suspended. To account for third-country bilateral agreements that are outside the control of Switzerland, we use data from the regional trade agreement database maintained by Egger and Larch (2008) and count the number of FTAs these countries are signatories to in a year that do not include Switzerland.

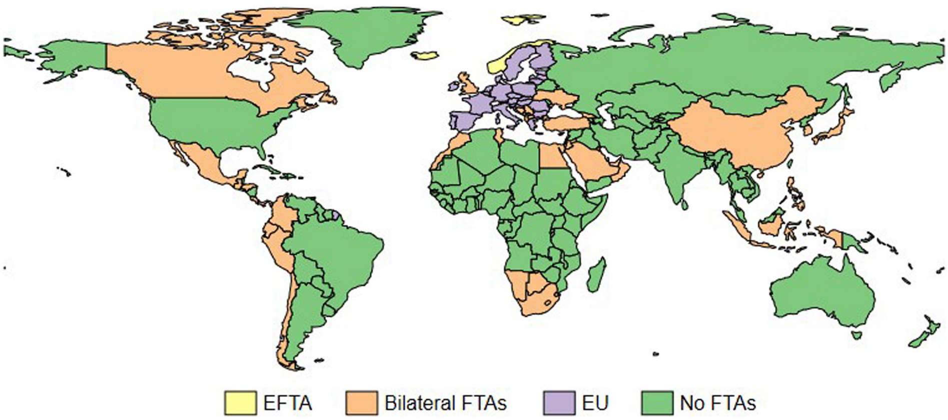

FIGURE 1 | Swiss FTAs in 2022. *Note:* The map shows which countries have a free trade agreement with Switzerland in 2022. The bilateral FTAs include those signed bilaterally with Switzerland and those signed together as part of the EFTA. *Source:* The Swiss FTA Monitor (SECO 2023). [Colour figure can be viewed at wileyonlinelibrary.com]

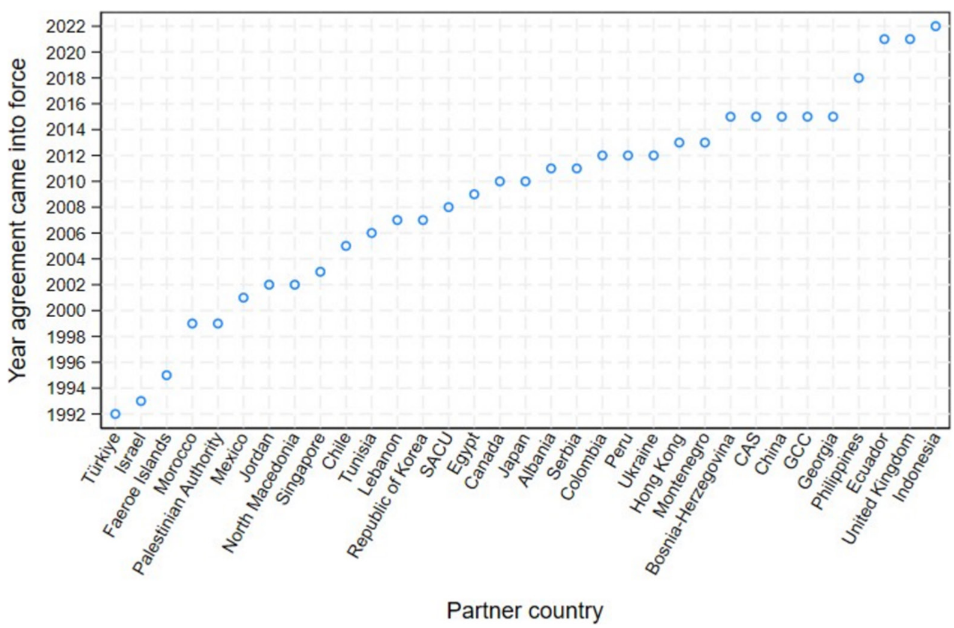

FIGURE 2 | Swiss free trade partners in 2022 and years of entry into force of the agreement. *Note:* For clarity of presentation, we exclude the EFTA Convention which came into force in 1960 and the FTA with the European Community members in 1973. SACU stands for the South African Customs Union and includes South Africa, Botswana, Eswatini, Lesotho and Namibia. CAS represents the Central American States of Costa Rica, Guatemala, Honduras and Panama. GCC represents the Gulf Cooperation Council members: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. *Source:* SECO (2023). [Colour figure can be viewed at wileyonlinelibrary.com]

4.2 | Agricultural Trade Data

Our analysis focuses on the agricultural sector, defined according to the Swiss Federal Office for Agriculture to include HS01–H24 (excluding fish and fish products, HS03), 290543, 290544, 3301, 3501–3505, 380910, 382360, 4101–4103, 4301, 5001–5003, 5101–5103, 5201–5203, 5301 and 5302. We analyse Swiss customs trade data (Swiss-Impex 2023) at the level of the partner country and HS6-digit products over time. It includes data on import quantities in kilograms (kg) and import values in Swiss Francs (CHF). A preliminary glance at the data confirms that most Swiss trade occurs with FTA partners, with this trend increasing over time (Figure 3). Furthermore, as shown in Table A2 in the appendix, the majority of Swiss bilateral trade is with EU members. However, FTAs with non-EU countries also play a significant role in Swiss trade policy. In aggregate, approximately 84% of Swiss trade occurs with FTA partners, while only about 16% of Swiss trade occurs with countries that do not have an FTA with Switzerland.

Figures A2 and A3 in the appendix map the geographic distribution of Swiss trade flows, highlighting diverse trading partners. European Union member states dominate Swiss imports, with Germany, Italy and the Netherlands as key suppliers. Outside Europe, the United States, China and Brazil are notable trade partners, while imports from developing regions such as Africa and South America focus on primary products, with Morocco, Colombia, Côte d'Ivoire and Ghana making significant contributions. Switzerland's exports, meanwhile, are concentrated in European markets, particularly Germany, Austria and the United Kingdom, with the United States and Japan being major non-European partners. Switzerland also exports to emerging markets, such as China, India and Brazil.

The composition of traded products is equally important. Swiss imports are dominated by primary agricultural goods, with high shares in fruits and nuts (HS08) and vegetables (HS07), reflecting dependence on foreign supplies. Cereals (HS10) and oil seeds (HS12) also have significant import shares, with minimal exports. Other sectors, such as beverages, spirits and vinegar (HS22) and dairy produce (HS04), reflect substantial imports. By contrast, Swiss exports are concentrated on high-value, processed agricultural products. Beverages, spirits and vinegar (HS22) lead the export flows, followed by dairy products (HS04) and preparations of cereals (HS19). Niche sectors, such as cocoa and cocoa preparations (HS18) and miscellaneous edible preparations (HS21), highlight Switzerland's competitive advantage in high-quality, value-added production. These patterns reveal Switzerland's strategy of importing raw materials while excelling in processed, high-value exports in niche global markets.

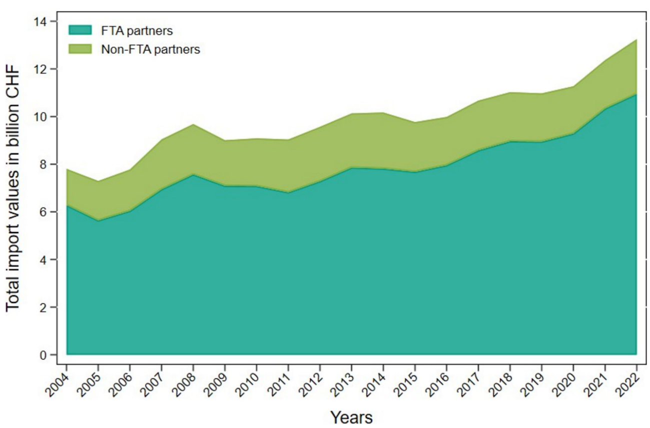

FIGURE 3 | Swiss agricultural imports by FTA status of the partners. [Colour figure can be viewed at wileyonlinelibrary.com]

Recent advancements in the structural gravity literature emphasise the importance of including intranational trade flows, as they allow the identification of international trade costs relative to domestic trade costs (Yotov et al. 2016; Yotov 2022). However, due to data limitations, most empirical applications, including ours, rely solely on international trade data. In our case, we lack domestic trade data at the HS6 digit level for Switzerland. Without a domestic trade benchmark, we cannot fully assess whether increased international trade flows under FTAs replace or complement domestic production. This is a key issue in the agricultural sector, where domestic production often meets a share of demand and may respond differently to FTAs than international trade.

4.3 | Auxiliary Data

Swiss-Impex (2023) also provides access to data on specific tariffs in CHF/kg imposed on imports from partner countries over time. Switzerland stands out in its tariff application as one of the few countries that explicitly express tariffs in specific or per-unit terms. Given that these tariffs are fixed amounts per unit rather than a percentage of value, their impact depends on the price of the product. As such, per-unit tariffs place a heavier burden on lower priced items within a given tariff line. Developing countries, which typically export at lower prices, face higher ad valorem equivalents for the same specific tariff compared with high-income countries. As a result, while specific tariffs may appear nondiscriminatory as MFN measures, they can effectively discriminate against developing countries' exports (Chowdhury 2012; Fiankor et al. 2024). However, the tariffs are only reported when trade flows are observed. Thus, when we introduce zero trade observations, information on tariffs is missing. To deal with this situation, we resort to the MAcMap-HS6 database maintained by the CEPII and the International Trade Center (Guimbard et al. 2012). As the MAcMap dataset is available only for every third year between 2007 and 2019, we interpolate using data from previous years whenever we encounter missing data. While this is limiting, there remain substantial challenges with the quality of publicly reported tariff data, especially when multiple countries are concerned. Teti (2023) highlights that standard sources for tariff data suffer from significant measurement errors due to misreporting and the resulting false imputations, which lead to artificial spikes in bilateral time series data and, consequently, cause massive inaccuracies in the measurements.

We also include data on NTMs, which are policy measures other than tariffs that affect international trade by affecting quantities, prices or both (UNCTAD 2019). As tariffs have been significantly liberalised since the establishment of the WTO, there has been a concurrent rise in standard-like NTMs as tools for market access. Therefore, it is crucial to account for these NTMs in our estimations. Given that the proliferation and increasing relevance of NTMs, including those in Switzerland, are driven by sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) measures (Irek 2022; Fiankor 2023b), we account for NTMs using the aggregate product-level number of SPS and TBT measures imposed by Switzerland on imports from an origin country each year. The data on NTMs are accessed from the WTO's comprehensive data on NTM notifications via the Trade Analysis and Information System (UNCTAD 2019). Data on GDP are accessed from the World Bank World Development Indicators.

Our final estimation sample covers imports from 202 countries (see Table A3), 730 HS6-digit products, over 19 years (i.e., 2004–2022). Summary statistics on all the variables included in the estimation are presented in Table A4 in the appendix.

5 | Results and Discussion

We present and discuss the results of our analysis in this section. We first present the average effects before assessing whether and to what extent they are heterogeneous along the three dimensions, and end by assessing dynamic effects.

5.1 | Baseline Findings

We present the average effect of Swiss FTAs on imports in Table 1, with each column depicting one of the five import margins. In column (1), we find that, on average, the presence of an FTA leads to an 8.5% increase in import values. In terms of magnitude, this coefficient translates into an effect size of 8.75%.[7] In column (2), we find no statistically significant effect of FTAs on import quantities. In column (3), we find a negative effect of FTAs on import prices; specifically, FTAs decrease import prices by 3.4%. At the extensive margin, we find that FTAs increase the probability of trade by two percentage points and decrease the probability of market exit rates by one percentage point.[8] That we do not observe a statistically significant change in import quantities is inconsistent with the theoretical framework in Figure A1. However, the finding that FTAs increase import values and import probabilities and lower import prices and market exit rates confirms our a priori expectations. These findings are also consistent with the existing empirical literature. A recent meta-analysis of the effects of trade agreements on agricultural trade based on 61 empirical studies and 1961 effect sizes (Afesorgbor et al. 2024) find that trade agreements generally have a positive and significant effect on agricultural and food trade. The fact that FTAs do not lead to an increase in import quantities suggests that the negative price effect outweighs the quantity effect. This phenomenon is consistent with the idea that the cost savings from lower tariffs may not be fully passed through to domestic consumers but may be partially captured by foreign suppliers. Additionally, the reduction in trade costs may incentivise the entry of higher quality goods, which are priced higher, increasing import values without a proportional rise in quantities.

On the effects of third-country agreements, we find that an extra agreement signed by a partner country that excludes

TABLE 1 | The effect of Swiss FTAs on different margins of Swiss agricultural imports.

	Intensive margin			Extensive margin	
	Import values	Import quantity	Import prices	Import probability	Import market exit
Outcome variable	(1)	(2)	(3)	(4)	(5)
FTA_{ot}	0.085***	−0.020	−0.032***	0.021***	−0.010***
	(0.029)	(0.037)	(0.010)	(0.002)	(0.003)
$Third\ Country\ FTA_{ot}^{d\neq \text{CHE}}$	0.000	−0.003*	−0.001**	0.001***	−0.001***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
$\log GDP_{ot}$	0.458***	0.319***	0.154***	0.034***	−0.018***
	(0.031)	(0.034)	(0.010)	(0.002)	(0.003)
NTM_{opt}	−0.061***	−0.039***	−0.000	−0.002***	0.002***
	(0.006)	(0.007)	(0.002)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes
Observations	587,108	587,108	206,194	587,108	484,345
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses. The differences in the number of observations across columns are due to differences in estimators. Columns (1), (2), (4) and (5) account for zero trade observations, which are dropped in column (3). The number of observations in column (5) differs because countries exporting to a product destination market every year are excluded from the exit analysis.

Switzerland, decreases import quantities by 0.3%, decreases import prices by 0.1%, increases import probability by 0.1 percentage points and decreases the probability of import market exit by 0.1 percentage points. Thus, as the number of agreements that Swiss trade partners have signed increases, exports destined to Switzerland are reduced. However, in the period under consideration, the effects are too marginal to have any meaningful impact.

The control variables have the expected signs. Bigger countries export more to Switzerland, with a 10% increase in GDP, increasing Swiss imports by 49%. Bigger countries also command higher product prices, which could indicate specialisation patterns in producing higher quality. At the extensive margin, bigger countries are also more likely to export to Switzerland and less likely to exit the Swiss market. NTMs, specifically standards and technical regulations, decrease Swiss imports and increase market exit rates (see also Fiankor 2023b; Irek 2022). Tariffs, by contrast, have no statistically significant effect on the different margins of imports. Given the quality of the tariff data, especially, when trade flows are missing, we interpret this finding with caution.

5.2 | Heterogeneous Effects

Our baseline findings provide a general answer to the question of whether and to what extent Swiss FTAs affect agricultural imports at different margins. While this is insightful, average estimates can obscure relevant heterogeneities and limit the insightfulness of the findings for trade policy experts (Kohl 2014). To offer a more comprehensive answer to our research question, we subject our main findings to a series of heterogeneous analyses. Given the small effects we estimate for $ThirdCountryFTA_{ot}^{d\neq \text{CHE}}$, our discussions here will focus on FTA_{ot}.

5.2.1 | Heterogeneity Across Product Types: Basic and Processed Products

Swiss FTAs distinguish between basic agricultural products and processed agricultural products. Does this distinction moderate the trade effects of FTAs? This question forms the basis of our first heterogeneous analysis. We define processed products to include prepared edible fats, prepared foodstuffs and beverages and basic products to include products in their raw form that have not undergone any processing.[9] We present the results in Table 2. At the intensive margin, FTAs increase the import values (quantities) of raw agricultural products by 13% (15%) but decrease the import values (quantities) of processed agricultural products by 2.2% (26%). The effects on import prices and the extensive margin are not moderated by this product distinction.

While Swiss imports are dominated by raw or minimally processed agricultural commodities, such as fruits, vegetables and cereals, exports are centred around high-value, processed

TABLE 2 | The effect of FTAs on different margins of Swiss agricultural imports across basic and processed product types.

	Import values	Import quantities	Import prices	Import probability	Import market exit
	(1)	(2)	(3)	(4)	(5)
FTA_{ot}	0.127***	0.152***	−0.027*	0.022***	−0.014***
	(0.036)	(0.046)	(0.014)	(0.003)	(0.004)
$FTA_{ot} \times Processed_p$	−0.135**	−0.401***	−0.013	−0.003	0.008
	(0.057)	(0.077)	(0.020)	(0.005)	(0.005)
$Third\ Country\ FTA_{ot}^{d\neq \text{CHE}}$	−0.000	−0.003*	−0.001**	0.001***	−0.001***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
$\log GDP_{ot}$	0.493***	0.381***	0.154***	0.034***	−0.018***
	(0.034)	(0.038)	(0.010)	(0.002)	(0.003)
NTM_{opt}	−0.056***	−0.034***	−0.000	−0.002***	0.002***
	(0.006)	(0.007)	(0.002)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes
Observations	587,108	587,108	206,194	587,108	484,345
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses. The differences in the number of observations across columns are due to differences in estimators. Columns (1), (2), (4) and (5) account for zero trade observations, which are dropped in column (3). The number of observations in column (5) differs because countries exporting to a product destination market every year are excluded from the exit analysis.

goods, such as beverages, dairy and prepared foods. This divergence reflects Switzerland's reliance on imports for basic agricultural inputs due to its limited domestic production capacity, while its exports capitalise on specialisation and value addition in processed food and beverages. These patterns align with Switzerland's economic structure and trade strategy, leveraging its strengths in high-value production while depending on global markets for raw intermediate inputs (Fiankor 2023a; Fiankor et al. 2025). Swiss exports in terms of value are mainly roasted coffee and extracts thereof, nonalcoholic beverages, cheese, chocolate and edible preparations. Thus, FTAs appear to be more relevant for beneficiary countries that export raw agricultural products (e.g., cacao and coffee beans) that become intermediate inputs for Swiss valued-added exports (e.g., chocolate, baked goods and beverages). Nevertheless, tariff escalation may also play a role, with higher preference margins on raw commodities compared with their processed counterparts (e.g., raw cocoa beans and processed cocoa butter). Furthermore, FTAs often include rules of origin that specify the minimum local content required for a product to qualify for preferential tariffs. For processed agricultural products, meeting these rules can be more complex and costly due to multiple inputs from different countries. As a result, some exporters may not take advantage of the FTA, leading to reduced trade flows of processed goods. Finally, FTAs can alter the structure of global value chains. If the agreement makes it more profitable for processing to occur within Switzerland, it can lead to a relative decline in the imports of processed good, but shift trade flows towards raw materials and intermediate inputs.

5.2.2 | HS2 Sector-Specific Effects

Here, we assess the effects of FTAs across different product groups. We estimate a separate model for each HS2 product sector and report the results in Table 3.

When examining the effects of FTAs across different product groups, our analysis reveals substantial heterogeneity. For raw products, such as vegetables, fruits and nuts, coffee, tea and spices, FTAs generally have a positive impact on import values and quantities. This aligns with the expectation that trade liberalisation facilitates easier access to these inputs, supporting Switzerland's downstream processing industries. By contrast, the negative FTA effects observed for processed products on imports suggest that domestic producers might face reduced competition from foreign processed goods, possibly due to Switzerland's robust value-added production capabilities. Regarding import prices, the effects are negative and consistent with theoretical expectations whenever they are statistically significant. At the extensive margin, we observe varied effects across sectors, but for a few key products such as vegetables, fruits and nuts and tobacco, FTAs result in increased imports, reduced prices and lower market exit rates—effects consistent with trade theory. The sector-specific differences underscore the complexity of FTA impacts, highlighting that the benefits are not uniformly distributed across all product groups. The sector-specific heterogeneities we find are consistent with the existing meta-analysis on the topic in agricultural economics (see, e.g., Afesorgbor et al. 2024).

5.2.3 | FTA-Specific Effects

So far, we have assessed the average effects of the FTAs without distinguishing between individual agreements. For policy analysis, an obvious weakness of this approach is that the effects of a given agreement may be substantially different from the average (Baier et al. 2019). Following Kohl (2014), we adopt a specification in which the FTA effects are allowed to vary at the level of the underlying agreement.[10] Specifically, we estimate the following equation:

$$X_{opt} = \beta_0 + \beta_1 FTA_{ot} + \beta_1^k FTA_{ot} + \beta_2 \text{Third Country FTA}_{ot}^{d \neq \text{CHE}} + \beta_3 \log GDP_{ot} + \beta_4 NTM_{opt} + \beta_5 \log\left(1 + Tariff_{opt}\right) + \lambda_{pt} + \Pi_{op} + \epsilon_{opt} \quad (4)$$

where the variables remain as defined in Equation (3), but k denotes the individual FTAs. We estimate unique effects for a total of 36 individual agreements between Switzerland and its partners (Table 4). We calculate the distinct average treatment for agreement k as $\beta_1 FTA_{ot} + \beta_1^k FTA_{ot}$. For brevity, we only show the total effects in Table 4 and relegate the full table of results to the appendix (Table A7). Overall, most of our FTA estimates have the expected signs and many of them are statistically significant. However, we also obtain cases in which the effects go contrary to our a priori expectations. Specifically, 16 FTAs have positive effects on import values, 16 have no effect on import values and four reduce trade values. In total, 13 FTAs increase import quantities, 14 have no effect, nine reduce import quantities, 10 reduce import prices and five FTAs increase import prices. The pattern of inconsistency also characterises the extensive margins. This nuance is consistent with the empirical literature (Larch and Yotov 2024; Afesorgbor et al. 2024) and reflect the fact that some countries or agreements may need to be reassessed to better achieve their intended goals.

Other factors may explain why specific agreements fail to achieve their intended effects. Although the existence of an agreement addresses trade barriers, it does not account for the quality of domestic institutions or trade-related infrastructure in the exporting country, which are critical for realising the agreements' goals. These factors are often country-specific. Although our model specifications control for time-invariant country-specific factors, they do not account for time-varying ones. Consequently, in cases in which the estimated effects deviate from theoretical predictions, the influence of origin-specific time-varying factors cannot be ruled out.

5.3 | Dynamic Effects of Swiss FTAs

FTAs are dynamic in nature, and the duration of the trade responses they induce may take several years (Larch and Yotov 2024; Egger et al. 2022). First, there could be anticipation effects if firms start adjusting their production and import decisions in anticipation of the new trade conditions that come with a soon-to-be implemented FTA. Some trade costs between the partners may also start falling once the intention to sign an agreement is announced. Second, there could be phasing-in effects if the FTAs reduce trade costs stepwise. For instance, smaller tariff cuts could be granted in earlier years and bigger cuts in later years, or tariffs in earlier years and NTMs in later years. Due to these two factors, the trade effects of FTAs may

TABLE 3 | The effect of FTAs on agricultural imports by HS2 product sectors.

	Import values	Import quantity	Import prices	Import probability	Market exit
	FTA_{ot}	FTA_{ot}	FTA_{ot}	FTA_{ot}	FTA_{ot}
Variable of interest	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
HS01: Animals, live	−0.319	0.58	0.226	0.062**	−0.062**
HS02: Meat	−0.647***	−0.382*	−0.132*	−0.108***	0.108***
HS04: Dairy produce	−0.448**	−0.480**	0.032	−0.028**	0.028**
HS05: Animal products, nes	0.204	−0.024	0.195	0.025	−0.025
HS06: Trees and other plants	−0.471***	−0.427***	−0.067	0.008	−0.008
HS07: Vegetables	0.647***	0.304***	−0.009	0.028***	−0.028***
HS08: Fruits and nuts	0.404***	0.386***	−0.068***	0.054***	−0.054***
HS09: Coffee, tea, mate, spices	0.103**	0.102	−0.011	−0.001	0.001
HS10: Cereals	−0.696**	−0.975**	−0.08	−0.054***	0.054***
HS11: Products of milling industry	0.560**	0.539	−0.090*	0.033***	−0.033***
HS12: Oil seeds	0.017	−0.408**	0.049	0.007	−0.007
HS13: Lac; natural gums, resins	−0.333	0.128	−0.119	0.014	−0.014
HS14: Vegetable plaiting materials	−2.173***	−2.316***	0.098	−0.055**	0.055**
HS15: Animal, vegetable fats & oils	−0.068	−0.393**	−0.176***	0.029***	−0.029***
HS16: Preparations: meat, fish	0.685**	0.660**	−0.105	0.015	−0.015
HS17: Sugars & sugar confectionery	−0.719***	−0.838***	−0.04	−0.005	0.005
HS18: Cocoa & cocoa preparations	0.094	0.093	−0.063	0.035**	−0.035**
HS19: Preparations: cereals	−0.023	−0.096	−0.046	0.010	−0.010
HS20: Preparations: vegetables, fruits	−0.315***	−0.448***	0.034	0.009	−0.009
HS21: Misc. edible preparations	0.176	0.668***	−0.105***	0.025**	−0.025**
HS22: Beverages, spirits, vinegar	0.035	0.052	0.036	0.037***	−0.037***
HS23: Residues of food industry	0.115	−0.553***	0.119	0.007	−0.007
HS24: Tobacco	0.523***	0.516***	−0.016	0.073***	−0.073***
HS29: Organic chemicals	−0.662	0.974	−0.131	0.070	−0.07
HS33: Essential oils and resinoids	−0.217**	−0.212**	−0.303***	0.023	−0.023
HS35: Albuminoidal substances	−1.138***	−0.968***	−0.19	−0.047**	0.047**
HS38: Misc. chemical products	0.769*	0.957*	0.273	0.059	−0.059
HS41: Raw hides and skins	−1.747**	−0.817	0.087	0.119***	−0.119***
HS43: Fur skins and artificial fur	−1.292**	1.263	−0.714	−0.098*	0.098*
HS50: Silk	−0.342	−0.524	−0.099	−0.041	0.041
HS51: Wool	0.076	−0.474	0.300	0.054***	−0.054***
HS52: Cotton	−1.322***	−1.077***	−0.303	0.118***	−0.118***
HS53: Other vegetable textile fibres	1.145	−1.036	−1.286	0.050	−0.050

Note: ***, ** and * denote significance at 1%, 5% and 10% respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses. All models include controls for third-country FTAs, GDP of the exporting country, NTMs, tariffs and product–time and product–origin fixed effects. The HS2 sectors defined here do not cover all products in some cases. HS29 covers 290543 and 290544, while HS33 includes only 3301. HS35 includes 3501–3505, HS38 includes 380910 and 382360, HS41 includes 4101–4103, 4301, HS50 includes 5001–5003, HS51 includes 5101–5103, HS52 includes 5201–5203 and HS53 includes 5301 and 5302.

TABLE 4 | Estimates for specific FTAs between Switzerland and its trade partners.

	Import values	Import quantity	Import prices	Import probability	Market exit
	(1)	(2)	(3)	(4)	(5)
FTA_{ot} × Albania	0.705***	1.416***	0.163	0.014	−0.007
FTA_{ot} × Bulgaria	0.047	−0.026	0.327***	0.015	0.020
FTA_{ot} × Bahrain	1.556**	1.722***	−0.374	−0.050	0.077***
FTA_{ot} × Bosnia	1.496***	1.481***	−0.013	−0.041***	0.052***
FTA_{ot} × Botswana	2.269*	1.354	−0.684	−0.050	0.091*
FTA_{ot} × Canada	−0.066	−0.385***	−0.062	−0.004	0.012
FTA_{ot} × Chile	−0.199	−0.231	−0.067	0.036***	0.091***
FTA_{ot} × China	−0.044	−0.426***	−0.006	0.121***	−0.176***
FTA_{ot} × Colombia	0.196***	−0.333***	0.003	0.036***	−0.034***
FTA_{ot} × Costa Rica	0.226**	0.352***	−0.208***	−0.057***	0.071***
FTA_{ot} × Ecuador	0.269*	0.093	−0.011	−0.014	0.030*
FTA_{ot} × Egypt	−0.202	−0.660***	−0.081	0.007	−0.009
FTA_{ot} × Georgia	0.783**	0.775***	0.203***	0.064***	−0.037**
FTA_{ot} × Guatemala	−0.202	−0.660**	−0.081	0.007	−0.009
FTA_{ot} × Hong Kong	0.119	0.332	−0.200***	0.027***	−0.012
FTA_{ot} × Honduras	−0.103	0.229**	0.075	−0.014	0.028
FTA_{ot} × Croatia	0.266***	0.111	0.155**	−0.019*	0.069***
FTA_{ot} × Indonesia	−0.153	−0.122	0.092	0.071***	−0.073***
FTA_{ot} × Japan	0.394***	0.283**	−0.095***	−0.040***	0.039***
FTA_{ot} × Korea	0.799*	1.057**	−0.159**	0.062***	−0.039**
FTA_{ot} × Kuwait	1.205	2.530***	−0.539**	−0.029	0.068
FTA_{ot} × Lebanon	0.076	0.246	0.208***	0.031**	−0.033**
FTA_{ot} × Lesotho	5.625***	9.110***	−0.061*	−0.057	0.108*
FTA_{ot} × Montenegro	1.932***	0.620**	−0.183	0.107***	−0.074***
FTA_{ot} × Namibia	−0.704	0.485	0.086	−0.050*	0.096***
FTA_{ot} × Oman	−2.105***	−3.128***	−0.683***	−0.058***	0.090***
FTA_{ot} × Panama	0.744***	0.257	−0.125	−0.020	0.028
FTA_{ot} × Peru	0.620***	0.739***	−0.061	0.126***	−0.130***
FTA_{ot} × Philippines	−0.387***	−0.894***	0.070**	−0.022**	0.021*
FTA_{ot} × Qatar	0.743	0.397	0.227	−0.088***	0.110***
FTA_{ot} × Romania	−0.881**	−0.876*	0.040	0.032***	0.004
FTA_{ot} × Saudi Arabia	0.868***	0.067	−0.355***	−0.0241**	0.046***
FTA_{ot} × Serbia	1.054***	1.047***	−0.009	0.087***	−0.031***
FTA_{ot} × Swaziland	2.120***	1.840***	−0.060	0.002	0.034

(Continues)

TABLE 4 | (Continued)

	Import values	Import quantity	Import prices	Import probability	Market exit
	(1)	(2)	(3)	(4)	(5)
$FTA_{ot} \times$ Tunisia	0.580***	0.977***	−0.208***	0.019	0.010
$FTA_{ot} \times$ U.A.E.	−0.774**	−0.396**	−0.210***	0.019**	0.003
$FTA_{ot} \times$ Ukraine	−0.549	−0.000	0.078	0.077***	−0.045***
Observations	587,108	587,108	206,194	587,108	484,345
Controls	Yes	Yes	Yes	Yes	Yes
Product–time FE	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes

Note: ***, ** and * denote statistical significance at the 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses. All models include controls for third-country FTAs, GDP of the exporting country, NTMs, tariffs and product–time and product–origin fixed effects.

TABLE 5 | The effect of FTAs on Swiss agricultural import values across different lags and leads of the FTA variable.

	Import values	Import values	Import values	Import values	Import values	Import values
	(1)	(2)	(3)	(4)	(5)	(6)
FTA_{ot-1}	0.044	0.009	0.004	0.001	−0.031	−0.004
	(0.047)	(0.063)	(0.065)	(0.065)	(0.062)	(0.059)
FTA_{ot-2}		0.045	0.028	0.014	0.027	0.019
		(0.047)	(0.061)	(0.062)	(0.058)	(0.057)
FTA_{ot-3}			0.023	−0.022	−0.023	−0.025
			(0.044)	(0.059)	(0.059)	(0.060)
FTA_{ot-4}				0.065	0.065	0.066
				(0.045)	(0.046)	(0.047)
FTA_{ot}	0.046	0.043	0.055	0.075	0.054	0.038
	(0.049)	(0.050)	(0.051)	(0.052)	(0.061)	(0.059)
FTA_{ot+1}					0.048	−0.038
					(0.042)	(0.055)
FTA_{ot+2}						0.102**
						(0.050)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Product–time FE	Yes	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes	Yes
Total FTA effect	0.090***	0.096***	0.109***	0.133***	0.140***	0.158***
	(0.029)	(0.030)	(0.032)	(0.035)	(0.040)	(0.045)
Observations	554,580	521,889	489,729	456,973	412,483	365,633

Note: ***, ** and * denote statistical significance at the 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses. All models include controls for third-country FTAs, GDP of the exporting country, NTMs, tariffs and product–time and product–origin fixed effects.

occur with some dynamics. To capture the dynamic adjustments of Swiss FTAs, we use 2-year leads (to capture phase-in effects) and 4-year lags (to capture anticipation effects) of the FTA variable. Using a much longer lag and lead terms would limit our ability to identify effects for much more recent agreements. The results are presented in Table 5.

At the lower panel of Table 5, we report the average *total* effect of FTAs on trade after accounting for anticipation and/or phasing-in effects as the sum of the contemporaneous effect and the lag and/or the lead term. The results suggest that the overall treatment effect of FTAs remains positive with a coefficient estimate ranging from 0.09 to 0.158 depending on the length of the phase-in or anticipation effects we allow. However, regarding specific anticipation effects and phase-in effects, we find no evidence of the former, as all the lagged terms are statistically insignificant. Nevertheless, we find that the effects may phase in up to 2 years after implementation. The statistically insignificant and small effects observed are not surprising. It is worth noting that while staggered liberalisation of preferences under an FTA is theoretically possible, it is rarely observed in FTAs ratified by Switzerland. Typically, in the case of Switzerland, market access conditions are implemented without transition phases, with only a few exceptions.

6 | Extension—The Effect of Swiss FTAs on Exports

Thus far, our analysis has focused on Swiss imports, a strategic choice, given that agricultural exports make up only a small share of Switzerland's total trade. However, liberalising trade within FTAs means that Swiss exports also enjoy trade preferences abroad. As such, we extend our analysis to the effect of FTAs on Swiss agricultural exports. We obtain data on Swiss export values and quantities from Swiss-Impex (2023) covering 201 countries and 712 HS6-digit products from 2004 to 2022. Figure 4 indicates that export values are higher for countries with which Switzerland has an FTA.

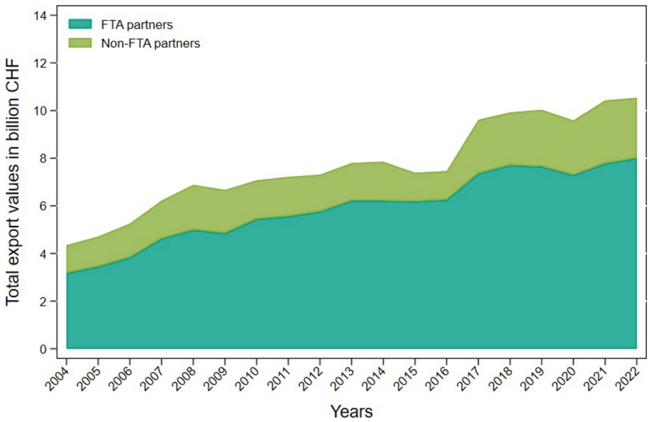

FIGURE 4 | Structure of Swiss exports. [Colour figure can be viewed at wileyonlinelibrary.com]

We then estimate a version of Equation (3), replacing the outcome variables with export margins. The results are presented in Table 6 and show that FTAs have a positive and statistically significant effect on export values. Specifically, an FTA between Switzerland and a partner country increases exports by 47%, all else equal. This effect is smaller than the 93% increase estimated by Kohler (2015). Unlike imports, we also find that FTAs significantly increase export quantities by 53%. Interestingly, contrary to theoretical predictions that trade cost reductions lower prices, FTAs are associated with higher Swiss export prices. This likely reflects the premium placed on Swiss exports, which are considered high quality. Supporting this, Table A4 shows that while the average price for imports is 36 CHF/kg, Swiss exports command a significantly higher average price of 100 CHF/kg. We can, therefore, conclude that Switzerland exports higher-quality products that sell for higher prices, especially to countries they have a trade agreement with. Alternatively, these price variations across destinations could reflect exporters arbitrarily varying their markups. The literature on quality sorting highlights product quality as a key driver of international trade (Martin 2012; Manova and Zhang 2012; Harrigan et al. 2015; Fiankor 2023a). This literature documents that firms often charge varying prices (net of cost, insurance and freight charges) for the same goods exported to different markets. Swiss exporters exhibit

TABLE 6 | The effect of FTAs on different margins of Swiss agricultural exports.

	Export values	Export quantity	Export prices	Export probability	Export market exit
	(1)	(2)	(3)	(4)	(5)
FTA_{ot}	0.236***	0.358***	0.029**	0.000	−0.001
	(0.058)	(0.052)	(0.012)	(0.003)	(0.003)
$Third\ Country\ FTA_{ot}^{d\neq CHE}$	−0.010***	−0.008***	−0.002***	0.001***	−0.000***
	(0.002)	(0.003)	(0.001)	(0.000)	(0.000)
$\log GDP_{ot}$	0.695***	0.208**	0.024	0.043***	−0.045***
	(0.062)	(0.097)	(0.015)	(0.003)	(0.004)
NTM_{opt}	0.002	−0.005	0.001*	0.002***	−0.002***
	(0.002)	(0.003)	(0.001)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000	−0.000	−0.000	0.000***	−0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Destination–product FE	Yes	Yes	Yes	Yes	Yes
Observations	362,303	362,303	115,616	362,303	306,582
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses.

similar patterns. For example, Fiankor (2023a) shows that a Swiss firm exported the same HS8-digit product, 'hard cheese' (HS 0406 9099), to 18 countries, with free-on-board (FOB) prices ranging from 10.70 CHF/kg in Peru to 16.00 CHF/kg in South Korea. While such price differences may arise from exporters arbitrarily adjusting markups, they may also reflect quality variations, such as more durable packaging for higher-cost markets. Unlike raw agricultural products, where quality differentiation is limited, Swiss agri-food exports are largely processed products where quality sorting is common. This suggests that Swiss exporters may tailor product quality across destinations. At the extensive margin, we find no statistically significant effect of FTAs. As to whether the effects we find are heterogeneous across basic and processed products, we show in Table A5 that this is not the case for exports.

In relation to the effects we estimate for imports, the export-side effects are larger in economic magnitude. What explains the asymmetry in the size of the trade effects for exports and imports? Although our estimates cannot provide direct answers, we can offer plausible reasons based on the policy environment. First, it is important to note that these average effects are conditional on the value of existing imports and exports between trade partners at the inception of the agreement. Second, the concessions granted by Switzerland's trade partners are often more substantial, as these partners typically have fewer defensive positions in agriculture. In contrast, Swiss agricultural policy is highly protectionist, with significant tariffs and NTMs limiting the scope of liberalisation on imports. As a result, the relative gains from FTAs on imports may be smaller, given Switzerland's constrained concessions. Third, the nature of the traded products themselves plays a key role. Swiss agricultural exports, such as cheese and other high-value processed goods such as coffee and chocolate, are often niche products with strong international demand. FTAs enhance market access, leading to disproportionately large gains in export value and quantity. By contrast, strong protections for sensitive domestic products limit the potential for significant import increases. Lastly, NTMs further contribute to this asymmetry. Whereas FTAs reduce tariffs, NTMs—such as TRQs, quality standards and certification requirements—remain particularly restrictive for agricultural imports into Switzerland (Fiankor et al. 2025; Fiankor and Shingal 2025). These constraints can dampen import growth despite tariff reductions. Conversely, Swiss exports may adapt more readily to the partner country's standards, resulting in greater export increases.

7 | Conclusions

The WTO has been making little progress in multilateral trade liberalisation for years. As a result, since the Doha round, we have observed a rise in the number of bilateral FTAs. Switzerland has kept pace with this trend, signing numerous FTAs. In 2024, Switzerland had in place a network of 33 FTAs with 43 partners. Among the primary goals of these agreements is to facilitate trade among member countries, allowing consumers to benefit from lower prices and increased product variety. The aim of this paper is to assess whether these objectives are achieved in practice. Specifically, we assess the effect of Swiss FTAs on different margins of agricultural imports over the period between 2004 and 2022. Furthermore, because partner countries often sign additional FTAs with other countries, we also assess how the network of FTAs Swiss partners are involved in influences their exports to Switzerland. Empirically, we situate our analysis within a gravity framework and estimate a reduced-form gravity model.

Our findings show that Swiss FTAs increase imports, decrease import prices and reduce market exit rates. These findings are, however, heterogeneous along different dimensions. Swiss FTAs increase the import values and quantities of raw products but decrease the imports of processed products. We find further heterogeneous effects across HS2-digit product sectors and for individual agreements. Thus, while the average effects of Swiss FTAs on imports and product prices are in line with our theoretical priors and the available empirical evidence, the heterogeneities we find also highlight the importance of examining different sectors and agreements and support our empirical choice of going beyond just the average effects. Nevertheless, these heterogeneities also suggest that in some cases, the findings are inconsistent with theoretical priors. For instance, in some cases, we find that FTAs decrease imports.

Our empirical findings are not without limitations. The existence of the agreement only solves the trade barrier issue but does not reflect the quality of domestic institutions and trade-related infrastructure or local shocks (e.g., climate change and extreme weather events, political instability and economic crisis) in the product–origin country. As long as these factors remain country- and time-specific, they cannot be captured by our model specifications. In this case, our FTA effects may be biased, as the FTA variable picks up other confounding factors that drive trade.

Recent reviews of the regional trade agreement literature, such as those by Larch and Yotov (2024) and the meta-analysis by Afesorgbor et al. (2024), show that although trade agreements generally enhance trade, in cases of individual agreements or products, the empirical findings do not always align with the theoretical predictions. As such, even if Swiss FTAs generally achieve the intended trade effects for which they were signed, policymakers should keep these associated heterogeneities in mind when using average FTA estimates for counterfactual analysis and/or trade negotiations.

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Data Availability Statement

The data that support the findings of this study are openly available from publicly available data sources that are all mentioned in the manuscript.

Endnotes

[1] The terms *big country* and *small country* here is used without prejudice to the economic size of the countries. The small country case references a situation where a country's imports constitute a very small share of the world market and, therefore, do not influence world market prices. In this context, an existing study that also examines the agricultural sector in small economies is Copenhagen Economics (2016). However, our study differs in focus: while Copenhagen Economics (2016) analyses trade relationships between the EU common market (a large economy) and its partners, we examine trade relationships between a small country and its trade partners.

[2] There are also trade programs such as the Generalised System of Preferences (GSP) designed to promote economic growth in developing countries by giving them preferential access to the markets of developed countries. Under the GSP, selected goods from eligible developing countries can enter the importing country at reduced or zero tariff rates. The GSP grants developing countries non-reciprocal, preferential market access to developed countries through reduced or zero tariffs, unlike FTAs, which are reciprocal arrangements with mutual obligations. Our focus here is on reciprocal arrangements.

[3] Much of the literature assessing the effects of trade agreements focuses on multiple countries (e.g., Baier and Bergstrand 2007; Baier et al. 2019; Sun and Reed 2010; Jean and Bureau 2016). However, a smaller subset of studies examines the impacts of trade agreements on specific countries, including Japan (Yamanouchi 2019; Ando et al. 2022), Canada (McDougall 2020), India (Jagdambe and Kannan 2020), and the United States (Ajewole et al. 2022). Our work contributes to this second stream of literature by providing a focused analysis on Switzerland.

[4] Two main assumptions underlie the model. First, goods are differentiated by country of origin (i.e., the Armington assumption) such that two goods of the same kind coming from different countries are imperfect substitutes, for example, German, and Italian cheese are distinct goods in the composite group cheese. Thus, the reason Swiss consumers purchase foreign goods is that they are different from the ones produced at home. Other motivations may exist for purchasing foreign goods, for example, in a Ricardian world, foreign goods will be purchased because they are produced more efficiently abroad than at home. Second, consumer preferences are identical and homothetic across countries and captured by a constant elasticity of substitution (CES) utility function. Given that the formal derivation of the gravity equation is now standard in the literature (see, e.g., Anderson and Van Wincoop 2003; Yotov et al. 2016), we do not reproduce the derivation.

[5] This choice is motivated by challenges in obtaining detailed data on product-level preferential margins across multiple countries. Nevertheless, using an FTA dummy enables us to consider the broader context of FTAs, which often involve not only tariff preferences but also quota arrangements and reductions in other non-tariff and quota barriers. This approach is standard in the trade literature (Baier and Bergstrand 2007; Baier et al. 2019; Egger and Larch 2008; Egger et al. 2022) and offers a practical way to estimate trade effects without requiring detailed data on product-specific tariff reductions or concessions, which are often difficult to compile across multiple agreements. The limitation, however, is that our model abstracts from the complexity of individual concessions within FTAs, and our effects reflect the cumulative impact of these individual concessions.

[6] Addressing this concern using instrumental variable techniques is challenging because very often what determines the probability to sign a trade agreement also affects the volume of trade flows. The interested reader should refer to Larch and Yotov (2024) for a discussion of these issues.

[7] The trade effect of an FTA can be calculated as $[\exp(\beta_1) - 1] \times 100$.

[8] We also estimate the effect of FTAs on the extensive margins using logit and probit models. The results presented in Table A5 of the Appendix are in line with our main findings in terms of direction, magnitude, and statistical significance. Thus, the choice of estimator does not influence our results.

[9] Basic products are defined to include products of HS sections 01–14, excluding Section 4.3, headings 0402–0406 and 0408, and subheading 0801.32, plus headings 1801, 1802, 2401, 5001, 5101 to 5103, 5201, 5202, 5301 and 5302. Everything else is considered a processed product. This definition was provided by the Swiss Federal Office of Agriculture (FOAG) based on the official definitions adopted by the Swiss Secretariat for Economic Affairs (SECO).

[10] For cases in which the agreements are signed within a bloc such as SACU or the EU, we assess the effects at the country-level. For instance, for the effect of the EU-Switzerland association agreement, we estimate different effects for Croatia and Romania that joined the EU over the study period. Note that we are unable to estimate unique effects for the founding members of the EU as there is no variation in the FTA dummy for them over the study period. For members of the Gulf Cooperation Council, we also estimate country-specific effects for Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. Thus, in essence, the variation we exploit here is more at the country level that at the agreement level.

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Appendix A

A.1 | Tables

TABLE A1 | HS2 product sectors and their import and export shares.

HS2 product sector	Import share (%)	Export share (%)
HS01: Animals, live	0.01	0.11
HS02: Meat	3.52	0.90
HS04: Dairy produce	3.91	6.43
HS05: Animal products, nes	0.76	3.89
HS06: Trees and other plants	3.78	0.08
HS07: Vegetables	8.66	0.22
HS08: Fruits and nuts	10.68	0.23
HS09: Coffee, tea, mate, spices	3.60	2.45
HS10: Cereals	5.99	0.13
HS11: Products of milling industry	2.95	0.32
HS12: Oil seeds	5.10	0.21
HS13: Lac; natural gums, resins	0.27	0.17
HS14: Vegetable plaiting materials	0.19	0.11
HS15: Animal, vegetable fats & oils	5.40	0.82
HS16: Preparations: meat, fish	0.52	0.04
HS17: Sugars & sugar confectionery	4.16	1.20
HS18: Cocoa & cocoa preparations	2.15	4.99
HS19: Preparations: cereals	1.05	6.69
HS20: Preparations: vegetables, fruits	6.99	4.28
HS21: Misc. edible preparations	3.40	6.39
HS22: Beverages, spirits, vinegar	13.80	51.88
HS23: Residues of food industry	8.61	4.59
HS24: Tobacco	1.11	1.49
HS29: Organic chemicals	0.34	0.01
HS33: Essential oils and resinoids	0.34	0.90
HS35: Albuminoidal substances	1.54	0.69
HS38: Misc. chemical products	0.77	0.03

(Continues)

TABLE A1 | (Continued)

HS2 product sector	Import share (%)	Export share (%)
HS41: Raw hides and skins	0.00	0.68
HS43: Fur skins and artificial fur	0.00	0.00
HS50: Silk	0.00	0.00
HS51: Wool	0.03	0.03
HS52: Cotton	0.35	0.06
HS53: Other vegetable textile fibres	0.03	0.00

TABLE A2 | Swiss agricultural trade relationships with FTA and non-FTA partners in 2022.

Partner	Imports	Exports	Trade	Share of trade (%)
EFTA	137	85	222	0.78
EU	13,102	5409	18,511	65.33
FTA	2194	2737	4931	17.40
No FTA	2146	2526	4672	16.49
Total	17,579	10,757	28,336	100.00

Note: Trade is the sum of imports and exports. Imports, exports and trade values are in million CHF. Data used for the calculations come from Swiss-Impex. The 'No FTA' group is derived as the residual difference between the total reported trade flows and the trade values that fall within the three FTA groups. Furthermore, given that unilateral trade preferences are not FTAs, it is possible that the 'No FTA' group includes imports from developing and least developed countries that enjoy nonreciprocal preferential exports to Switzerland under the GSP scheme.

TABLE A3 | List of countries included in the study.

Aruba, Afghanistan, Angola, Albania, Andorra, Argentina, Armenia, American Samoa, Antigua and Barbuda, Australia, Austria, Azerbaijan, Burundi, Belgium, Benin, Burkina Faso, Bangladesh, Bulgaria, Bahrain, Bahamas, Bosnia and Herzegovina, Belarus, Belize, Bermuda, Bolivia, Brazil, Barbados, Brunei, Bhutan, Botswana, Central African Republic, Canada, Chile, China, Cote d'Ivoire, Cameroon, Democratic Republic of the Congo, The Republic of the Congo, Colombia, Comoros, Cape Verde, Costa Rica, Cuba, Curacao, Cayman Islands, Cyprus, Czech Republic, Germany, Djibouti, Dominica, Denmark, Dominican Republic, Ecuador, Egypt, Eritrea, Spain, Estonia, Ethiopia, Finland, France, Faroe Islands, Micronesia, Gabon, Georgia, Ghana, Gambia, Equatorial Guinea, Greece, Grenada, Greenland, Guatemala, Guyana, Hong Kong, Honduras, Croatia, Haiti, Hungary, Indonesia, India, Ireland, Iran, Iraq, Iceland, Israel, Italy, Jamaica, Jordan, Japan, Kazakhstan, Kenya, Kyrgyzstan, Cambodia, Saint Kitts and Nevis, South Korea, Kuwait, Laos, Lebanon, Liberia, Libya, American Samoa, Sri Lanka, Lesotho, Lithuania, Luxembourg, Latvia, Macao, Morocco, Moldova, Madagascar, Maldives, Mexico, Marshall Islands, North Macedonia, Mali, Malta, Myanmar, Montenegro, Mongolia, Northern Mariana Islands, Mozambique, Mauritania, Mauritius, Malawi, Malaysia, Namibia, New Caledonia, Niger, Nigeria, Nicaragua, Netherlands, Norway, Nepal, Nauru, New Zealand, Oman, Pakistan, Panama, Peru, Philippines, Papua New Guinea, Poland, Portugal, Paraguay, Palestine, French Polynesia, Qatar, Romania, Russian Federation, Rwanda, Saudi Arabia, Sudan, Senegal, Singapore, Solomon Islands, Sierra Leone, Slovenia, San Marino, Somalia, Serbia, South Sudan, Sao Tome and Principe, Suriname, Slovakia, Slovenia, Sweden, Swaziland, Seychelles, Syria, Turks and Caicos Islands, Chad, Togo, Thailand, Tajikistan, Turkmenistan, Timor-Leste, Tonga, Trinidad and Tobago, Tunisia, Türkiye, Tuvalu, Tanzania, Uganda, Ukraine, Uruguay, United Kingdom, United States, United Araba Emirates, Uzbekistan, St. Vincent and the Grenadines, Venezuela, US Virgin Islands, Viet Nam, Vanuatu, Yemen, South Africa, Zambia, Zimbabwe.

TABLE A4 | Summary statistics of variables included in the estimation.

Variable	Mean	SD	Min	Max	N	Unit
Import value$_{opt}$	2,805,434	3,371,736	0	360,572,139	669,864	CHF
Export value$_{dpt}$	298,200	5,135,876	0	831,598,983	490,637	CHF
Import quantity$_{opt}$	76,122	619,352	0	30,022,336	669,864	Kg
Export quantity$_{dpt}$	91,542	6,132,433	0	1,578,214,294	490,637	Kg
Import price$_{opt}$	37	685	0	207,386	235,830	CHF/kg
Export price$_{dpt}$	100	1566	0	419,885	136,268	CHF/kg
GDP_{ot}	1,095,511	2,808,794	223	25,439,700	656,877	Million USD
NTM_{opt}	12	12	0	52	669,864	
$Tariff_{opt}$	523	1821	0	22,430	669,864	CHF/kg
FTA_{ot}	0.532	0.499	0	1	669,864	
Third Country FTA$_{ot}$	22.848	20.267	0	66	666,881	

TABLE A5 | The effect of FTAs on the extensive margins of Swiss agricultural exports: alternative estimators.

	Import probability		Import market exit	
Outcome variable	**(1)**	**(2)**	**(3)**	**(4)**
FTA_{ot}	0.086***	0.160***	−0.048***	−0.093***
	(0.006)	(0.011)	(0.006)	(0.011)
$Third\ Country\ FTA_{ot}$	0.005***	0.009***	−0.006***	−0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
$\log GDP_{ot}$	0.154***	0.278***	−0.080***	−0.147***
	(0.001)	(0.003)	(0.001)	(0.003)
NTM_{opt}	−0.006***	−0.011***	0.007***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes
Observations	587,108	587,108	484,345	484,345
Estimator	Probit	Logit	Probit	Logit

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses.

TABLE A6 | The effect of FTAs on different margins of Swiss agricultural exports across basic and processed product types.

	Intensive margin			Extensive margin	
	Import values	**Import volume**	**Import prices**	**Import probability**	**Import market exit**
Outcome variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
FTA_{ot}	0.083	0.246	0.047	0.006	−0.005
	(0.143)	(0.158)	(0.033)	(0.006)	(0.006)
$FTA_{ot} \times Processed_p$	0.166	0.118	−0.023	−0.007	0.006
	(0.153)	(0.165)	(0.035)	(0.007)	(0.007)
$Third\ Country\ FTA_{ot}^{d \neq \mathrm{CHE}}$	−0.010***	−0.008***	−0.002***	0.001***	−0.000***
	(0.002)	(0.003)	(0.001)	(0.000)	(0.000)
$\log GDP_{ot}$	0.695***	0.208**	0.024	0.043***	−0.045***
	(0.062)	(0.097)	(0.015)	(0.003)	(0.004)
NTM_{opt}	0.002	−0.005	0.001*	0.002***	−0.002***
	(0.002)	(0.003)	(0.001)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000	−0.000	−0.000	0.000***	−0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes
Observations	362,303	362,303	115,616	362,303	306,582
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses.

TABLE A7 | Estimates for specific agreements (complete table of results).

	Import values	Import volume	Import prices	Import probability	Import market exit
	(1)	(2)	(3)	(4)	(5)
FTA_{ot}	−0.410***	−0.065	−0.062*	−0.073***	0.091***
	(0.088)	(0.104)	(0.035)	(0.011)	(0.015)
$FTA_{ot} \times$ Albania	1.090***	1.464***	0.224*	0.088***	−0.097***
	(0.000)	(0.337)	(0.041)	(0.000)	(0.000)
$FTA_{ot} \times$ U.A.E.	−0.365	−0.331	−0.148*	0.092***	−0.088***
	(0.315)	(0.227)	(0.085)	(0.016)	(0.019)
$FTA_{ot} \times$ Bulgaria	0.457**	0.091	0.389***	0.088***	−0.071***
	(0.190)	(0.333)	(0.091)	(0.016)	(0.020)
$FTA_{ot} \times$ Bahrain	1.965***	1.787***	−0.313	0.023	−0.013
	(0.639)	(0.658)	(0.392)	(0.027)	(0.029)
$FTA_{ot} \times$ Bosnia	1.906***	1.546***	0.048	0.032*	−0.039*
	(0.175)	(0.207)	(0.059)	(0.017)	(0.021)
$FTA_{ot} \times$ Botswana	2.679**	1.419	−0.623	0.023	0.001
	(1.335)	(1.061)	(0.762)	(0.047)	(0.056)
$FTA_{ot} \times$ Canada	0.343**	−0.320**	−0.000	0.069***	−0.078***
	(0.144)	(0.157)	(0.057)	(0.014)	(0.018)
$FTA_{ot} \times$ Chile	0.210	−0.166	−0.005	0.109***	
	(0.240)	(0.221)	(0.105)	(0.022)	
$FTA_{ot} \times$ China	0.366***	−0.361***	0.056	0.194***	−0.267***
	(0.105)	(0.130)	(0.042)	(0.013)	(0.017)
$FTA_{ot} \times$ Colombia	0.606***	−0.268*	0.066	0.109***	−0.125***
	(0.111)	(0.157)	(0.056)	(0.015)	(0.018)
$FTA_{ot} \times$ Costa Rica	0.636***	0.416***	−0.146***	0.016	−0.019
	(0.129)	(0.155)	(0.056)	(0.016)	(0.020)
$FTA_{ot} \times$ Ecuador	0.678***	0.158	0.051	0.059***	−0.060**
	(0.177)	(0.175)	(0.064)	(0.021)	(0.023)
$FTA_{ot} \times$ Egypt	0.207	−0.595**	−0.019	0.080***	−0.099***
	(0.158)	(0.255)	(0.065)	(0.015)	(0.019)
$FTA_{ot} \times$ Georgia	1.193***	0.840***	0.266**	0.138***	−0.128***
	(0.324)	(0.301)	(0.121)	(0.021)	(0.023)
$FTA_{ot} \times$ Guatemala	0.361***	0.055	−0.099	0.077***	−0.090***
	(0.106)	(0.173)	(0.070)	(0.018)	(0.022)
$FTA_{ot} \times$ Hong Kong	0.528*	0.387	−0.139*	0.099***	−0.103***
	(0.278)	(0.245)	(0.081)	(0.015)	(0.019)
$FTA_{ot} \times$ Honduras	0.307***	0.294*	0.137	0.059***	−0.062***
	(0.117)	(0.152)	(0.098)	(0.020)	(0.023)
$FTA_{ot} \times$ Croatia	0.676***	0.176	0.217***	0.054***	−0.021
	(0.161)	(0.232)	(0.058)	(0.015)	(0.019)

(Continues)

	Import values	Import volume	Import prices	Import probability	Import market exit
	(1)	(2)	(3)	(4)	(5)
$FTA_{ot} \times$ Indonesia	0.256*	−0.057	0.155**	0.144***	−0.164***
	(0.135)	(0.209)	(0.071)	(0.025)	(0.028)
$FTA_{ot} \times$ Japan	0.803***	0.348**	−0.034	0.032**	−0.051***
	(0.146)	(0.138)	(0.050)	(0.014)	(0.019)
$FTA_{ot} \times$ Korea	1.209**	1.122**	−0.098	0.136***	−0.130***
	(0.470)	(0.567)	(0.076)	(0.017)	(0.023)
$FTA_{ot} \times$ Kuwait	1.615**	2.595***	−0.477**	0.043*	−0.022
	(0.784)	(0.812)	(0.227)	(0.022)	(0.025)
$FTA_{ot} \times$ Lebanon	0.485**	0.311	0.270***	0.105***	−0.124***
	(0.214)	(0.210)	(0.069)	(0.018)	(0.024)
$FTA_{ot} \times$ Lesotho	6.035***	9.174***		0.015	0.018
	(1.146)	(0.732)		(0.054)	(0.064)
$FTA_{ot} \times$ Montenegro	2.342***	0.685**	−0.122	0.180***	−0.165***
	(0.418)	(0.345)	(0.127)	(0.023)	(0.026)
$FTA_{ot} \times$ Namibia	−0.294	0.550	0.148	0.022	0.005
	(0.430)	(0.470)	(0.128)	(0.022)	(0.028)
$FTA_{ot} \times$ Oman	−1.695**	−3.063***	−0.622***	0.015	−0.001
	(0.666)	(0.714)	(0.236)	(0.024)	(0.027)
$FTA_{ot} \times$ Panama	1.154***	0.322	−0.064	0.053***	−0.062***
	(0.290)	(0.217)	(0.104)	(0.020)	(0.023)
$FTA_{ot} \times$ Peru	1.030***	0.804***	0.001	0.199***	−0.221***
	(0.147)	(0.161)	(0.053)	(0.014)	(0.018)
$FTA_{ot} \times$ Philippines	0.023	−0.829***	0.132***	0.051***	−0.069***
	(0.186)	(0.283)	(0.049)	(0.016)	(0.019)
$FTA_{ot} \times$ Qatar	1.153	0.462	0.289	−0.016	0.027
	(1.112)	(0.931)	(0.601)	(0.027)	(0.029)
$FTA_{ot} \times$ Romania	−0.472	−0.806**	0.102	0.105***	−0.087***
	(0.358)	(0.355)	(0.095)	(0.015)	(0.019)
$FTA_{ot} \times$ Saudi Arabia	1.277***	0.132	−0.294***	0.049***	−0.044**
	(0.487)	(0.838)	(0.104)	(0.016)	(0.019)
$FTA_{ot} \times$ Serbia	1.464***	1.113***	0.052	0.160***	−0.122***
	(0.159)	(0.181)	(0.057)	(0.015)	(0.019)
$FTA_{ot} \times$ Swaziland	2.530***	1.904***	0.002	0.075**	−0.056
	(0.475)	(0.634)	(0.131)	(0.030)	(0.035)
$FTA_{ot} \times$ Tunisia	0.990***	1.042***	−0.146	0.092***	−0.080***
	(0.195)	(0.256)	(0.100)	(0.020)	(0.027)
$FTA_{ot} \times$ Ukraine	0.355	0.065	0.140*	0.150***	−0.136***
	(0.242)	(0.250)	(0.078)	(0.015)	(0.019)

(Continues)

TABLE A7 | (Continued)

	Import values	Import volume	Import prices	Import probability	Import market exit
	(1)	(2)	(3)	(4)	(5)
$Third\ Country\ FTA_{ot}$	0.001	−0.001	−0.002***	0.001***	−0.002***
	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
$\log GDP_{ot}$	0.514***	0.437***	0.144***	0.025***	−0.004
	(0.037)	(0.039)	(0.010)	(0.002)	(0.003)
NTM_{opt}	−0.064***	−0.045***	−0.000	−0.002***	0.002***
	(0.006)	(0.008)	(0.002)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000	0.000	0.000	−0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Origin–product FE	Yes	Yes	Yes	Yes	Yes
Observations	587,108	587,108	206,194	587,108	484,345
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses.

TABLE A8 | The effect of Swiss FTAs on different margins of Swiss agricultural imports: Relaxing stringency of fixed effects.

	Import values	Import quantities	Import prices	Import probability	Import market exit
	(1)	(2)	(3)	(4)	(5)
FTA_{ot}	−0.011	0.098***	0.047***	0.004***	−0.002
	(0.040)	(0.030)	(0.007)	(0.002)	(0.002)
$Third\ Country\ FTA_{ot}$	0.004***	0.009***	0.004***	0.001***	−0.001***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
$\log GDP_{ot}$	0.489***	0.401***	0.036***	0.073***	−0.054***
	(0.009)	(0.007)	(0.001)	(0.000)	(0.000)
NTM_{opt}	0.208***	0.130***	−0.006***	0.010***	−0.008***
	(0.012)	(0.010)	(0.000)	(0.000)	(0.000)
$\log(1 + Tariff_{opt})$	−0.000***	−0.000***	0.000	0.000***	−0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Distance_o$	−0.288***	−0.235***	0.168***	−0.038***	0.025***
	(0.022)	(0.017)	(0.004)	(0.001)	(0.001)
$Border_o$	1.764***	1.546***	−0.127***	0.291***	−0.256***
	(0.046)	(0.043)	(0.009)	(0.002)	(0.004)
$Language_o$	−0.590***	−0.241***	0.078***	0.028***	−0.019***
	(0.042)	(0.039)	(0.007)	(0.002)	(0.002)
Product–time FE	Yes	Yes	Yes	Yes	Yes
Observations	607,700	607,700	213,422	607,700	488,393
Estimator	PPML	PPML	OLS	LPM	LPM

Note: ***, ** and * denote significance at 1%, 5% and 10%, respectively. Intercepts are included but are not reported. Cluster–robust standard errors are in parentheses.

A.2 | The Economics of Trade Agreements

Standard microeconomic theory predicts that trade agreements generate terms-of-trade gains for member countries. To illustrate this, we provide a simplified framework for analysing these effects in a small open economy within a partial equilibrium setting (see also Plummer et al. 2011). The small country assumption is appropriate in this context, as Switzerland's international market influence is relatively modest, accounting for just 1.67% of global merchandise imports and 2.96% of global imports of commercial services, which together represent 1.9% of total global merchandise and commercial services imports (Zimmermann 2023). Figure A1 depicts the domestic market for a specific good in a country preparing to join an FTA. We refer to this country as the 'home' country, other signatories to the FTA as *partner* countries and nonmember countries of the FTA as *outsiders*. Before the FTA enters into force, the home country imposes a most-favoured-nation tariff (t^{MFN}) on all imports, irrespective of their origin. We express tariffs in specific terms as a fixed monetary amount per unit of imports. At this stage, the home country collects tariff revenue equivalent to the product of the tariff rate and the volume of imports (i.e., $t^{MFN} \times [S_0 - D_0]$). Additionally, we assume that the outsider is the most efficient producer of the good and offers the lowest price among the three.

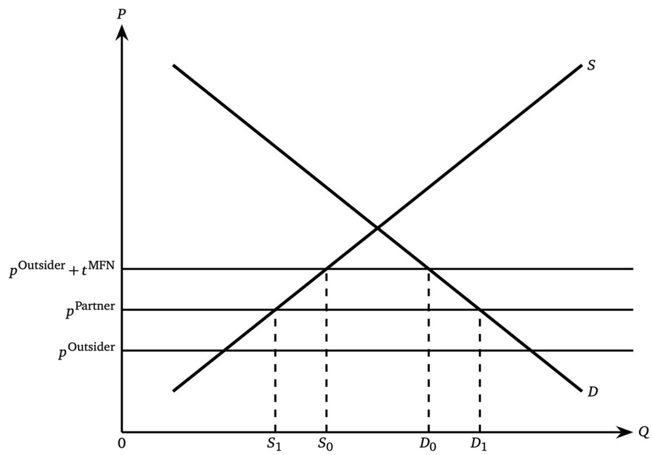

FIGURE A1 | The economic effects of trade agreements on imports in a small open economy.

Before the FTA, domestic producers supply S_0 units of the good, while domestic consumers demand D_0 units. The excess demand, $D_0 - S_0$, is met through imports from the outsider, who supplies the product at the lowest price. In this pre-FTA scenario, domestic consumers in the home country pay a price of $p^{Home} = p^{Outsider} + t^{MFN}$ per unit of the good, assuming that the product is homogeneous or perfectly substitutable. After signing the FTA, the removal of tariffs on imports from the FTA partner reduces the price of these imports to $p^{Partner}$, making them cheaper than imports from the outsider. This price reduction leads to increased consumption, with domestic demand rising to D_1. As a direct consequence, imports will increase from $D_0 - S_0$ to $D_1 - S_1$, with all imports now sourced from the FTA partner rather than the outsider. The lower domestic price also results in a reduction in local production, with domestic producers supplying only S_1. The trade creation effect of the FTA is represented by two components. First, the reduction in domestic production, $S_1 - S_0$, is replaced by more efficient imports from the partner country. Second, the increase in consumption, $D_1 - D_0$, is also satisfied by additional imports. Overall, trade creation is captured by the change in total imports due to the FTA: $[S_1 - D_1] - [S_0 - D_0]$.

A.3 | Figures

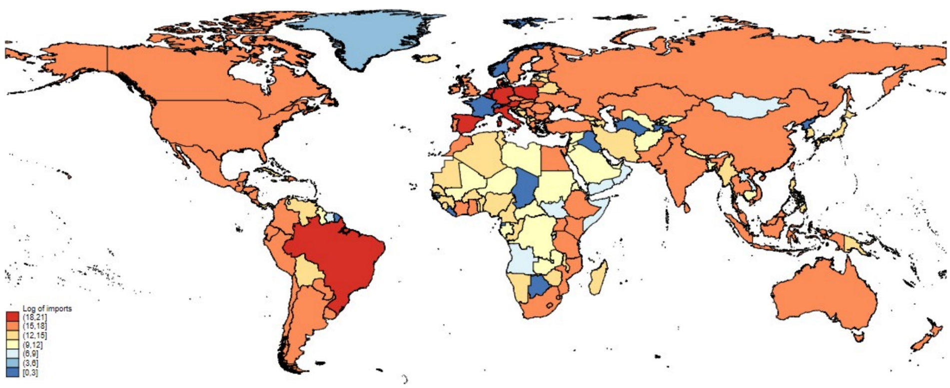

FIGURE A2 | Import sources. [Colour figure can be viewed at wileyonlinelibrary.com]

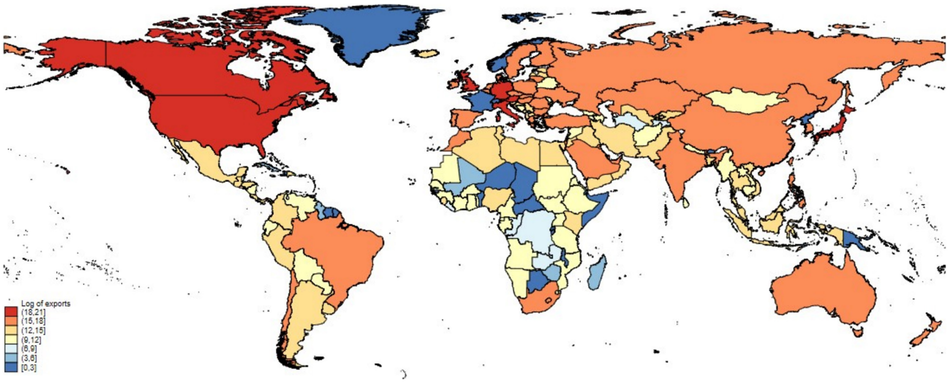

FIGURE A3 | Export destination. [Colour figure can be viewed at wileyonlinelibrary.com]