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ABSTRACT

The Causal Impact of Common Native Language on International Trade: Evidence from a Spatial Regression Discontinuity Design*

This paper studies the causal effect of sharing a common native language on international trade. Switzerland is a multilingual country that hosts four official language groups of which three are major (French, German, and Italian). These groups of native language speakers are geographically separated, with the corresponding regions bordering countries which share a majority of speakers of the same native language. All of the three main languages are understood and spoken by most Swiss citizens, especially the ones residing close to internal language borders in Switzerland. This unique setting allows for an assessment of the impact of common native (rather than spoken) language as a cultural aspect of language on trade from within country-pairs. We do so by exploiting the discontinuity in various international bilateral trade outcomes based on Swiss transaction-level data at historical language borders within Switzerland. The effect on various margins of imports is positive and significant. The results suggest that, on average, common native language between regions biases the regional structure of the value of international imports towards them by 18 percentage points and that of the number of import transactions by 20 percentage points. In addition, regions import 102 additional products from a neighboring country sharing a common native language compared to a different native language exporter. This effect is considerably lower than the overall estimate (using aggregate bilateral trade and no regression discontinuity design) of common official language on Swiss international imports in the same sample. The latter subsumes both the effect of common spoken language as a communication factor and of confounding economic and institutional factors and is quantitatively well in line with the common official (spoken or native) language coefficient in many gravity model estimates of international trade.

JEL Classification: C14, C21, F14, R12 and Z10
Keywords: common language, culture, international trade, quasi-randomized experiments and regression discontinuity design

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1 Introduction

This paper revolves around three pertinent questions in economics. First, why is consumption so much biased towards domestic goods? Second, why are imports so much biased towards similar countries? Third, what is the economic value of common culture?[1] The question of key interest to this paper is to which extent common language as a measure cultural proximity affects international trade.

The overall quantitative effect (and even the channels of influence) of a common language on trade is well studied in empirical international economics. Trade economists usually estimate the impact of common language on bilateral trade from gravity model regressions of the following general form:

$$M_{ij} = e^{\lambda \text{language}_{ij}} d_{ij} \mu_i m_j u_{ij}, \tag{1}$$

where M_{ij} measures bilateral trade (imports) of *country j* from *country i*, language_{ij} is a binary indicator variable which is unity whenever two countries have the same official language and zero else, λ is an unknown but estimable parameter on language_{ij}, d_{ij} is the joint impact of other measurable bilateral trade-impeding or trade-enhancing factors (such as bilateral distance or trade agreement membership) on bilateral trade, μ_i and m_j are exporter- and importer-specific factors of influence (such as GDP, price indices, etc.), and u_{ij} is a country-pair-specific remainder error term. λ should be interpreted as a *direct effect of common language on bilateral trade* in terms of a semi-elasticity.[2] A key problem with this identification strategy is that λ may be biased due to omitted confounding cultural, institutional, and political factors in u_{ij} beyond the usually employed trade cost variables in d_{ij} that are correlated with language_{ij} (see Egger and Lassmann, 2012, for a meta-analysis of the common

[1] The first question is one of Obstfeld and Rogoff's (2001) six major puzzles in international macroeconomics. The second one is the very root of new trade theory as developed in Krugman (1980). The last question is at the heart of a young literature which aims at quantifying the role of preferences for economic outcomes (see Guiso, Sapienza, and Zingales, 2006, for a survey).

[2] New trade models suggest that λ is not a marginal effect or a semi-elasticity of trade but only a *direct* or *immediate* effect, since μ_i and m_j depend on language_{ij} as well (see Krugman, 1980; Helpman and Krugman, 1985; Eaton and Kortum, 2002; Anderson and van Wincoop, 2003; Melitz, 2003; or Helpman, Melitz, and Rubinstein, 2008, for such models). We leave this issue aside here since we are primarily interested in estimating the parameter on common native language rather than the corresponding semi-elasticity of trade consistently. In principal, the estimate of this parameter may then serve as an input to assess general equilibrium effects of language_{ij} depending on the assumed model structure. In all of the aforementioned models, Armington-type preferences and iceberg-type bilateral trade costs exhibit an isomorphic impact on trade flows (see Anderson and van Wincoop, 2004). Hence, preference-related and transaction-cost-related effects of common language on trade are inherently indistinguishable.

language effect on trade which points to the importance of such confounding factors in related empirical work). As a consequence, λ cannot be interpreted as a causal direct treatment effect of language on trade.[3] Moreover, Melitz and Toubal (2012) point out that λ reflects a weighted impact of *spoken language* as a mere vehicle of communication and *native language* as a contextual cultural factor, rendering the interpretation of λ difficult.[4] The present paper is devoted to estimating the direct effect of common native language as a measure of cultural proximity rather than spoken language as a means of communication.

We contribute to the literature on common language and trade by utilizing a quasi-experimental design. The causal role of a common native language on trade can be estimated from utilizing the discontinuity of native language in a small neighborhood around internal historical language borders in Switzerland together with information on trade between a spatial unit in Switzerland and a country of origin. This strategy obtains an estimate of λ_{CNL} which may be interpreted as a *local average direct (and causal) treatment effect* of common native language on bilateral (country-to-Swiss-zip-code) imports. Estimates in this study amount to about 0.18 for the value share of import transactions and to about 0.20 for the share of numbers of import transactions. The corresponding semi-elasticities to those parameters are 0.28 for the log (positive) import value and 0.31 for the log number of transactions. The comparable naïve (non-causal) impact of common official language on trade in the data is much larger. The naïve estimate of common official language between Swiss zip codes and all countries (adjacent and non-adjacent) in the data at hand amounts to 0.99 for the log import value and to 0.81 for the log number of import transactions.[5] With adjacent exporter countries only – Austria, France, Germany,

[3]For instance, such confounding factors are the religious orientation (see Helpman, Melitz, and Rubinstein, 2008) or common culture and institutions (see Greif, 1989, 1993; Casella and Rauch, 2002; Rauch and Trindade, 2002; and Guiso, Sapienza, and Zingales, 2006).

[4]Technically, one could refer to a variable reflecting common spoken language by CSL_{ij} and one reflecting common native language by CNL_{ij}. Then, one could replace $e^{\lambda \text{language}_{ij}}$ in (1) by $e^{\lambda_{CNL}\text{CNL}_{ij}} e^{\lambda_{CSL}\text{CSL}_{ij}}$. This illustrates that λ in traditional models reflects a weighted average of effects of native and spoken language.

[5]Common official language is the measure of common language which is typically used in the literature (see Egger and Lassmann, 2012). The estimates are based on Poisson pseudo-maximum-likelihood regressions of positive import flows ($M_{ij} > 0$) and, alternatively, the number of import transactions on the following covariates: common language which is coded as one whenever a foreign country uses the majoritarian native language of a Swiss zip code as an official language and zero else; log geographical distance between a Swiss zip code and the capital of the foreign export country of origin of Swiss imports; and a full set of fixed zip code effects (there are 3,079 zip codes) and fixed exporting country of origin effects (there are 220 countries of origin). The total number of zip code by country observations with positive bilateral imports in those regressions is $153,256$. Notice that those regressions may be viewed as one part of two-part models which

and Italy, yet excluding Liechtenstein which does not collect its own trade data but forms part of Switzerland's trade statistics – these effects amount to 1.21 for import value and 0.68 for the number of transactions in the data at hand.[6] Using exactly the same zip codes that are used for identification of the causal effect of common native language – their number amounts to 1,485 – , the naïve estimates amount to 0.97 for import value and to 0.75 for the number of import transactions. Hence, a relatively small fraction of the naïve (non-causal) estimate of λ accrues to common native language as a measure of cultural proximity. In our data, less than one-third of the naïve λ parameter for import value and about 40% of the one for the number of import transactions is attributable to cultural proximity. The rest is either due to bias (owing to omitted confounding factors) or to spoken language as a mere vehicle of communication. From this perspective, earlier estimates on the effect of common language on trade should not be interpreted as economic effects of cultural proximity alone.

The remainder of the paper is organized as follows. The next section provides some institutional background supporting the use of internal native language zone boundaries in Switzerland as instruments for causal inference about language-borne effects of common culture on international trade. Section 3 relates ours to earlier work on the impact of a common language on bilateral trade. Section 4 provides details about the data-set and descriptive statistics for core variables of interest. Section 5 outlines briefly the spatial regression discontinuity design for the data at hand, summarizes the results, and assesses their robustness. The last section concludes by summarizing the key insights.

2 Native languages as cultural traits in Switzerland

The paper adopts an identification strategy which differs from previous work by exploiting data on native language differences *within* a country, Switzerland, and (transaction-level) data on imports of different language zones in Switzerland with other countries. That said, we should emphasize that Switzerland is not just another country where several languages are spoken (see Melitz and Toubal, 2012,

distinguish between the margin referring to whether there are any imports at all and other margins which we focus on (see Egger, Larch, Staub, and Winkelmann, 2011).

[6]Recall that nothing of that effect could be explained by common official language because all adjacent countries' official languages are also official languages of Switzerland. And little should be explained by spoken languages (which at the required detailed geographical level cannot be measured) for the arguments given in Footnote 2.

for descriptive evidence on multi-linguality on the globe). Switzerland consists of four language communities – German, French, Italian, and Romansh (ordered by the number of speakers) – that mainly reside in geographically distinct areas whose internal borders have deep historical roots. According to the Census of the Swiss Federal Statistical Office from 2000, German is the native language of roughly 4,640,400 speakers, French that of roughly 1,485,100 speakers, Italian of about 471,000 speakers, and Romansh of about 35,100 speakers.[7] Except for Romansh, all languages are main national tongues (the official and main native languages) in countries adjacent to Switzerland.[8] Among Switzerland's five neighboring countries, German is the official language in Germany, Austria, and Liechtenstein, French is the official language of France, and Italian the one of Italy such that everyone of the three main languages of Switzerland is the single official language spoken in at least one of the adjacent countries as shown in Figure 1. In fact, none of Switzerland's neighboring countries has an official (or main native) language beyond the three aforementioned tongues. These languages are important among the 6,909 known languages spoken worldwide at our time. German ranks 10th among the native languages spoken worldwide (90.3 million speakers), French ranks 16th (67.8 million speakers), and Italian ranks 19th (61.7 million speakers).[9] Every student in a Swiss school has to learn a second language of the country mostly from third grade and, in some German-speaking cantons, from fifth to seventh grade onwards. Swiss pupils learn a third language from fifth to seventh grade onwards, and Swiss citizens are supposed to understand if not speak all three main tongues. In any case, residents close to internal language borders tend to speak the main native languages on either side of an internal border particularly well.[10]

[7] One may distinguish between five main dialects of Romansh (*Bündnerromanisch*) and consider the official Romansh an artificial language.

[8] Whether the three languages Swiss (Bündner-)Romansh and the Ladin and Friulian – spoken in the Alps of northern Italy – form three subgroups of a common Rhaeto-Roman language or not is a controversial question in linguistic research (*questione ladina*, see Bossong, 2008; and Liver, 2010). In any case, the Romansh regions in Switzerland and northern Italy do neither share common borders nor do they share obvious common socio-linguistic or historic roots as the French-, German-, and Italian-speaking regions of Switzerland do with their respective neighboring countries. Since Romansh was never the official language of a state or country in modern history and there is no large-enough foreign language base so as to identify specific language-related trade ties, we will not consider the Romansh language boundaries in our analysis and exclude the corresponding regions and data in the regression analysis.

[9] According to Lewis (2009), the top five native languages on the globe are: Chinese (1,213 million speakers), Spanish (329 million speakers), English (328 million speakers), Arabic (221 million speakers), and Hindi (182 million speakers).

[10] French-speaking cantons teach German as the second language, Ticino teaches French as the second language, Graubünden teaches one of the three languages – German, Italian, or Romansh

All of that leaves the issue at stake in this paper not one of common *official* language in very broad terms, and also not one of *spoken* language as such, but mainly one of common *native* language as a measure of *cultural proximity*. Of course, the notion of *native* language does not just refer to linguistic proficiency but entails persistent common cultural traits and preferences that individuals and regions speaking a common language share. In particular, a common native language generates trust, knowledge of cultural habits and social norms of interaction and, through this channel, stimulates economic exchange beyond the impact of spoken language in a narrow sense on trade. Our definition of language will thus refer to the concept of *common native language* as a measure of cultural proximity rather than to the concept of mere language proficiency and ability to speak.[11]

– Figure 1 about here –

The geographical pattern of agglomeration of native speakers with different language background in Switzerland is strong and can best be visualized on a map of the country as in Figure 2. Each of the four colors corresponds to one language spoken by the majority (at least 50%) of inhabitants in a Swiss municipality.[12] Of course, using a majoritarian rule to cut native language zones would be misleading if today's language borders were largely different from the historical ones or the discontinuity about language usage were rather smooth at the majority-based language borders. It turns out that historical and majority-rule-based language borders are the same (see Figure 3), and we will illustrate below that there is a clear (though not a sharp) discontinuity about the main native language within relatively narrow spatial intervals around the Swiss internal historical language borders. We will utilize exactly this discontinuity to infer the causal impact of language on measures of international trade transactions of small spatial units.

– Figure 2 about here –

– as the second language, and the following six of the 21 (mostly) German-speaking cantons teach French as the second language: Bern, Basel-Landschaft, Basel Stadt, Fribourg, Solothurn, and Valais. The other cantons teach English as the second language (Source: EDK Swiss Conference of Cantonal Ministers of Education).

[11] The deep cultural aspect particularly of native language was emphasized in anthropology (e.g., the work of Franz Boas), linguistics (e.g., in Benjamin Whorf's concept of linguistic relativity) and philosophy (e.g., the work of Johann Gottfried Herder, Wilhelm von Humboldt, or Ludwig Wittgenstein).

[12] While we use zip codes in the regression analysis, we employ municipality aggregates of zip codes in some of the graphical analysis for reasons of presentation.

It is worth emphasizing that language borders within Switzerland do not always coincide with the ones of *Cantons* which have some economic and political autonomy (e.g., with regard to setting profit tax rates, etc.).[13] As will become clear below, by isolating spatial units of different native language majority *within* cantons we may condition on most economic, institutional, and political factors that may change at cantonal borders (certainly, in comparison to country-level studies; see also Brügger, Lalive, and Zweimüller, 2009; Eugster and Parchet, 2011).[14]

– Figure 3 about here –

The use of transaction-level data with spatial information is essential to our analysis for two reasons. First, it allows us to geo-spatially identify the location of importers within Switzerland. This is essential to determine the majoritarian native language zone an importer resides in as well as her distance to the respective language border within Switzerland. Second, it reveals novel insights into the impact of common native language on alternative margins of trade such as the number of bilateral transactions and the number of products traded as examples of extensive margins, versus the value per transaction or the unit value as examples of intensive margins. The latter may be useful to determine whether language is mainly a determinant of variable trade costs (as is commonly assumed; see Egger and Lassmann, 2012) or of fixed trade costs.

The results in this study can be summarized as follows. Suppose we were interested in the size of the discontinuity of the average of the three considered native languages spoken in Switzerland at the intra-Swiss language borders. Then, we would have

[13] Politically, cantons can be compared to what are called *States* in the United States and *Länder* in Germany. The Swiss Federation consists of 26 cantons which joined the country sequentially between 1291 (the foundation of inner Switzerland by the four German-speaking so-called *Urkantone*) and 1815 (when the Congress of Vienna established independence of the Swiss Federation and when the French-speaking cantons Genève, Valais, and Neuchâtel joined the Federation, consisting of 22 cantons by then). In 1979, the French-speaking canton Jura separated from the canton of Berne and constituted the 26th canton (with six half-cantons that became full cantons as of the Constitution of 1999: *Appenzell-Ausserrhoden*, *Appenzell-Innerrhoden*, *Basel-Stadt*, *Basel-Landschaft*, *Nidwalden*, and *Obwalden*).

[14] In contrast to other studies exploiting language differences within Switzerland, we think of native language borders as to entail a fuzzy identification design. Most (but even not all) individuals have *one* native language. Yet, spatial aggregates host fractions of individuals of different native language. Hence, native language borders do not generate a sharp design: there are German native speakers on either side of the German-French border in Switzerland and the same is true for French native speakers, etc. It has been neglected in earlier work that this calls for suitable identification strategies (such as instrumental variable estimation) in order to render estimated discontinuities at language borders interpretable as (causal) local average treatment effects.

to consider the degree of fuzziness of native language: native German speakers on the German-speaking versus the French-speaking (or Italian-speaking) side of the language borders within Switzerland. If native language use jumped from zero (on the untreated side) to one(-hundred percent; on the treated side) we would have a sharp design. It turns out that this discontinuity is not one but about 0.66 (across all three native language usages and regions in Switzerland within a close enough distance around internal language borders). Hence, we could say that the degree of fuzziness in the data amounts to about 34%. The estimated cultural bias on trade induced by common native language is estimated at 0.18 for import value and at 0.20 for the number of import transactions. Hence, an increase in common native language similarity by 100 percent raises the import value share from countries with that native language by about 18 percentage points and that of the number of import transactions by about 20 percentage points. We find significant positive effects on the share of import value, the number of transactions, and the number of products imported from adjacent foreign countries with a (majoritarian) common native language as opposed to ones with a different native language. There is no such effect on the unit value, the value per transaction, or the quantity per transaction. Hence, common native language seems to affect bilateral trade primarily through various extensive margins. Arguably, the latter points to common (at least native) language as a factor that reduces fixed market access costs rather than variable trade costs. In addition, we provide evidence on the heterogeneity of the language effect. It turns out to differ with transaction size and across industries, and seems to be more relevant for differentiated goods in comparison to homogeneous products.

The findings are important in three regards. First, they allow isolating and quantifying economic effects of pure cultural aspects of common native language. A positive impact of common culture speaks to the relevance of the size of cultural communities and could tell an economic lesson against separatist movements that draw a romantic picture of cultural isolation that might ultimately lead to economic disruption and a lack of economic prosperity. Second, a comparison of the findings with naïve estimates in this paper and a large body of estimates in earlier work suggests that aspects of language as a mere means of communication are probably not much more important than cultural aspects (to some extent, this differs from conclusions in Melitz and Toubal, 2012). However, the estimates nevertheless indicate that there are also sizable potential gains from common spoken language, e.g., through foreign language training in schools which can be affected by policy makers. Third, evidence of common language as a fixed trade cost factor may potentially influence the specification of structural trade models which distinguish between fixed and variable trade costs. For instance, modeling language effects on trade by way of fixed trade costs may lead to largely different economic effects of common language in

general equilibrium relative to earlier research.

3 Common language as a driver of trade in the literature

The interest in the role of language as a means of interaction and its consequences for outcome has its habitat at the interface of several disciplines within and at the boundaries of the social sciences.[15] Common language – partly as a reflection of cultural proximity – is understood to stimulate interaction in general and cross-border transactions of various kinds in particular.[16]

In the context of international economics, theoretical research identifies a role for common language as a mere means of communication or as a broader substrate on which common culture and externalities florish (see, e.g., Kónya, 2006; Janeba, 2007; and Melitz, 2012). Empirical research typically models common language as a non-tariff barrier to trade – mostly in the form of an iceberg-type, ad-valorem trade cost element among the numerous variable costs to trade. Among geographical and cultural trade-impeding or trade-facilitating factors (see McCallum, 1995; Helliwell, 1996; Frankel and Romer, 1999; Eaton and Kortum, 2002; Anderson and van Wincoop, 2004; Disdier and Head, 2008), common language is one of the usually employed determinants of trade costs usually employed in *gravity models* of bilateral goods trade (see Helliwell, 1999; Melitz, 2008; Fidrmuc and Fidrmuc, 2009; Egger and Lassmann, 2012; Melitz and Toubal, 2012; Sauter, 2012).

In a meta-analysis, Egger and Lassmann (2012) find that the language coefficient in gravity models likely captures confounding economic, cultural, and institutional determinants in cross-country studies. In general, cultural proximity is viewed as an endogenous variable owing to confounding factors (see Disdier, and Mayer, 2007; Guiso, Sapienza, and Zingales, 2009; Felbermayr and Toubal, 2010). Accordingly, the parameter on common language indicators tends to be very sensitive to the exclusion of covariates among the determinants of bilateral trade flows – much more so than, e.g., that of bilateral distance (see Table 4 in Head and Mayer, 2013). Hence, the common language parameters in previous studies on the determinants of bilateral

[15] See Laitin (2000), Hauser, Chomsky, and Fitch (2002), Fidrmuc and Ginsburgh (2007), Holman, Schultze, Stauffer, and Wichmann (2007), Chiswick (2008), Fidrmuc and Fidrmuc (2009), Matser, van Oudenhoven, Askevis-Leherpeux, Florack, Hannover, and Rossier (2010), and Falck, Heblich, Lameli, and Südekum (2012) for recent important contributions on the matter in political science, sociology, socio-linguistics, economics, and psychology.

[16] See the references to 81 studies in Egger and Lassmann (2012) for evidence on the language effect on international goods transactions.

trade should not be interpreted as to reflect a causal impact of common culture on trade. Differentiating the communication and cultural aspects of common language is difficult. Some authors have attempted measuring cultural proximity and avoiding the bias of language coefficients through instrumental variables in a variety of related contexts (e.g., Sauter, 2012 uses official language status across Canadian provinces as an instrument for spoken language in provinces). However, one would ideally use data which allow for a better isolation of cultural from other aspects of language (see Falck, Heblich, Lameli, and Südekum, 2012, for such an approach). The latter is a strategy pursued in this paper.

4 Transaction-level import data and spoken languages in Switzerland

4.1 Data sources

To identify the direct treatment effect of common native language for alternative margins of bilateral imports, we use data from various sources. First of all, we utilize transaction-level import data (imports from abroad) of the Swiss Federal Customs Administration (*EDEC*) between January 2006 and June 2011. This data source contains for the universe of import transactions (102,518,645 data points) the following information (inter alia): an identifier for the importing authority (a person, a firm, or a political entity); an identifier of the address of the importing authority; the value per transaction; the quantity imported; the product (Harmonized System 8-digit code; *HS 8*); the time (day and even hour) of entering the country; and the country of origin.[17] We collapse this information at the zip code and country-of-origin language zone level across all years and compute the following outcome variables: the aggregate value of imports per country-of-origin language zone relative to all imports of that zip code for all dates and importing authorities covered, *Value share*; the number of transactions per country-of-origin language zone relative to all transactions of that zip code for all dates and importing authorities covered, *Transactions share*; the number of HS 8-digit product codes per country-of-origin language zone imported by that zip code for all dates and importing authorities covered, *Number of products (HS8 tariff lines)*; the logarithm of the average unit value per country-of-origin language zone of all imports by that zip code for all dates

[17] Compared to the import data, the transaction-level export data at our disposal do not cover the universe of transactions (but only about 40%) so that we suppress the corresponding information and results here and focus on imports.

and importing authorities covered, *Log unit value*; the logarithm of the value per import transaction by country-of-origin language zone of all imports by that zip code for all dates and importing authorities covered, *Log value per transaction*; and the logarithm of the quantity per import transaction by country-of-origin language zone of all imports by that zip code for all dates and importing authorities covered, *Log quantity per transaction*. The outcomes are based on trade with countries adjacent to Switzerland, with Germany and Austria as German-speaking exporters, France as the French-speaking exporter and Italy as the Italian-speaking exporter.[18]

We match this information with geo-spatial data on the exact location of language borders within Switzerland at 100-meter intervals. Language borders are determined by exploiting zip-code-based information from the 1990 Census and Geographical Information Systems data of the Swiss Federal Statistical Office (*Bundesamt für Statistik*). Moreover, we utilize Geographical Information Systems data provided by *Swisstopo (Amtliche Vermessung Schweiz)* to determine the location of Swiss zip code centroids in space and their Haversine distance in kilometers to all points along the internal language border in Switzerland as well as to all points along the national border. This allows for an exact determination of the minimal great circle distance of each zip code (of which there are 3,079 in the data) from the language border.[19] The geospatial information and the use of distances to internal language borders is elemental for the identification strategy towards a causal effect of common native language as an aspect of common culture on trade. In particular, the chosen approach helps avoiding a bias from omitted confounding factors. Moreover, we can utilize the geospatial information to determine the minimal great circle distance of each spatial unit in Switzerland from the country's external border (even of the external border

[18]Liechtenstein is a German-speaking country but, as indicated before, its trade flows are reported within Switzerland's trade statistics so that the country appears neither as a country of origin nor – due to its large distance to the Swiss language border – as an importing unit within Switzerland.

[19]These belong in 3,495 zip codes for the sample period of which 3,079 can be used after dropping Romansh, non-trading, and non-matchable (between customs and spatial data) zip codes. Unlike with many firm-level data-sets available nowadays, the present one is untruncated. Hence, it contains all transactions that cross Swiss international borders officially. Some transactions are as small as one Swiss Franc. Moreover, since Switzerland charges a lower value-added tax rate than its neighboring countries and most products from neighboring (European Union member) countries are exempted from tariffs, there is an incentive even for individuals to declare foreign-purchased products when entering Switzerland. More precisely, everything shipped into Switzerland by postal services is subject to customs checking (including taxation and, where applying, tariff payments). Personally imported goods of a value below 300 Swiss Francs can be imported without declaration, though one would save on taxes when declaring. For alcohol and other sensitive products, there are numerous exceptions from the 300 Swiss Francs rule, and even smaller purchases have to be declared. More details on this matter are available from the authors upon request.

of a specific foreign language zone). As alternative geo-spatial information, we use data from *Die Post* to determine road distances from Swiss zip code centroids to the closest point on the language border on a road. We conjecture that road distances reflect transaction costs more accurately than great circle distances. In general, we focus on spatial units within a radius of 50 kilometers from internal language in terms of great circle or road distances with the zip code sample being generally somewhat smaller for the latter than the former.[20] The fact that the data contain both the intermediate importer and the final recipient as well as the shipper suggests that we are able to exploit all shipments imported by firms or individuals that are located within the zip codes included in our sample (we will assess the sensitivity of the results with regard to this point below).

Moreover, we augment the data-set by information on the mother tongue spoken in households per municipality from the 2000 Census. This information was kindly provided by the Swiss Federal Statistical Office (*Bundesamt für Statistik*). In conjunction with geo-spatial information, the data on the distribution of actual mother tongue may be used to measure the discontinuity in the majority use of native language as a percentage-point gap in mother tongue spoken of spatial units on one side of the Swiss language border relative to exporting foreign language zones to ones on the other side of the Swiss language border. Later on, this will allow us to express the estimated treatment effect of common language on various import aggregates per percentage point gap in common native language.

4.2 Descriptive statistics

The value of the average transaction in the covered sample is 9,930 Swiss Francs (CHF) and the median value is 376 CHF. Figures 4–7 summarize for all geographical units the frequency of positive import transactions per geographical unit with adjacent German-speaking, French-speaking, Italian-speaking, and (non-adjacent) other countries (rest of the world, RoW), respectively.

– Figures 4–7 about here –

The figures support the following conclusions. First, the share of positive import transactions from the same language zone is generally higher for units with the same dominant mother tongue in Switzerland than for other regions. Very few spatial units

[20] Calculating minimal road distances of all zip codes to internal language borders in Switzerland is time-consuming and costly. Since identification of the causal direct effect of common native language is local at the language border by way of the chosen design, it is unproblematic to focus on a band of 50 kilometers around internal language borders anyway.

outside the German- or Romansh-speaking parts have a similarly high concentration of imports from Germany or Austria as the ones in those zones (see Figure 4). The same pattern is true for the French-speaking and the Italian-speaking parts of the country with respect to destinations that share a common language (see Figures 5 and 6). Figure 7 shows that imports to the rest of the world are much more evenly distributed over the three considered language regions. Unsurprisingly, rural regions exhibit lower shares with the RoW than the densely populated regions in the French-speaking part of the country and the Swiss-German agglomerations, in particular around Zurich (the largest city of Switzerland) and Berne (the capital of Switzerland).[21] Second, a randomly drawn unit from all over Switzerland accounts for a larger share of import transactions from German-speaking countries than from elsewhere for three reasons: the German-speaking part of Switzerland is relatively large, Germany is larger than France or Italy, and the transport network openness of Switzerland to German-speaking countries is relatively higher than to other language zones due to (relevant, non-mountainous) border length, road accessibility, etc. Altogether, Figures 4–7 provide clear evidence of a language divide in the concentration of import transactions in Switzerland.

– Tables 1–3 about here –

Tables 1–3 provide a more detailed overview of the importing behavior of Swiss regions (zip codes) located within alternative (great circle) distance brackets from the language border.[22] The tables indicate that Swiss regions import a larger share of import volume or transactions and more products from neighboring countries with a common native language that is spoken by a majority of the inhabitants than on average. This pattern is similar for units within the same canton (see the lower panel of Tables 1–3) – where the language border within Switzerland divides a canton and institutional differences between treated and untreated regions are minimal – and for all units (see the upper panel of Tables 1–3) at cross-cantonal or intra-cantonal language borders.[23] Moreover, language differences appear to affect predominantly

[21] We will demonstrate later on that the pattern of RoW imports is not discontinuous about internal language borders.

[22] The estimation procedures below will alternatively utilize road distances and great circle distances to determine a zip code's distance to the internal language border. For the sake of brevity (and since results are very similar between the two concepts) and smaller sample size when using road distances at given distance bands to the internal language borders, we suppress numbers based on road distance in Tables 1–3.

[23] Later on, we will provide evidence that average fixed importing zip code effects estimated from a gravity model of log bilateral imports of Swiss zip codes from foreign countries are not discontinuous at the Swiss internal language borders. Hence, the differences in trade between

extensive transaction margins of trade (such as the share of transactions) but less so intensive transaction margins of trade (such as the value per transaction or the unit value). Hence, the total value of a region's imports is predominantly skewed towards countries of origin with a common native language due to the number of transactions and the number of products traded. This suggests that common native language mainly affects fixed transaction costs rather than marginal (or ad-valorem) trade costs, in contrast to traditional gravity modeling.

Let us just single out a few numbers for a discussion of Tables 1–3. According to the bottom row of the top panel of Table 1, German-speaking regions in Switzerland trade on average 53.8% of their import volume and 51.9% of their transactions with German-speaking countries. These numbers are 50.9% and 47.1% for zip codes which are located on the German side of intra-cantonal Swiss language borders that separate French-speaking and German-speaking regions. They are 56.3% and 49% for German-speaking zip codes around the intra-cantonal language border between Italian-speaking and German-speaking regions. German-speaking Swiss regions import only 5.1% and 9.7% of their import volume from French- and Italian-speaking countries of origin, respectively. The corresponding shares of transactions from these source countries are 3.6% and 8.6%, respectively. The same qualitative pattern (with some quantitative differences) arises when considering French- and Italian-speaking regions' common-language versus different-language imports.[24] The same is true for the number of imported products as shown in Table 2. Clearly, the number of products imported from countries with a common native language spoken by the majority is relatively higher. On the other hand, Tables 2 and 3 do not confirm similar patterns for the log unit value, the log value per transaction, and the log quantity per transaction. These outcomes do not differ between imports from differing language groups. Tables 4–5 summarize further features of the Swiss spatially disaggregated data.

– Tables 4–5 about here –

Table 4 indicates the number of zip codes in different language areas and distance brackets from the Swiss internal language borders. For instance, that table demonstrates that the number of German-speaking regions in the data is much bigger than that of French- and Italian-speaking regions. However, Table 4 suggests that

units with common and non-common language at internal language borders do not arise from differences in characteristics which are specific to zip codes (such as income, taxation, or the like).

[24]The import shares of French-speaking regions from France tend to increase with increasing distance from the respective language border, while import shares of Italian-speaking regions from Italy tend to decrease with increasing distance from the language border.

the number of zip codes is relatively symmetric on either side of Swiss language borders within symmetric distance bands around those borders. If all zip codes with a native majority of one of the three languages considered were used to infer the average treatment effect of common native language independent of their distance to language borders, transactions from 3,079 zip codes could be utilized. Of those, only 986 zip codes would be used when focusing on intra-cantonal language borders. Of course, the number of zip codes used in estimation declines as one narrows the symmetric distance window around language borders: there are 30 zip codes within a $\pm$1-kilometer band of language borders all over Switzerland of which 24 are located at intra-cantonal language borders; there are 706 zip codes within a $\pm$20-kilometer band of language borders all over Switzerland of which 435 are located at intra-cantonal language borders.

Table 5 indicates that the language border effect is drastic and discontinuous in the sense that, no matter how narrow of a distance band around the internal border we consider, the one language is spoken by a large native majority while the majoritarian language of the adjacent different-language community accounts for a positive but much smaller fraction. Nevertheless, the design is fuzzy regarding the share of individuals of any of the native languages considered on any side and type (French, German, Italian) of internal language border considered. This suggests that the parameter on majority-related common native language should not be interpreted as a local direct average treatment effect of common language (LATE; i.e., locally at the language border). With a sharp design, the parameter would measure the LATE associated with a jump of the difference in common native language from zero to one-hundred percent of all speakers.[25]

5 Spatial RDD estimation of the local average treatment effect (LATE) of common native language on trade

This section is organized in three subsections. First, we briefly outline the identification strategy of the LATE as a spatial regression discontinuity design in Subsection 5.1. Then, we summarize the corresponding benchmark results regarding the LATE in Subsection 5.2. Finally, we assess the robustness of the findings and extensions in various regards in Subsection 5.3.

[25]Melitz and Toubal (2012) provide evidence that the fraction of native language in virtually all exporting countries with only a single official language is less than 100%. Not surprisingly, this is true as well for Switzerland.

5.1 A spatial regression discontinuity design (RDD) for the LATE of common native language majority

This paper's empirical approach is based on the following identification strategy. Bilateral imports of geographical unit $j = 1, ..., N$ which, in our case, is a Swiss zip code, from country i are given by the relationship in Equation (1). Let us specify two such bilateral import relationships based on the latter equation. Imports of j from i are determined as $M_{ij} = e^{\lambda_{CNL}\text{CNL}_{ij}} e^{\lambda_{CSL}\text{CSL}_{ij}} d_{ij}\mu_i m_j u_{ij}$, where CNL and CSL reflect common native and common spoken language variables (shares), and ones of k from i by $M_{ik} = e^{\lambda_{CNL}\text{CNL}_{ik}} e^{\lambda_{CSL}\text{CSL}_{ik}} d_{ik}\mu_i m_k u_{ik}$. Suppose that we pick countries and zip codes such that $\text{CNL}_{ij} \geq 0.5$ while $\text{CNL}_{ik} < 0.5$, $\text{CSL}_{ij} \approx \text{CSL}_{ik}$ and $d_{ij} \approx d_{ik}$. Then,

$$\frac{M_{ij}}{M_{ik}} = e^{\lambda_{CNL}} \frac{u_{ij}}{u_{ik}} \tag{2}$$

Notice that λ_{CNL} can be estimated as a constant to the log-transformed relationship in Equation (2), if (conditional or unconditional) independence of $(\text{CNL}_{ij} - \text{CNL}_{ik})$ and $\ln \frac{u_{ij}}{u_{ik}}$ is achieved. Econometric theory proposes two elementary options to achieve such independence, instrumental variables estimation or – in very broad terms – a control function approach, where we subsume any form of controlling for observable variables (with more or less flexible functional forms) under the latter approach.[26]

The variable CNL_{ij} measures the share of speakers in zip code j with the same common native language as the majority of the population in exporting country i. Alternatively, we may determine a binary variable $RULE_{ij}$ which is unity between i and j for, say, historically mainly German-speaking zip codes in Switzerland for their imports from Germany and Austria, and similarly for French-speaking and Italian-speaking zip codes with imports from France or Italy. Notice that we focus only on imports from four included exporting countries which share common land borders with Switzerland (Austria, France, Germany, and Italy), for reasons of clean identification. As said before, the dominant language is the mother tongue of at least

[26]Hence, we use the term control function for conditioning on regressors beyond ones in $e^{\lambda_{CNL}\text{CNL}_{ij}} d_{ij}$ for all countries i and regions j in parametric and nonparametric frameworks. Naturally, this notion includes switching regression models, matching, as well as regression discontinuity designs (see Wooldridge, 2002), all of which may be portrayed as to involve some sort of control function (and some weighting of units). Notice that when formulating the control function for an outcome equation in terms of residuals from first-stage regressions, even instrumental variable estimation can be cast as a control function approach. In terms of the above notation, the usual approach adopted in the literature was one where the assumption was made that $E\left[\frac{u_{ij}}{u_{ik}}\right] = 1$, and all variables in the model were assumed to comprehensively control for $d_{ij}\mu_i m_j$ for all units i, j, and k.

50% of the residents by definition, but not necessarily and even not actually of 100%. As indicated before and as is visible from Figures 8–10, treatment assignment is discontinuous but not sharp at the historical language borders, since the percentage of speakers is not 100% for any native language in any region.[27] In addition, Figure 11 – which is organized in such a way that the treatment (averaged within distance bins of 1 km) is shown in the vertical dimension, and panels on the left-hand side are based on great circle distance to the language border as the forcing variable, while panels on the right-hand side are based on road distance to the language border as the forcing variable – visualizes the discontinuity of treatment at the language border. Akin to Figures 8–10, it is shown that the discontinuity is pronounced but does not jump from zero to one at the border. The curvature is quite flat and similar on both sides of the language border.

– Figures 8–11 about here –

Let us generally refer to an import outcome of any kind for spatial unit j as y_j. Recall from Section 4 that we employ six alternative bilateral import outcomes (generally referred to as y_{ij}) in the analysis: *Value share*; *Transactions share*; *Number of products (HS8 tariff lines)*; *Log unit value*; *Log value per transaction*; and *Log quantity per transaction*.

We follow the literature on regression discontinuity designs (RDDs; see Imbens and Lemieux, 2008; Angrist and Pischke, 2009; and Lee and Lemieux, 2010) and postulate a flexible function about a so-called forcing variable, which may remove the endogeneity bias of the average treatment effect on outcome. For this, let us define the forcing variable for imports from country i by spatial unit (zip code) j, x_{ij}, as the centered (road or great circle) distance to the intra-Swiss language border in kilometers. We code the forcing variable negatively in the non-treatment case ($x_{ij} < 0$ if $\text{CNL}_{ij} < 0.5$)[28] and positively in the treatment case ($x_{ij} \geq 0$ if $\text{CNL}_{ij} \geq 0.5$). For convenience, we will sometimes refer to zip codes with $x_{ij} < 0$ as

[27] The figures indicate that the share of the population speaking the native language spoken by the majority of the population in a zip code is higher than 80% in most regions, and that the change at the language borders is drastic but not sharp. The degree of fuzziness may be measured by the difference in the fraction of speakers of a common language to the "right" of the border (in the treatment region) and those to the "left" of the border (in the control region). This difference amounts to 0.66. This estimate is based on an optimally chosen bandwidth around internal language borders for treatment which amounts to 18 km (Imbens and Kalyanaraman, 2012). An estimate across all three native language usages and regions in Switzerland within 50 km around internal language borders amounts to 0.81. With a sharp design, the corresponding difference would be unity. Hence, a larger deviation of that difference from unity is associated with a larger degree of fuzziness.

[28] Then, there is a different language majority between j and the respective foreign language zone.

to be situated *to the left* of the border and ones with $x_{ij} \geq 0$ as to be situated *to the right* of the border. Let us define the sufficiently smooth (parametric polynomial or nonparametric) continuous functions $f_0(x_{ij})$ at $x_{ij} < 0$, $f_1(x_{ij})$ at $x_{ij} \geq 0$, and $f_1^*(x_{ij}) \equiv f_1(x_{ij}) - f_0(x_{ij})$.

With a fuzzy treatment assignment design – where, say, any main language zone in Switzerland contains native speakers of yet another main language type – as in the data at hand, the average treatment effect (ATE) in an arbitrary geo-spatial unit and the local average treatment effect (LATE) in a close neighborhood to a Swiss internal language border of CNL_{ij} on outcome are defined as

$$\begin{aligned} \text{ATE} &\equiv \frac{E[y_{ij}|x_{ij} \geq 0] - E[y_{ij}|x_{ij} < 0]}{E[\text{CNL}_{ij}|x_{ij} \geq 0] - E[\text{CNL}_{ij}|x_{ij} < 0]} \qquad (3) \\ &= \lambda_{CNL} + E\left[\frac{f_1^*(x_{ij})}{E[\text{CNL}_{ij}|x_{ij} \geq 0] - E[\text{CNL}_{ij}|x_{ij} < 0]}\right] \\ \text{LATE} &\equiv \lim_{\Delta \to 0} \frac{(E[y_{ij}|0 \leq x_{ij} < \Delta] - E[y_{ij}| - \Delta < x_{ij} < 0])}{(E[\text{CNL}_{ij}|0 \leq x_{ij} < \Delta] - E[\text{CNL}_{ij}| - \Delta < x_{ij} < 0])} \\ &= \lambda_{CNL}. \qquad (4) \end{aligned}$$

Hence, ATE is the adjusted difference in conditional expectations of outcome between treated and untreated units, while LATE is the conditional expectation in outcome between treated and untreated units *in the neighborhood of* $x_{ij} = 0$. Both ATE and LATE are adjusted for the degree of fuzziness in the denominator which is a scalar in the open interval $(0, 1)$ in case of some finite degree of fuzziness as is the case with the data at hand. If treatment assignment is truly random conditional on x_{ij} and there is no other discontinuity determining treatment assignment other than about x_{ij}. Then, the limit of the difference in conditional expectations in Equation (4) is unconfounded by other covariates and there is no need to control for observables beyond $f_0(x_{ij})$ and $f_1(x_{ij})$.[29]

Empirically, the adjustment through the denominator in (3) and (4) can easily be made when regressing outcome y_{ij} on $\widehat{CNL}_{ij}$ instead of CNL_{ij} (apart from the control functions $f_0(.)$ and $f_1(.)$), where $\widehat{CNL}_{ij}$ is the prediction from a regression of

[29] We will check this later on by additionally controlling for the demeaned distance of zip code j to the Swiss external language border to a specific language zone and by estimating LATE in a subsample of observations where λ_{CNL} is only estimated from units to the left and the right of intra-cantonal language borders as is the case in the cantons of Bern (German/French), Valais (German/French), Fribourg (German/French), and Graubünden (German/Italian). Moreover, we will demonstrate that, for a given exporting country i and bilateral imports of zip code j from i versus zip code k from i as in (1), there is no discontinuity about zip code-specific effects m_j and m_k at internal language borders in Switzerland.

CNL_{ij} on the indicator variable RULE_{ij} which is unity whenever $x_{ij} \geq 0$ and zero else (and on the control functions $f_0(.)$ and $f_1(.)$).[30]

Regarding the design of the data-set for identification of the LATE of common native language on import outcomes, notice that each Swiss spatial unit (zip code) within a certain distance bracket to the left and the right of a Swiss language border is used up to thrice: once as a treated observation ($x_{ij} \geq 0$) and up to twice (depending on the considered distance window around language borders) as a control observation ($x_{ij} < 0$). This is because, say, a unit j in the German-speaking part and adjacent to the French-speaking part of Switzerland is considered as *treated* with imports from the German-speaking foreign language zone but as *untreated* (*control*) with imports from the French-speaking or the Italian-speaking foreign language zone, respectively. Given the choice of a certain distance window around language borders, only units which are within the respective window of two different language borders will show up thrice in the data.[31]

5.2 Main results

In the empirical analysis, we only consider zip codes within a radius of 50 kilometers (defined as either the minimum road or the minimum great circle distance) around internal language borders in Switzerland. We summarize regression results for the LATE of a common native language of residents in a region on the aforementioned outcomes for imports in Table 6 (using road distance as the forcing variable) and Table 7 (using great circle distance as the forcing variable) and in Figures 12 and 13. Notice that the adopted instrumental variable strategy entails that the estimated parameter on common native language reflects the LATE associated with a jump from zero (to the conceptual *left* of the border) to one-hundred percent (to the conceptual *right* of the border). Hence, the impact of common native language per percentage point overlap in common native language amounts to $0.01 \times \lambda_{CNL}$. Tables 6 and 7 contain eight numbered columns each, which indicate the functional form of the control functions $f_0(x_{ij})$ and $f_1(x_{ij})$, and Figures 12 and 13 illustrate the estimates of the nonparametric control functions in Column (4) of Tables 6 and 7. For each outcome considered, we report information with regard to the point estimate of LATE ($\hat{\lambda}_{CNL}$) and its standard error with a parametric control function and the correlation coefficient between the model prediction and the data

[30] Of course, as is standard with two-stage least squares, the standard errors have to be adjusted properly for the fact that $\widehat{CNL}_{ij}$ is estimated rather than observed.

[31] In the sample at hand, 15 German-speaking zip codes lie within 50 km from both the German-French and the German-Italian language border if we use the great circle distance as a distance measure. The corresponding number with respect to road distance is 4.

with a nonparametric control function, estimated in line with Fuji, Imbens, and Kalyanaraman (2009) and Imbens and Kalyanaraman (2012). Moreover, we report information on the number of cross-sectional units used for estimation, the R^2, and – for nonparametric estimates – the chosen bandwidth.[32] Tables 6 and 7 are organized in four panels: the panel on the upper left contains the results for the LATE of λ_{CNL} estimated from units within and across cantons; the panel on the upper right estimates the LATE by conditioning not only on the control function based on the forcing variables but also on the demeaned distance to Switzerland's external border with the respective language;[33] the two panels in the lower part of the tables correspond to the respective ones in the upper part but are only based on regressions involving intra-cantonal language borders in Switzerland to eliminate institutional differences between zip codes on two sides of a language border to the largest possible extent.

– Tables 6–7 and Figures 12–13 about here –

The tables and figures suggest the following conclusions. First, the quantitative difference between most of the comparable estimates of LATE on the same outcome in the upper left and upper right panels of Table 6 is relatively small and so is the one between the corresponding estimates of LATE in the upper and lower panels of Table 6. Hence, the results suggest that the RDD about road distance to internal language borders is capable of reducing substantially the possible bias of the LATE of common language majorities on (Switzerland's) import behavior. Second, model selection among the polynomial models based on the Akaike Information Criterion (AIC) as suggested by Lee and Lemieux (2010) leads to the choice of first-order to third-order polynomial control functions: higher-order polynomials are rejected in comparison due to efficiency loss. The AIC is minimized for the first-order polynomial control function for the value share and the transactions share. A second-order polynomial control function is selected for the number of products as outcome and the log quantity per transaction. A third-order polynomial is selected for the log unit value. And a fifth-order polynomial is selected for the log value per transaction.[34] Tables 6–7

[32] Recall that units may surface up to thrice in a regression: once as a treated and up to twice as a control unit. Therefore, the number of observations is relatively large in comparison to the ones reported in Table 4.

[33] Austria and Germany for German imports (relative to others), France for French imports, and Italy for Italian imports. The respective distance is demeaned properly such that λ_{CNL} still measures the LATE of a common language majority.

[34] In general, also the Bayesian Information Criterion selects first-order to third-order control functions. For the sake of brevity, we report LATEs involving either first-order to third-order parametric control functions or nonparametric control functions in the tables.

indicate that there is some sensitivity of the point estimates to the functional form of the control function. The reason for this might be that within a band of 50 kilometers around the internal language borders the functional form of the control function still matters. Therefore, it may be preferable to consider a nonparametric rather than a parametric control function. The point estimates indicate that the first-order polynomial parametric control functions tend to generate LATE parameters which tend to be closer to the nonparametric counterparts than the ones based on higher-order polynomials, on average. Third, utilizing the great circle distance instead of road distance in Table 7, the results are robust compared to Table 6. The LATE amounts to 0.222 for the import volume share, to 0.218 for the import transactions share and to 174 for the number of products with a parametric first-order polynomial control function. With a nonparametric control function, it amounts to 0.179 with respect to the import value share, to 0.199 regarding the import transaction share, and to 145 regarding the number of products. We find no significant effect regarding the log unit value, the log value per transaction, and the log quantity per transaction. Finally, the results suggest that speaking a common native language mainly reduces *fixed* rather than *variable trade costs*. The latter flows from the fact that we identify effects mainly at extensive import margins in the upper part of each panel in the vertical dimension but not on intensive import margins.

Table 6 suggests a significant LATE of common native language of 0.187 for the import volume share and 0.202 for the import transactions share, according to Column (1) of Table 6. The LATE of common native language for the number of transactions amounts to 186. Estimates based on a nonparametric control function suggest similar point estimates of the LATE in Column (4) of Table 6:[35] 0.179 for the import volume share, 0.196 for the import transactions share, and 102 for the number of transactions. Hence, the import value share from a given country is about 18 percentage points higher, the transaction share is almost 20 percentage points higher for a zip code with a common native language exporter than those shares are for a comparable zip code with a different native language exporter. Regions import 142 additional products from a neighboring country sharing a common native language compared to different native language exporters. There is no robust evidence regarding effects of common native language on other considered trade outcomes. Akin to the parametric evidence, results based on the nonparametric control function point to a dominance of effects of common native language on the extensive transaction margin of trade rather than at intensive margins (such as value per transaction, quantity per transaction, or unit value).

[35]The bandwidth for the nonparametric estimator is determined by following Imbens and Kalyanaraman (2012). The selected bandwidths are always reported in the tables.

Figures 12 and 13 visualize these results. While Figure 12 utilizes all zip codes within a certain distance to the language border in Switzerland, Figure 13 is only based on zip codes to the right and the left of intra-cantonal language borders. Both figures are organized in a similar way as Figure 11. They clearly suggest that discontinuities are more pronounced for extensive than intensive import transaction margins. The figures also suggest that the nonparametric control function eliminates the bias in the treatment effect even within the full data sample (within ±50 kilometers from the internal language borders).

5.3 Sensitivity analysis and extensions

The results reported in Subsection 5.2 provided already some insights in the sensitivity of the LATE estimates of common native language (majority) on import behavior by comparing results based on various (parametric and nonparametric) control functions, by considering road distance versus great circle distance as the forcing variable, and by comparing results for all zip codes within a certain window around the intra-Swiss language border versus ones that were located within the same canton. The aim of this section is to illustrate the qualitative insensitivity of the aforementioned results along various lines and to provide further results based on components (in terms of product and size categories) of imports rather than total imports.

The nonparametric native language LATE for alternative bandwidths

In a first step, we analyze the sensitivity of the nonparametric regressions to different bandwidth choices in Table 8.

– Table 8 about here –

In Columns (1) and (5) of Table 8, we utilize the same bandwidths (see Imbens and Kalyanaraman, 2012) as in Columns (4) and (8) of Table 6. The remaining nonparametric LATE estimates in Table 8 are based on fixed (lower than optimal) bandwidths in the other columns of Table 8.[36] The corresponding findings suggest that the results are fairly insensitive to choosing bandwidths between 20 and 30 kilometers, and bandwidths at 10 kilometers produce insignificant LATE parameters.

[36]The optimal bandwidth is about 40 kilometers for the extensive margins of interest, which is in line with bandwidths for outcomes chosen by the cross-validation criterion (these amount to 37 km for the value and the transactions share, to 39 km for the number of products, to 49 km for the log unit value, to 40 km for the log value per transaction, and to 50 km for the log quantity per transaction with all language borders). Since the cross-validation criterion suggests a bandwidth below 10 km for treatment, we use fixed bandwidths of 10, 20 and 30 as alternatives.

In general, bandwidths that are smaller than the optimal bandwidth lead to an efficiency loss, while bandwidths larger than the optimal one lead to larger bias.

Geographical placebo effects of the native language LATE

Moreover, we undertake two types of placebo analysis to see whether discontinuities of trade margins at internal language borders are spurious artifacts or not. For the first one, we consider the local average treatment effect of common native language on import outcomes from the rest of the world. The reason for this analysis is to check whether the pattern of trade around internal language borders indeed reflects a cultural relationship to the surrounding languages rather than spurious discontinuities which could occur for other languages and cultural contexts as well. For this, we utilize a sharp RDD and define language to be unity for all Roman languages.

– Table 9 about here –

This analysis is summarized in Table 9, and it suggests that there is no systematic effect of intra-Swiss language differences on imports from the rest of the world at the internal language borders. For the second placebo analysis, we test whether we observe discontinuities at points other than the majoritarian native language borders by splitting the sample in subsamples with forcing variables of $x_{ij} < 0$ or $x_{ij} > 0$. Then, we test for discontinuities at the median level of the forcing variable in those subsamples. Table 10 suggests that such discontinuities do not appear at the median.

– Tables 10 and 11 about here –

Furthermore, Figures 12 and 13 suggest that a discontinuity might exist at a distance to the internal language border of about 15 kilometers. Table 11 provides an assessment of this issue. It turns out that a statistically significant discontinuity is only detected with a first-order polynomial control function for import value shares with all (intra-cantonal and inter-cantonal internal border) data-points. Specifications with parametric higher-order polynomial control functions or nonparametric control functions do not identify a statistically significant discontinuity. Moreover, none of the control function approaches detects a significant discontinuity at a placebo language border which is 15 kilometers away of the actual language border when only considering intra-cantonal placebo borders.

Lack of a RDD for fixed zip code-specific effects at internal language borders

Since the underlying data are double-indexed (by Swiss zip code and foreign country), we may assess whether the importer-specific characteristics differ jointly between zip codes on the two sides of an internal language border. We illustrate graphically that zip code omitted variables are powerfully controlled for by the chosen design in Figure 14. For this, we estimate gravity models of the form of equation (1). While the modeling of the trade cost function is quite standard across new trade models, the structural interpretation of μ_i and m_j depends on the underlying theoretical model.

– Figure 14 about here –

Figure 14 suggests that there is no discontinuity of zip code characteristics (regarding their size and consumer price index) at Swiss internal common native language borders. Hence, considering regional units close to the language borders within Switzerland powerfully eliminates important sources of heterogeneity across exporters and importers. Moreover, by the normalization of outcomes – i.e., using import value or transaction shares from the same language zone of origin, etc. – any possible source of bias from a heterogeneity of foreign language zones is eliminated anyway.

The native language LATE for alternative intensive product margins

Here, we consider three additional outcomes regarding intensive *product* (rather than *transaction*) margins: log value per HS 8-digit product line; log unit value per product line; and log quantity per product line. The corresponding estimates are summarized in Table 12.

– Table 12 about here –

Except for the log unit value per product, where the LATE amounts to 0.236 with a nonparametric control function in Column (4) of Table 12, these intensive product margins are not affected by common native language. Altogether, the results confirm the earlier interpretation of the evidence about common (native) language as a determinant of fixed rather than ad-valorem trade costs.

The native language LATE for specific internal language borders

Next, we assess the possibly varying magnitude of the LATE of interest for specific internal language borders: the French-German and the German-Italian border within Switzerland. The corresponding results are summarized in Table 13. Columns (1)–(4)

refer to the French-German border and Columns (5)–(8) refer to the Italian-German border.

– Table 13 about here –

We observe that the LATE is much higher for the latter, amounting to 0.285 regarding the value share and to 0.293 regarding the transactions share, when considering the nonparametric estimates in Column (8). It is 0.168 and 0.180, respectively, for the former sample in Column (4). Hence, common native language is nearly twice as important for the German-Italian border than for the French-German one. One explanation for this may be seen in the relative importance of geographical barriers (by way of the mountains)[37] for the relative magnitude of cultural language barriers.

Beyond those border-specific results, we estimated the LATE for the internal language border in the canton of Fribourg only. The reason for this exercise was to eliminate any role of mountain barriers for the treatment effect of common native language. Doing so when using road distances to the internal border as the forcing variable led to LATE estimates of 0.249 for the value share (with a standard error of 0.067), and to 0.225 for the transactions share (with a standard error of 0.056) with a nonparametric control function. Hence, the corresponding results exhibit a slightly higher magnitude than the ones which are pooled across language treatments and language borders. Apart from that, the topographical barriers should not pose major problems to our identification strategy in the sense that they would spuriously confound the LATE of common native language. Transport routes such as tunnels are nowadays well accessible (for instance, it takes only 20 minutes to cross the Gotthardpass, which is the most important geographical barrier in the sample), and most parts of the language border do not involve mountainous barriers anyway.

The native language LATE for specific native languages

Beyond differences in the native language LATE across language barriers, there might be a difference with regard to specific native languages (or language treatments). One reason for this could be a greater general acceptance of or taste for goods from a specific language zone across all customers. Notice that part of the effect in Table 13 might be due to such heterogeneity already. Akin to the descriptive statistics about the transactions share shown in Figures 4–6, we summarize the relative magnitude of the LATE across the languages French, German, and Italian in Table 14.

– Table 14 about here –

[37]These alpine barriers are the *Gotthardpass* – a main transit route – and *Berninapass*.

In general, a distinction across the three native languages leads to a loss of degrees of freedom so that the LATE cannot be estimated at the same precision as the pooled estimates. In any case, there is evidence of the LATE to be strongest for imports from Italy when considering intra- and extra-cantonal language borders within Switzerland. With intra-cantonal language borders only the LATE for imports from France can be estimated at high-enough precision to reject the null hypothesis. The relative magnitude of the LATE for imports from France is comparable to the pooled estimates, irrespective of whether we consider all spatial units around internal language borders or only ones for intra-cantonal borders. The estimates for imports from Austria and Germany are somewhat smaller than the pooled ones, and the LATE estimates for imports from Italy are larger than the pooled estimates when considering all spatial units at the top of Table 14.

The native language LATE in the size distribution of importers

With the analysis at stake, it is worthwhile to consider different effects of native language on large versus small importers. The reason is that large importers might (i) more easily hire native workers from another language district (inducing worker commuting or migration) and (ii) engage in retailing. This would create fuzziness about the LATE.

– Table 15 about here –

To address this point in part, we augment the sensitivity analysis in Table 15 by reporting results for each of the four quartiles of the distribution of respective outcomes as used in Table 6. Since we consider road distance to be the preferable forcing variable, we base those results on road rather than great circle distance in the control function. For the sake of brevity, we only report estimates including the demeaned distance to respective national borders as a covariate. The nonparametric estimates in Table 15 suggest that the LATE is highest at the third quartile and lowest at the fourth quartile (of value shares and numbers of transactions).

Altogether, the findings in the previous subsection do not appear to be driven by large importers in particular. The quartile-specific results again point to the relevance of common native language for fixed rather than ad-valorem trade costs. For the smallest quartile of transaction sizes, the LATE is not only higher for extensive margins of trade than in the highest quartile, but it is even positive and significantly different from zero for log unit value and log value per transaction.

The native language LATE when excluding trading hubs

The effect of common native language may be biased by the fact that all zip codes, including major trading hubs, are used. It may be interesting to exclude the

following zip codes in which customs offices that handle trade in goods according to the Swiss Federal Customs Administration are located: Aarau, Basel, Birsfelden, Bern, Brig-Glis, Chavornay, Le Noirmont, Möhlin, and Pratteln. When excluding the corresponding zip codes, the LATE amounts to 0.184 regarding the value share, to 0.200 regarding the transactions share, and to 171 regarding the number of products.[38] These figures are similar to the ones reported in Table 6.

The native language LATE when accounting for cross-border shopping

One would want to see how the LATE of common native language changes as one excludes regional observations in the immediate proximity to the internal border. The latter would address the possibility of (internal language-)cross-border shopping as a consumer side counterpart to the supplier side argument related to hiring of non-local-native language commuters. Again, commuting or cross-border shopping would induce measurement error about the LATE of common native language.

– Tables 16 – 18 about here –

To shed light on this matter, we leave out all observations within 5, 10, and 15 kilometers around internal language borders and estimate the LATE from a discontinuity at a distance of 10, 20, and 30 kilometer, respectively, in the forcing variable in order to avoid measurement error in outcome by way of sales of goods at one side of the internal language border to customers at some distance on the other side of the border. Compared to the nonparametric estimates in Table 6, Tables 16 to 18 show that the nonparametric estimates of value and transactions shares increase to more than 0.2 if we leave out observations within 5, 10 and 15 kilometers from the language border. The estimates are robust across these three alternative truncation choices.[39] The pattern is the same – although less pronounced – for the parametric estimates.

The native language LATE for individual product categories

Finally, there may be a genuine interest in the relative magnitude of the LATE across alternative product categories for two reasons. First of all, preferences (and the specific role of culture) might differ across products or product types and, second, the relative importance of variable and fixed trade costs might vary across products.

[38] The corresponding estimates are based on a first-order polynomial specification, which is preferable when considering the AIC for the subsamples of data.

[39] The LATE for the value share amounts to 0.260, 0.262, and 0.270, respectively. It is 0.232, 0.242, and 0.276, respectively, for the transactions share. And it amounts to 128, 120, and 260 for the number of products, respectively. In addition, the LATE becomes significant if we leave out observations within 5 and 10 kilometers for the log unit value.

A first concern is that common culture by way of common native language might be more important for consumer goods than for intermediate goods. To shed light on this, we singled out consumer goods according to the Swiss Federal Customs Office to estimate the LATE of common native language only on those goods. The results are summarized in Table 19 for road distance as the forcing variable which suggests that there is no significant difference – neither qualitatively nor quantitatively – in the sensitivity of *all goods* in Table 6 versus *consumer goods only* in Table 19 to common native language.

– Table 19 about here –

In Figure 15, we illustrate estimates of the LATE point estimates across all HS 2-digit product lines (of which there are 97) by way of kernel density plots, and in Table 20 we summarize the LATE estimates across three goods categories – *homogeneous*, *reference-priced*, and *differentiated* goods – according to the so-called liberal classification by Rauch (1999). Both in Figure 15 and in Table 20 we utilize road distance as the forcing variable. The corresponding results may be summarized as follows. Figure 15 suggests that the dispersion of the LATE is fairly high for all outcomes. The LATE may be very high or even negative for some products, while the (by the industry share in terms of import value) weighted average is similar to the point estimates reported in Table 6. For instance, the LATE regarding the import value share is highest (amounting to 0.805) for *Vegetable plaiting materials* (HS 2-digit code 14) and lowest (amounting to 0.203) for *Electrical machinery and equipment and parts, telecommunications equipment, sound recorders, television recorders* (HS 2-digit code 85). The LATE in the – in terms of import value and in descending order – most important 2-digit products in the data at hand – *Jewelry* (pearls, stones, precious metals, imitation jewelry, coins; HS 2-digit code 71), *Machinery* (nuclear reactors, boilers, machinery and mechanical appliances, computers; HS 2-digit code 84), and *Pharmaceutical products* (HS 2-digit code 30) amounts to 0.282, 0.203, and 0.419, respectively.

– Figure 15 and Table 20 about here –

Table 20 reveals that the impact of common native language is more pronounced for *reference-priced* and *differentiated* goods than for *homogeneous* goods. In particular, there is a positive impact of common native language in those goods categories for both *reference-priced* and *differentiated* good import value and transaction shares and for *differentiated* good number of products. Even though we suppress the corresponding results here for the sake of brevity, similar conclusions could be drawn when employing the conservative classification by Rauch (1999). These results are broadly

in line with the findings in Melitz and Toubal (2012) who argue that cultural traits such as ethnic ties and trust are expected to be more important for differentiated than for homogeneous goods because trade in the former requires a larger amount of information.[40]

To get a more precise image about the importance of CNL underlying this relatively broad goods classification, we accompany this analysis by some evidence at the level of individual – HS 4-digit level– products based on their importance in terms of import volume. For this, let us consider one homogeneous production input (*refined copper & alloys (no mast alloy), unwrought; HS 4-digit code 7403*) and one homogenous consumer good (*fruit juices (& grape must) & veg. juice, no spirit; HS 4-digit code 2009*).The LATE amounts to 0.802 regarding the value share and to 0.751 regarding the transactions share for copper. It is 0.344 regarding the value share and 0.436 regarding the transactions share for fruit juice.[41] Next, we pick two reference-priced goods (*salt incl. table & dentrd., pure sodium chloride; HS 4-digit code 2501*; and *portland cement, aluminous cement, slag cement etc.; HS 4-digit code 2523*). The LATE is 0.528 regarding the value share and 0.661 regarding the transactions share for salt. The respective figures amount to 0.540 and 0.497, and to 0.5 regarding the number of HS 8-digit product lines for cement.[42] As an alternative, we consider two differentiated consumer goods (*women's or girls' suits, ensemb. etc., not knit etc.; HS 4-digit code 6204*; and *motor cars & vehicles for transporting persons; HS 4-digit code 8703*). For *suits*, the LATE is 0.346 regarding the value share, 0.339 regarding the transactions share, and 5 regarding the number

[40]Notice that one could write M_{ij} in (1) generically as

$$M_{ij} = b_{ij} t_{ij} \mu_i m_j u_{ij}, \tag{5}$$

where b_{ij} would be some ij-specific Armington-type parameter in the spirit of Anderson (1979) or Anderson and van Wincoop (2004) and t_{ij} is a measure of (exponentiated) pure trade costs. If one assumes in (1) that $b_{ij} = 1$ such that $t_{ij} = e^{\lambda \text{language}_{ij}} d_{ij}$ or $t_{ij} = e^{\lambda_{CNL} \text{CNL}_{ij}} e^{\lambda_{CSL} \text{CSL}_{ij}} d_{ij}$, all effects of common language on bilateral imports are channeled through trade costs. In general, it could be that $b_{ij} = f(\text{CNL}_{ij}, \text{CSL}_{ij}, d_{ij})$ as well as $t_{ij} = f(\text{CNL}_{ij}, \text{CSL}_{ij}, d_{ij})$. In the latter case, λ_{CNL} would measure the net impact of common native language of j from i through preferences as well as trade costs. The evidence provided in this paper suggests that differentiated goods depend more strongly on common native language (i.e., common culture) than homogeneous goods which provides some implicit support for a role of native language in preferences rather than only trade costs. However, it is not possible to discern the two channels quantitatively, since identically indexed Armington and trade cost parameters exert an isomorphic impact on trade volume.

[41]A first-order polynomial specification is chosen by the AIC for both products.

[42]A first-order polynomial specification is chosen by the AIC for salt, and a third-order polynomial specification is selected for cement.

of products. The LATE is 0.249 for the value share, 0.311 for the transactions share, 1.5 for the number of products, and -0.841 for the log unit value for *Cars*.[43] The choice of additional alternative products also provides significant results for LATE. Together with the results from Table 20, we conclude from this that native language barriers seem to relate more closely to fixed trade costs related to cultural differences. Although on average, the language effect seems to be more pronounced for reference-priced and differentiated goods than for homogenous goods, the analysis of individual products shows that the effect of common native language is overall important.

6 Conclusions

This paper combines three sources of information to isolate the impact of common native language as a measure of cultural proximity on international trade: geographical information about language zones in Switzerland; transaction-level data on international trade by geographical site in Switzerland; and the distance of importers to internal language borders within Switzerland as well as to national borders. These data let us infer the impact of common native language on international trade to language zones corresponding to the ones around the internal language border in Switzerland. The empirical framework chosen for such inference is a fuzzy regression discontinuity design, focusing on import transaction data of three language zones in Switzerland: German-speaking, French-speaking, and Italian-speaking. We consider different margins of trade of these zones from countries sharing a common language. We postulate flexible functional forms about the impact of distance-to-internal-language-border on such trade flows to identify the discontinuity of importing behavior at the internal language borders. Since Swiss citizens quite proficiently speak the respective other (non-native) main languages of the country, especially within regions in close proximity to internal language borders, we argue that this paper is able to estimate the effect of common native language capturing common cultural traits that generate common preferences, trust, and information about social norms of interaction, thereby leading to enhanced trade.

This strategy suggests effects of common native language of the following magnitude. The value share and the transactions share of a geographical unit from an import destination are 18 and 20 percentage points higher, respectively, if common native language is the same. The effect is about 102 for the number of products imported. We find no significant effect with respect to the unit value, the value

[43] A first-order polynomial specification is chosen for suits, and a second-order polynomial specification is selected for cars.

per transaction, and the quantity per transaction. We conclude that – by reducing fixed rather than variable trade costs – speaking a common native language matters for extensive margins rather than intensive margins of trade. In addition, the local average treatment effect differs among transaction size classes and substantially so across industries, where it seems to be more important for differentiated goods categories rather than homogeneous products.

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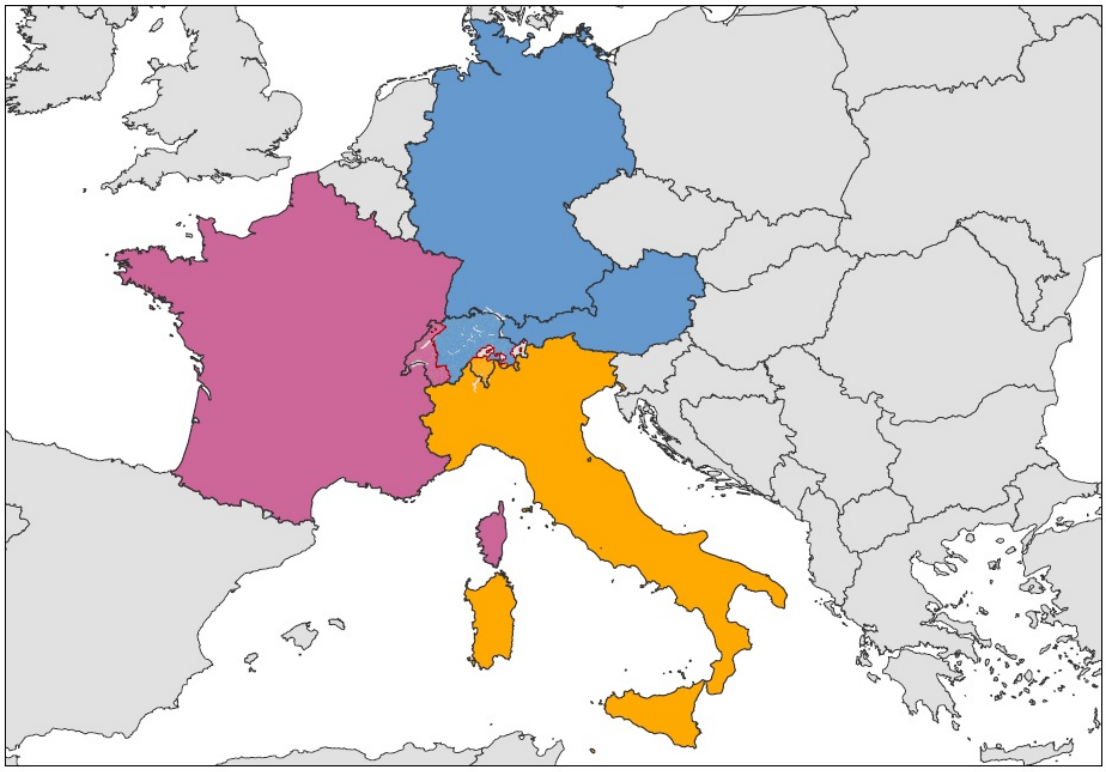
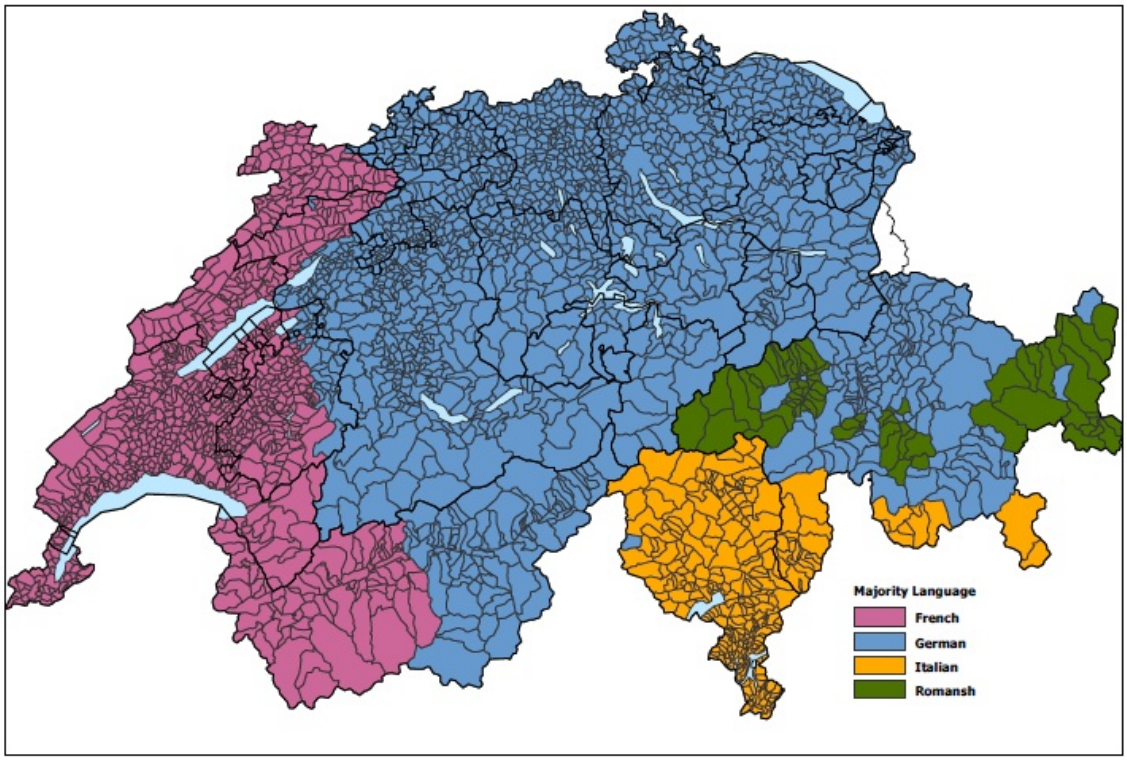
Figure 1: Language regions in Switzerland and neighboring countries by native language majority



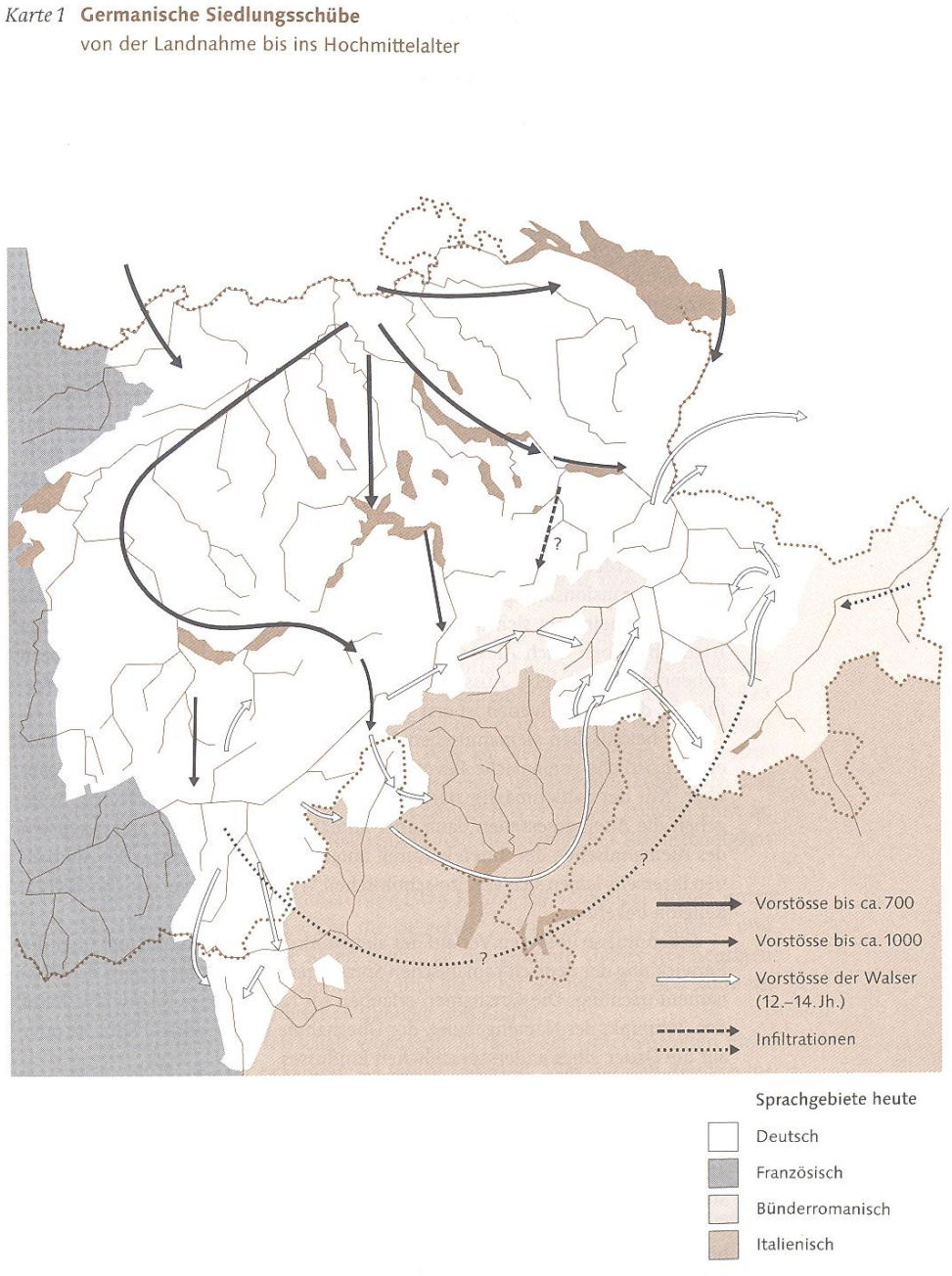
Data Source: Wikipedia; 1990 Census, Swiss Federal Statistical Office.

Figure 2: Language regions in Switzerland by native language majority



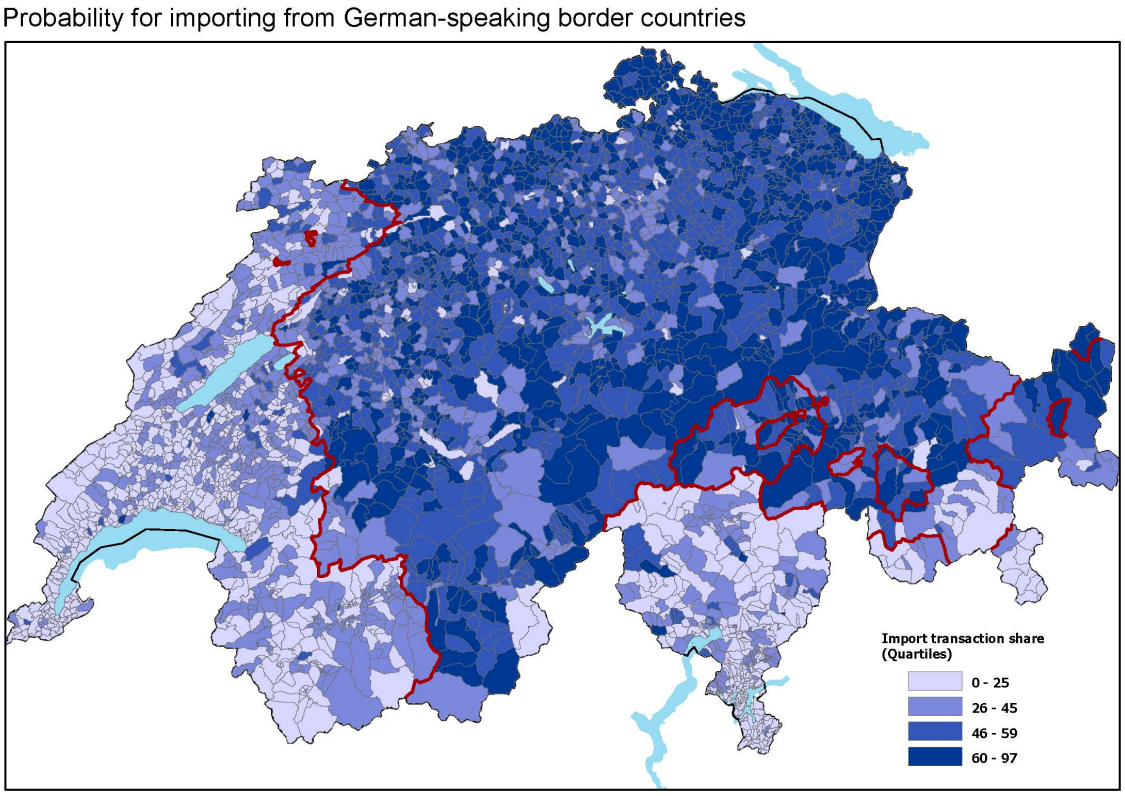
Data Source: 1990 Census, Swiss Federal Statistical Office. Thin lines represent municipality borders, bold lines indicate cantonal and national borders. Official 50% majority cutoff. Those borders are the same as the historical language borders associated with the political formation of Switzerland.

Figure 3: Historic language regions in Switzerland



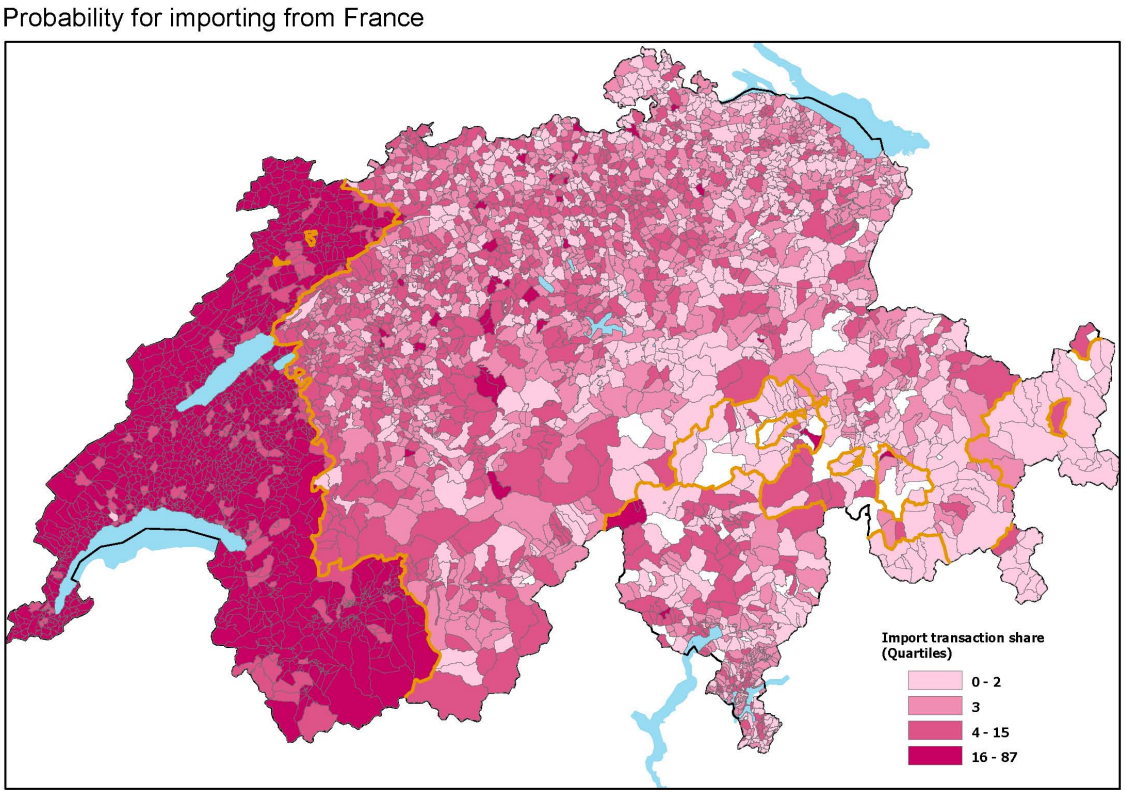
Source: Gallmann, 2010.

Figure 4: Share of transactions from German-speaking countries in total transactions by zip code in %



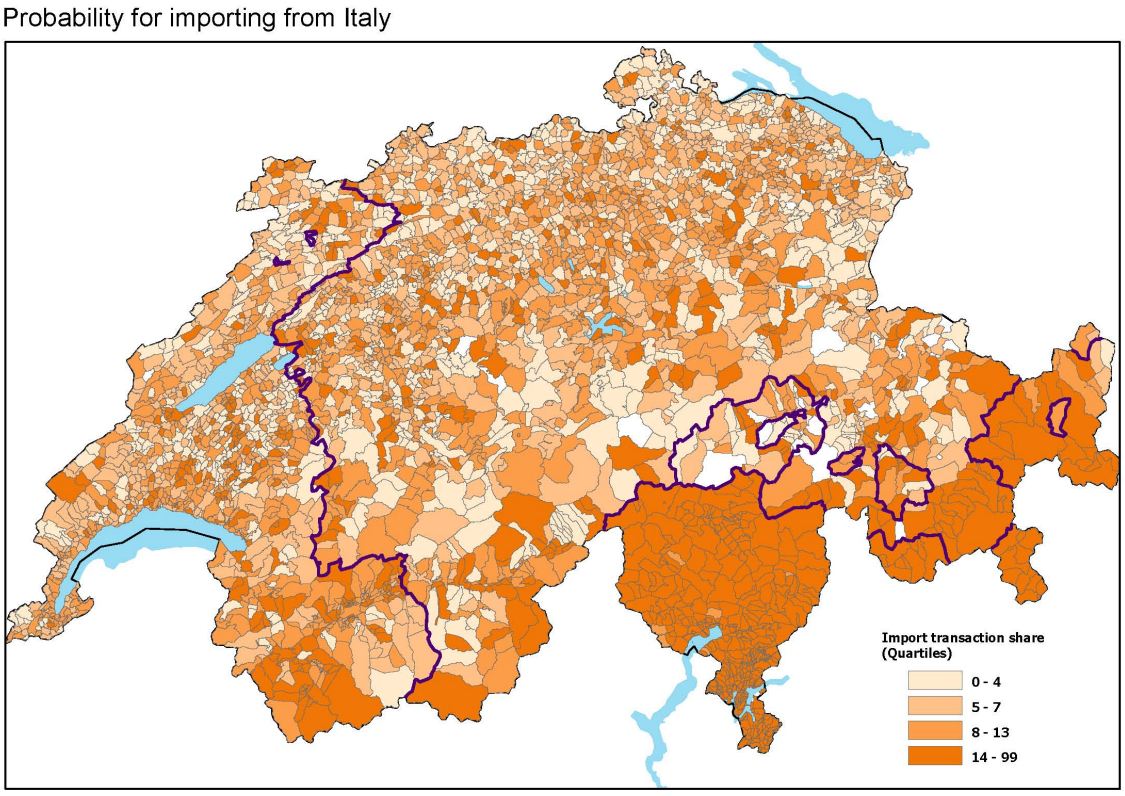
Data source: Swiss Federal Customs Administration 2006–2011 and 1990 Census, Swiss Federal Statistical Office. Bold red lines represent language borders, thin lines indicate zip code regions.

Figure 5: Share of transactions from France in total transactions by zip code in %



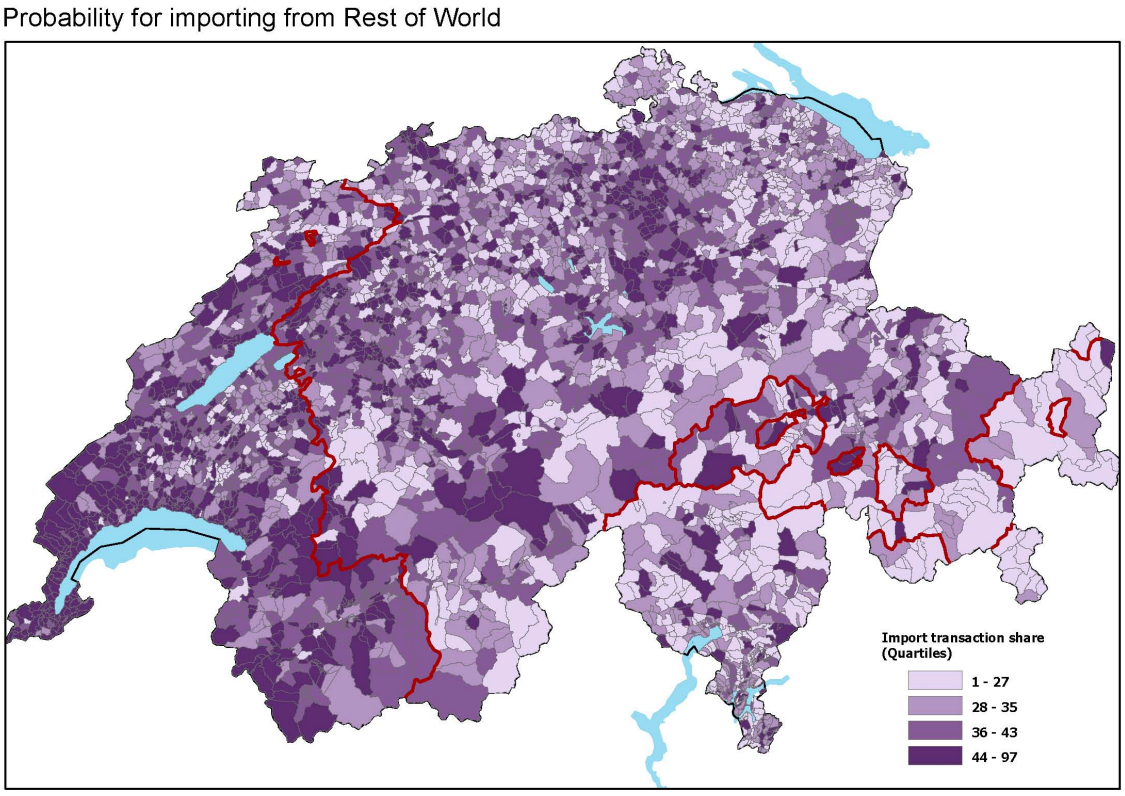
Data source: Swiss Federal Customs Administration 2006–2011 and 1990 Census, Swiss Federal Statistical Office. Bold yellow lines represent language borders, thin lines indicate zip code regions.

Figure 6: Share of transactions from Italy in total transactions by zip code in %



Data source: Swiss Federal Customs Administration 2006–2011 and 1990 Census, Swiss Federal Statistical Office. Bold purple lines represent language borders, thin lines indicate zip code regions.

Figure 7: Share of transactions from RoW in total transactions by zip code in %



Data source: Swiss Federal Customs Administration 2006–2011 and 1990 Census, Swiss Federal Statistical Office. Bold red lines represent language borders, thin lines indicate zip code regions.

Table 1: Descriptive statistics about imports and official language use within the three most important language districts in Switzerland

Characteristics of regions at the German-French language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially French-speaking regions				
Distance to language border in kilometers	% German speakers	% imports from German-speaking countries	% imports from French-speaking countries	% transactions from German-speaking countries	% transactions from French-speaking countries	% French speakers	% imports from German-speaking countries	% imports from French-speaking countries	% transactions from German-speaking countries	% transactions from French-speaking countries
All regional units										
0-1	80.7	45.2	10.5	40.0	6.8	62.8	43.6	13.2	34.6	13.5
1-2	85.2	37.8	9.4	35.8	7.2	81.4	35.2	17.9	31.9	15.7
2-5	94.6	42.4	7.3	43.4	5.1	87.0	30.2	28.2	26.9	23.8
5-10	97.5	51.9	6.2	49.2	4.6	90.5	31.1	26.4	29.4	21.6
10-20	97.4	52.3	6.8	50.7	4.6	92.9	29.9	26.1	26.0	23.3
20-50	97.8	52.7	6.2	49.4	4.3	94.6	25.7	31.3	23.5	24.2
All	96.8	53.8	5.1	51.9	3.6	91.9	24.8	29.7	22.9	23.7
Regional units within cantons through which intranational FR/DE language border runs										
0-1	83.5	44.8	8.4	38.3	5.1	66.5	40.7	13.8	33.2	14.8
1-2	86.8	33.8	10.3	32.1	7.6	75.4	40.6	20.8	28.2	17.6
2-5	94.2	40.3	7.1	40.5	4.7	85.6	30.9	26.7	26.1	23.5
5-10	97.1	50.9	7.5	48.4	5.0	90.8	29.9	26.2	27.1	22.4
10-20	97.6	52.4	6.9	49.5	4.8	93.1	30.0	24.4	26.7	22.1
20-50	98.2	53.0	6.5	48.3	4.1	96.1	25.8	27.5	22.3	22.9
All	96.9	50.9	6.9	47.1	4.5	91.5	29.2	25.5	25.3	22.1
Characteristics of regions at the German-Italian language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially Italian-speaking regions				
Distance to language border in kilometers	% German speakers	% imports from German-speaking countries	% imports from Italian-speaking countries	% transactions from German-speaking countries	% transactions from Italian-speaking countries	% Italian speakers	% imports from German-speaking countries	% imports from Italian-speaking countries	% transactions from German-speaking countries	% transactions from Italian-speaking countries
All regional units										
0-1	-	-	-	-	-	79.0	4.9	81.6	9.6	63.9
1-2	60.7	30.9	59.0	23.4	62.4	71.4	2.6	83.0	18.6	58.1
2-5	91.9	41.9	42.8	36.1	35.5	90.4	25.3	59.3	15.0	61.1
5-10	91.3	60.4	28.7	43.8	25.5	88.0	24.8	59.1	19.7	60.3
10-20	94.3	59.4	22.7	50.1	21.2	90.6	25.1	58.5	23.7	47.8
20-50	98.2	57.6	12.6	52.2	9.9	86.2	22.4	58.7	20.9	50.1
All	96.5	53.8	9.7	51.9	8.6	87.3	19.4	59.8	18.6	52.2
Regional units within cantons through which intranational IT/DE language border runs										
0-1	-	-	-	-	-	79.0	4.9	81.6	9.6	63.9
1-2	68.5	37.6	49.4	25.6	58.6	71.4	2.6	83.0	18.6	58.1
2-5	89.8	32.7	51.9	33.2	43.4	87.3	40.1	50.4	15.4	63.5
5-10	89.5	54.9	34.2	44.3	28.5	81.9	16.7	72.2	14.8	72.7
10-20	93.6	58.7	24.9	47.8	23.3	87.8	14.1	66.7	18.2	62.0
20-50	98.0	57.9	13.8	51.2	11.3	88.6	23.5	61.3	23.5	54.6
All	95.9	56.3	19.0	49.0	16.3	86.1	20.0	65.2	19.2	61.4

Source: Swiss Federal Customs Administration 2006–2011 (EDEC). Distance measured by great circle distance to the language border.

Table 2: Descriptive statistics about trade and official language use within the three most important language districts in Switzerland (continued)

Characteristics of regions at the German-French language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially French-speaking regions				
Distance to language border in kilometers	% German speakers	# products (HS 8) from German-speaking countries	# products (HS 8) from French-speaking countries	Log unit value from German-speaking countries	Log unit value from French-speaking countries	% French speakers	# products (HS 8) from German-speaking countries	# products (HS 8) from French-speaking countries	Log unit value from German-speaking countries	Log unit value from French-speaking countries
All regional units										
0-1	80.7	331	90	5.3	5.0	62.8	223	112	5.2	4.5
1-2	85.2	508	160	5.3	5.7	81.4	402	267	5.2	5.0
2-5	94.6	578	129	5.4	5.1	87.0	283	214	5.2	5.3
5-10	97.5	401	68	5.0	4.7	90.5	284	178	5.0	5.2
10-20	97.4	523	89	5.1	4.6	92.9	205	170	5.3	5.2
20-50	97.8	621	113	5.0	4.7	94.6	228	206	5.1	5.0
All	96.8	660	107	5.1	4.8	91.9	287	273	5.3	5.3
Regional units within cantons through which intranational FR/DE language border runs										
0-1	83.5	375	104	5.3	4.9	66.5	249	129	5.2	4.6
1-2	86.8	573	191	5.4	5.8	75.4	452	298	5.2	5.1
2-5	94.2	480	113	5.5	5.1	85.6	307	231	5.3	5.4
5-10	97.1	398	80	5.0	4.7	90.8	276	181	5.1	5.2
10-20	97.6	345	55	5.0	4.5	93.1	186	149	5.2	5.0
20-50	98.2	500	83	5.1	4.7	96.1	210	194	5.0	4.8
All	96.9	459	84	5.1	4.7	91.5	230	183	5.1	5.0
Characteristics of regions at the German-Italian language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially Italian-speaking regions				
Distance to language border in kilometers	% German speakers	# products (HS 8) from German-speaking countries	# products (HS 8) from Italian-speaking countries	Log unit value from German-speaking countries	Log unit value from Italian-speaking countries	% Italian speakers	# products (HS 8) from German-speaking countries	# products (HS 8) from Italian-speaking countries	Log unit value from German-speaking countries	Log unit value from Italian-speaking countries
All regional units										
0-1	-	-	-	-	-	79.0	27	116	4.5	4.9
1-2	60.7	30	67	4.4	4.2	71.4	7	17	5.1	6.0
2-5	91.9	109	55	4.7	3.7	90.4	71	171	5.0	3.5
5-10	91.3	210	141	5.1	4.0	88.0	87	163	4.6	4.4
10-20	94.3	214	204	4.8	3.8	90.6	83	142	4.6	4.0
20-50	98.2	345	84	5.0	4.4	86.2	207	372	5.1	4.3
All	96.5	660	166	5.1	4.5	87.3	204	420	5.1	4.4
Regional units within cantons through which intranational IT/DE language border runs										
0-1	-	-	-	-	-	79.0	27	116	4.5	4.9
1-2	68.5	37	84	4.4	4.6	71.4	7	17	5.1	6.0
2-5	89.8	82	58	4.5	3.2	87.3	74	235	6.7	3.0
5-10	89.5	236	168	5.1	3.9	81.9	110	248	4.9	4.1
10-20	93.6	233	226	4.9	3.9	87.8	62	215	4.5	3.6
20-50	98.0	248	70	4.9	4.4	88.6	79	238	4.9	3.6
All	95.9	234	96	4.9	4.2	86.1	78	225	4.9	3.8

Source: Swiss Federal Customs Administration 2006–2011 (EDEC). Distance measured by great circle distance to the language border.

Table 3: Descriptive statistics about trade and official language use within the three most important language districts in Switzerland (continued)

Characteristics of regions at the German-French language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially French-speaking regions				
Distance to language border in kilometers	% German speakers	Log value/transaction from German-speaking countries	Log value/transaction from French-speaking countries	Log quantity/transaction from German-speaking countries	Log quantity/transaction from French-speaking countries	% French speakers	Log value/transaction from German-speaking countries	Log value/transaction from French-speaking countries	Log quantity/transaction from German-speaking countries	Log quantity/transaction from French-speaking countries
All regional units										
0-1	80.7	8.2	8.4	6.3	7.0	62.8	8.3	8.2	6.7	6.5
1-2	85.2	8.0	8.2	6.2	6.5	81.4	8.3	8.4	6.7	7.3
2-5	94.6	8.4	8.5	6.8	6.8	87.0	8.3	8.4	6.9	6.8
5-10	97.5	8.3	8.2	6.7	6.7	90.5	8.3	8.4	6.7	6.8
10-20	97.4	8.2	8.3	6.7	6.9	92.9	8.2	8.2	6.6	6.9
20-50	97.8	8.3	8.3	6.8	7.0	94.6	8.2	8.4	6.5	7.3
All	96.8	8.4	8.3	6.9	6.6	91.9	8.2	8.4	6.5	7.1
Regional units within cantons through which intranational FR/DE language border runs										
0-1	83.5	8.2	8.4	6.4	6.6	66.5	8.4	8.2	6.7	6.5
1-2	86.8	8.1	8.2	6.1	6.0	75.4	8.4	8.1	6.8	7.0
2-5	94.2	8.2	8.4	6.5	6.5	85.6	8.4	8.4	7.0	6.9
5-10	97.1	8.3	8.4	6.7	7.1	90.8	8.4	8.4	6.8	6.8
10-20	97.6	8.2	8.2	6.6	6.9	93.1	8.1	8.2	6.6	6.8
20-50	98.2	8.2	8.1	6.6	6.8	96.1	8.1	8.2	6.5	7.1
All	96.9	8.2	8.2	6.6	6.8	91.5	8.2	8.2	6.6	6.9
Characteristics of regions at the German-Italian language border within Switzerland										
	Swiss officially German-speaking regions					Swiss officially Italian-speaking regions				
Distance to language border in kilometers	% German speakers	Log value/transaction from German-speaking countries	Log value/transaction from Italian-speaking countries	Log quantity/transaction from German-speaking countries	Log quantity/transaction from Italian-speaking countries	% Italian speakers	Log value/transaction from German-speaking countries	Log value/transaction from Italian-speaking countries	Log quantity/transaction from German-speaking countries	Log quantity/transaction from Italian-speaking countries
All regional units										
0-1	-	-	-	-	-	79.0	7.4	8.3	5.7	7.8
1-2	60.7	8.5	7.7	5.4	7.6	71.4	5.0	7.4	0.2	4.2
2-5	91.9	7.9	8.3	6.2	8.3	90.4	8.7	8.4	6.4	7.8
5-10	91.3	8.6	7.9	6.7	8.6	88.0	8.3	8.2	6.3	7.1
10-20	94.3	8.1	7.9	6.6	7.6	90.6	7.9	8.4	6.0	7.6
20-50	98.2	8.2	7.9	6.7	8.0	86.2	8.1	8.3	6.1	7.2
All	96.5	8.4	8.1	6.9	6.0	87.3	8.0	8.3	6.0	7.4
Regional units within cantons through which intranational IT/DE language border runs										
0-1	-	-	-	-	-	79.0	7.4	8.3	5.7	7.8
1-2	68.5	8.8	7.6	5.7	5.7	71.4	5.0	7.4	0.2	4.2
2-5	89.8	7.6	8.3	6.0	8.1	87.3	9.9	8.0	7.5	7.4
5-10	89.5	8.5	8.5	6.5	7.7	81.9	8.3	8.2	6.4	7.0
10-20	93.6	8.1	7.7	6.7	6.0	87.8	7.9	8.3	6.4	7.6
20-50	98.0	8.1	7.9	6.6	5.9	88.6	7.7	8.1	5.4	7.6
All	95.9	8.1	7.9	6.6	6.1	86.1	8.0	8.1	5.9	7.4

Source: Swiss Federal Customs Administration 2006–2011 (EDEC). Distance measured by great circle distance to the language border.

Table 4: Number of zip code regions in different language districts and in various distance intervals around internal Swiss language borders

	Official language			Official language		
Number of zip codes in French-German part	French	German	Number of zip codes in German-Italian part	German	Italian	Unique sum
Using great circle distances						
Within 1km of FR/DE intranational border	14	15	Within 1km of DE/IT intranational border	0	1	30
Within 5km of FR/DE intranational border	70	81	Within 5km of DE/IT intranational border	13	10	174
Within 10km of FR/DE intranational border	131	160	Within 10km of DE/IT intranational border	25	29	345
Within 20km of FR/DE intranational border	268	318	Within 20km of DE/IT intranational border	50	70	706
Within 50km of FR/DE intranational border	543	739	Within 50km of DE/IT intranational border	235	198	1700
All	808	1993	All	1993	278	3079
Within 1km of FR/DE intranational border	12	11	Within 1km of DE/IT intranational border	0	1	24
Within 5km of FR/DE intranational border	48	62	Within 5km of DE/IT intranational border	10	5	125
Within 10km of FR/DE intranational border	84	112	Within 10km of DE/IT intranational border	20	13	229
Within 20km of FR/DE intranational border	171	200	Within 20km of DE/IT intranational border	42	22	435
Within 50km of FR/DE intranational border	281	475	Within 50km of DE/IT intranational border	152	36	929
Through which intranational FR/DE language border runs	281	517	Through which intranational DE/IT language border runs	151	37	986
Using road distances						
Within 1km of FR/DE intranational border	16	18	Within 1km of DE/IT intranational border	4	5	43
Within 5km of FR/DE intranational border	61	59	Within 5km of DE/IT intranational border	11	12	143
Within 10km of FR/DE intranational border	109	121	Within 10km of DE/IT intranational border	19	18	267
Within 20km of FR/DE intranational border	232	259	Within 20km of DE/IT intranational border	30	32	553
Within 50km of FR/DE intranational border	561	726	Within 50km of DE/IT intranational border	120	79	1482
All	808	1993	All	1993	278	3079
Within 1km of FR/DE intranational border	14	16	Within 1km of DE/IT intranational border	4	3	37
Within 5km of FR/DE intranational border	43	50	Within 5km of DE/IT intranational border	10	8	111
Within 10km of FR/DE intranational border	69	94	Within 10km of DE/IT intranational border	16	10	189
Within 20km of FR/DE intranational border	144	169	Within 20km of DE/IT intranational border	25	16	354
Within 50km of FR/DE intranational border	258	434	Within 50km of DE/IT intranational border	101	31	820
Through which intranational FR/DE language border runs	281	517	Through which intranational DE/IT language border runs	151	37	986

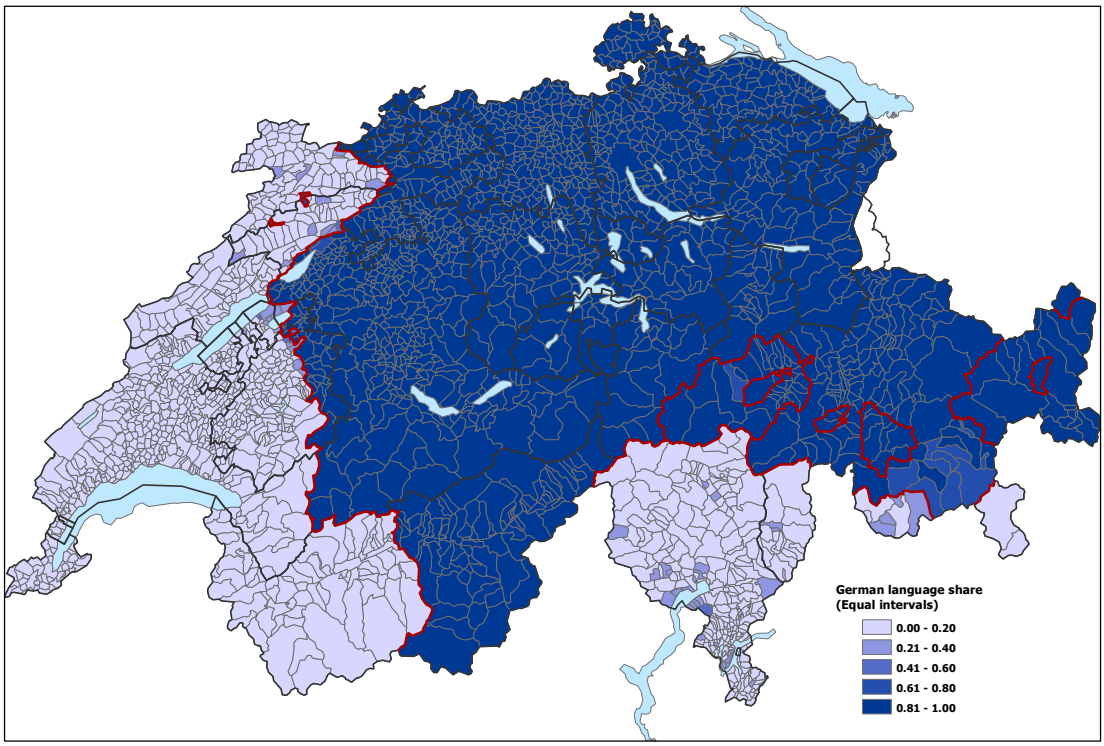
Source: 1990 Census, Swiss Federal Statistical Office. Distance measured by great circle distance to the language border.

Table 5: Population shares according to language in various distance intervals around internal Swiss language borders in %

	German-French speaking language border regions				German-Italian speaking language border regions			
	German speakers		French speakers		German speakers		Italian speakers	
Distance bins from language border	DE regions	FR regions	DE regions	FR regions	DE regions	IT regions	DE regions	IT regions
Within 1km of language border	80.7	36.1	18.4	62.8	-	21.0	-	79.0
Within 5km of language border	89.5	17.9	9.2	80.6	82.3	11.9	16.9	87.4
Within 10km of language border	93.4	13.2	5.5	85.2	86.6	11.5	12.6	87.8
Within 20km of language border	95.4	9.5	3.5	89.2	90.4	9.5	8.8	89.4
Within 50km of language border	96.8	6.9	2.0	91.9	96.5	11.2	2.9	87.3
All	96.8	6.9	2.0	91.9	96.5	11.2	2.9	87.3
Within 1km of language border	83.5	32.2	15.6	66.5	-	21.0	-	79.0
Within 5km of language border	90.2	19.8	8.7	78.7	83.4	17.6	15.8	82.4
Within 10km of language border	93.3	14.5	5.8	83.9	86.5	17.5	12.6	82.1
Within 20km of language border	95.2	10.1	4.0	88.6	90.2	14.9	9.0	84.4
Within 50km of language border	96.9	7.4	2.2	91.5	95.9	13.1	3.5	86.1
Through which language border runs	96.9	7.4	2.2	91.5	95.9	13.1	3.5	86.1

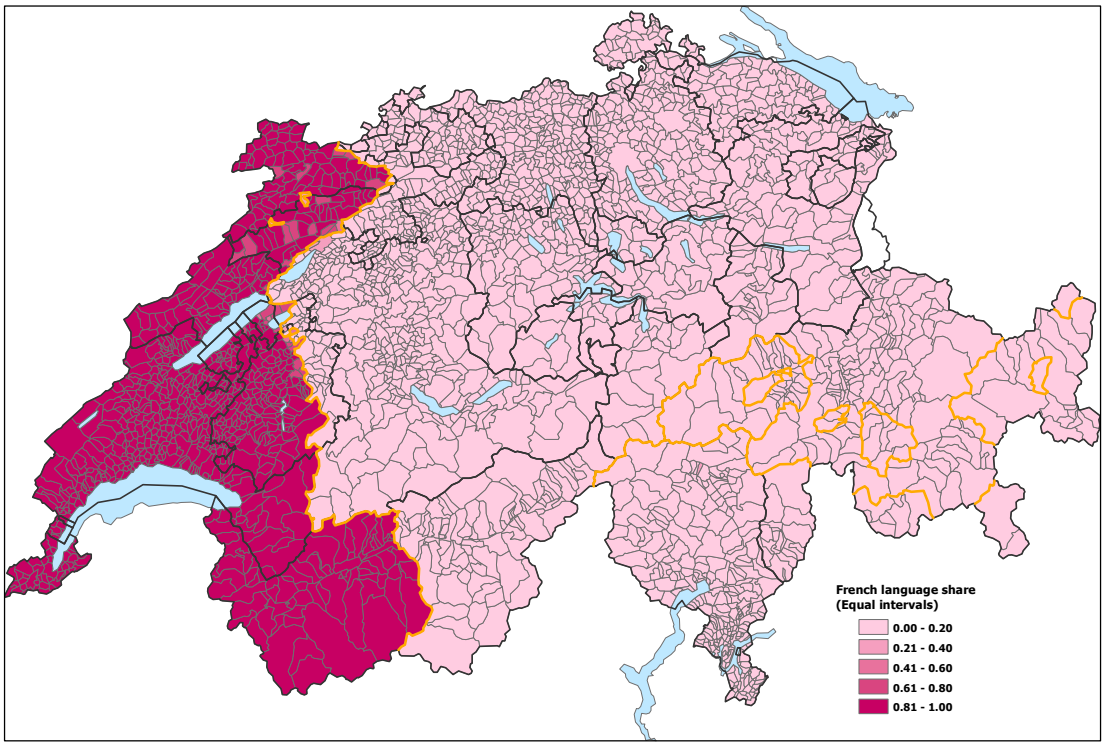
Source: 2000 Census, Swiss Federal Statistical Office. Distance measured by great circle distance to the language border.

Figure 8: Share of German-speaking population and language borders in Switzerland



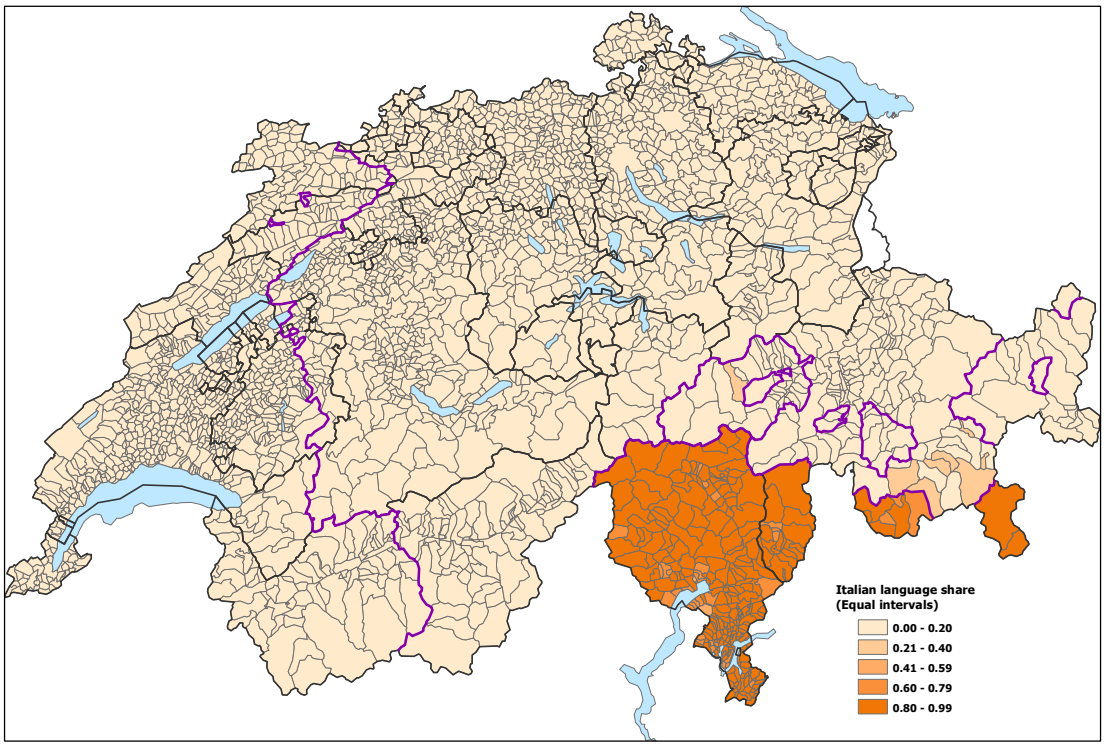
Data Source: 2000 Census, Swiss Federal Statistical Office. Thin lines represent municipality borders, bold lines indicate cantonal and national borders and red lines indicate language borders according to the official 50% rule. The figure shows the share of German-speaking population in German, French, and Italian speaking population.

Figure 9: Share of French-speaking population and language borders in Switzerland



Source: 2000 Census, Swiss Federal Statistical Office. Thin lines represent municipality borders, bold lines indicate cantonal and national borders and yellow lines indicate language borders according to the official 50% rule. The figure shows the share of French-speaking population in German, French, and Italian speaking population.

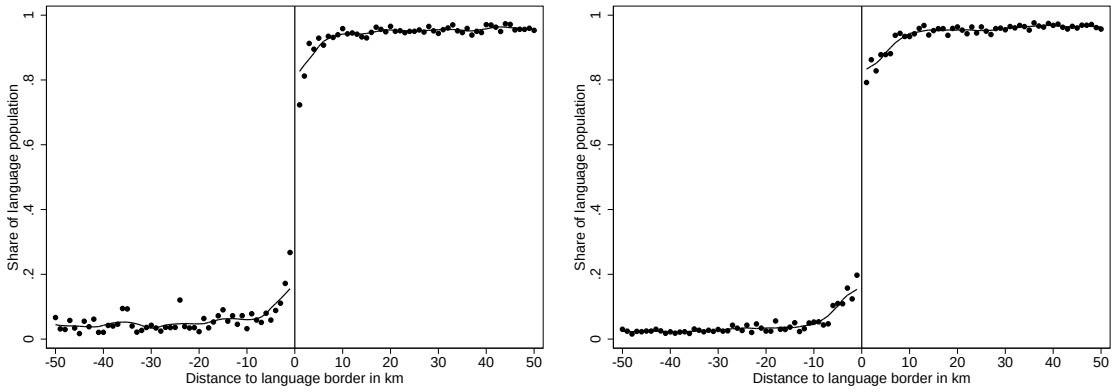
Figure 10: Share of Italian-speaking population and language borders in Switzerland



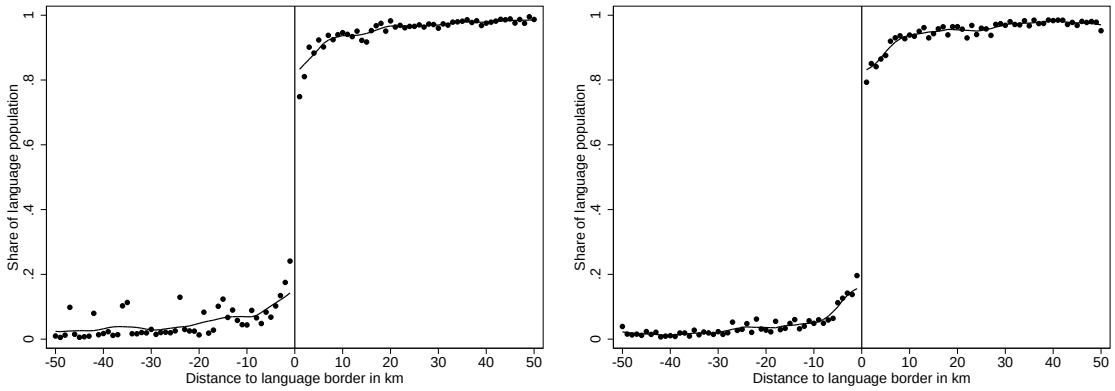
Source: 2000 Census, Swiss Federal Statistical Office. Thin lines represent municipality borders, bold lines indicate cantonal and national borders and purple lines indicate language borders according to the official 50% rule. The figure shows the share of Italian-speaking population in German, French, and Italian speaking population.

Figure 11: Treatment probability by great circle (left) and road distance (right) to language border

(a) All cantons



(b) Cantons through which internal language borders run



Notes: Treated observations (common language) to the right side of the language border (positive distance) and control observations (non-common language) to the left side of the language border (negative distance) in all figures.

Table 6: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland (using road distance to the language border)

Common native language		Baseline regression				Including distance to external border		
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.187	0.179	0.132	0.179	0.194	0.184	0.134	0.186
	(0.019)***	(0.032)***	(0.045)***	(0.025)***	(0.019)***	(0.031)***	(0.043)***	(0.025)***
Obs.	2968	2968	2968	2623	2968	2968	2968	2623
Cent. R-squ./Bandwidth	0.339	0.338	0.334	44	0.383	0.382	0.380	44
Transactions share								
Treatment	0.202	0.196	0.185	0.196	0.209	0.201	0.187	0.202
	(0.015)***	(0.025)***	(0.035)***	(0.022)***	(0.014)***	(0.024)***	(0.034)***	(0.022)***
Obs.	2968	2968	2968	2355	2968	2968	2968	2355
Cent. R-squ./Bandwidth	0.413	0.413	0.412	40	0.466	0.465	0.464	40
Number of products (HS8 tariff lines)								
Treatment	186.369	77.463	78.381	102.085	184.343	84.918	89.690	107.576
	(40.574)***	(66.924)	(93.802)	(53.857)*	(40.380)***	(66.794)	(93.809)	(52.893)**
Obs.	2968	2968	2968	1836	2968	2968	2968	1836
Cent. R-squ./Bandwidth	0.074	0.078	0.078	31	0.079	0.083	0.083	31
Log unit value								
Treatment	0.086	0.059	-0.147	0.081	0.088	0.085	-0.112	0.089
	(0.109)	(0.180)	(0.253)	(0.125)	(0.108)	(0.179)	(0.252)	(0.124)
Obs.	2954	2954	2954	2954	2954	2954	2954	2954
Cent. R-squ./Bandwidth	0.010	0.011	0.011	50	0.020	0.021	0.021	50
Log value per transaction								
Treatment	-0.052	-0.081	-0.233	-0.059	-0.067	-0.083	-0.227	-0.068
	(0.089)	(0.147)	(0.207)	(0.092)	(0.089)	(0.147)	(0.207)	(0.092)
Obs.	2954	2954	2954	2954	2954	2954	2954	2954
Cent. R-squ./Bandwidth	0.002	0.003	0.004	50	0.009	0.010	0.011	50
Log quantity per transaction								
Treatment	0.017	-0.254	-0.289	-0.177	-0.023	-0.260	-0.275	-0.183
	(0.160)	(0.265)	(0.372)	(0.210)	(0.158)	(0.263)	(0.370)	(0.210)
Obs.	2954	2954	2954	2163	2954	2954	2954	2163
Cent. R-squ./Bandwidth	0.004	0.006	0.006	36	0.022	0.022	0.022	36
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.155	0.174	0.153	0.163	0.163	0.162	0.137	0.160
	(0.025)***	(0.039)***	(0.052)***	(0.031)***	(0.024)***	(0.038)***	(0.051)***	(0.031)***
Obs.	1644	1644	1644	1468	1644	1644	1644	1468
Cent. R-squ./Bandwidth	0.357	0.359	0.358	43	0.397	0.397	0.397	43
Transactions share								
Treatment	0.180	0.197	0.229	0.193	0.187	0.186	0.215	0.189
	(0.019)***	(0.030)***	(0.040)***	(0.026)***	(0.018)***	(0.029)***	(0.039)***	(0.026)***
Obs.	1644	1644	1644	1352	1644	1644	1644	1352
Cent. R-squ./Bandwidth	0.448	0.450	0.454	39	0.495	0.495	0.498	39
Number of products (HS8 tariff lines)								
Treatment	182.133	112.093	149.891	133.725	185.618	100.619	135.794	128.002
	(44.431)***	(69.482)	(93.395)	(62.082)**	(44.020)***	(69.115)	(93.066)	(61.903)**
Obs.	1644	1644	1644	1205	1644	1644	1644	1205
Cent. R-squ./Bandwidth	0.079	0.081	0.081	34	0.091	0.095	0.094	34
Log unit value								
Treatment	0.050	0.170	-0.023	0.109	0.059	0.134	-0.065	0.099
	(0.136)	(0.214)	(0.287)	(0.197)	(0.135)	(0.212)	(0.286)	(0.195)
Obs.	1633	1633	1633	1492	1633	1633	1633	1492
Cent. R-squ./Bandwidth	0.021	0.023	0.024	44	0.038	0.038	0.040	44
Log value per transaction								
Treatment	-0.169	-0.181	-0.427	-0.173	-0.180	-0.174	-0.417	-0.177
	(0.115)	(0.181)	(0.244)*	(0.121)	(0.115)	(0.181)	(0.244)*	(0.121)
Obs.	1633	1633	1633	1633	1633	1633	1633	1633
Cent. R-squ./Bandwidth	0.006	0.006	0.009	50	0.009	0.009	0.011	50
Log quantity per transaction								
Treatment	-0.097	-0.241	-0.207	-0.181	-0.146	-0.208	-0.154	-0.173
	(0.209)	(0.328)	(0.442)	(0.237)	(0.207)	(0.326)	(0.440)	(0.236)
Obs.	1633	1633	1633	1466	1633	1633	1633	1466
Cent. R-squ./Bandwidth	0.001	0.002	0.005	43	0.018	0.018	0.021	43

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

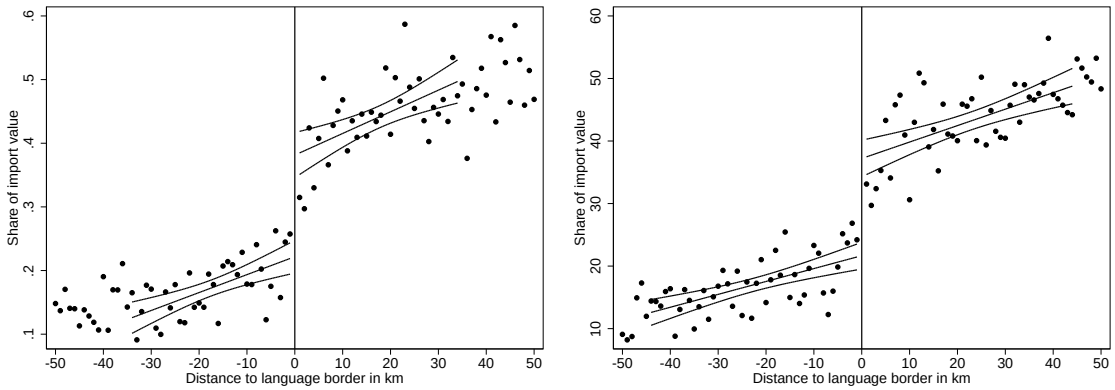
Table 7: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland (using great-circle distance to the language border)

Common native language	Baseline regression				Including distance to external border			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regional units within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.222	0.176	0.146	0.179	0.231	0.173	0.131	0.179
	(0.018)***	(0.029)***	(0.044)***	(0.026)***	(0.017)***	(0.029)***	(0.043)***	(0.026)***
Obs.	3414	3414	3414	2365	3414	3414	3414	2365
Cent. R-squ./Bandwidth	0.348	0.345	0.344	34	0.378	0.377	0.375	34
Transactions share								
Treatment	0.218	0.193	0.178	0.199	0.227	0.191	0.163	0.200
	(0.014)***	(0.023)***	(0.034)***	(0.020)***	(0.013)***	(0.022)***	(0.033)***	(0.020)***
Obs.	3414	3414	3414	2518	3414	3414	3414	2518
Cent. R-squ./Bandwidth	0.435	0.432	0.431	36	0.475	0.474	0.472	36
Number of products (HS8 tariff lines)								
Treatment	173.506	132.149	129.602	144.696	168.979	123.868	118.001	141.657
	(35.337)***	(58.958)**	(88.878)	(40.634)***	(35.148)***	(58.744)**	(89.071)	(40.553)***
Obs.	3414	3414	3414	2819	3414	3414	3414	2819
Cent. R-squ./Bandwidth	0.074	0.075	0.075	40	0.078	0.079	0.079	40
Log unit value								
Treatment	0.137	0.105	-0.139	0.131	0.148	0.085	-0.194	0.138
	(0.097)	(0.162)	(0.244)	(0.108)	(0.096)	(0.161)	(0.244)	(0.106)
Obs.	3395	3395	3395	3395	3395	3395	3395	3395
Cent. R-squ./Bandwidth	0.007	0.007	0.005	50	0.020	0.020	0.020	50
Log value per transaction								
Treatment	0.021	-0.055	-0.054	-0.018	-0.004	-0.060	-0.037	-0.030
	(0.082)	(0.137)	(0.206)	(0.094)	(0.081)	(0.136)	(0.206)	(0.094)
Obs.	3395	3395	3395	3021	3395	3395	3395	3021
Cent. R-squ./Bandwidth	0.003	0.005	0.006	44	0.009	0.011	0.011	44
Log quantity per transaction								
Treatment	0.050	-0.065	-0.357	-0.006	-0.026	-0.085	-0.310	-0.050
	(0.147)	(0.246)	(0.370)	(0.159)	(0.146)	(0.244)	(0.369)	(0.157)
Obs.	3395	3395	3395	3177	3395	3395	3395	3177
Cent. R-squ./Bandwidth	0.008	0.009	0.012	46	0.024	0.024	0.026	46
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.194	0.140	0.114	0.144	0.202	0.126	0.096	0.136
	(0.023)***	(0.038)***	(0.054)**	(0.034)***	(0.023)***	(0.037)***	(0.053)*	(0.033)***
Obs.	1872	1872	1872	1318	1872	1872	1872	1318
Cent. R-squ./Bandwidth	0.356	0.353	0.352	31	0.389	0.388	0.387	31
Transactions share								
Treatment	0.202	0.169	0.161	0.175	0.209	0.157	0.145	0.169
	(0.018)***	(0.029)***	(0.042)***	(0.026)***	(0.017)***	(0.028)***	(0.040)***	(0.025)***
Obs.	1872	1872	1872	1384	1872	1872	1872	1384
Cent. R-squ./Bandwidth	0.456	0.454	0.455	32	0.493	0.492	0.493	32
Number of products (HS8 tariff lines)								
Treatment	143.079	127.849	221.246	134.132	148.622	114.623	202.998	131.505
	(40.761)***	(65.539)*	(94.255)**	(49.069)***	(40.434)***	(65.309)*	(93.940)**	(48.786)***
Obs.	1872	1872	1872	1771	1872	1872	1872	1771
Cent. R-squ./Bandwidth	0.079	0.079	0.081	44	0.089	0.091	0.092	44
Log unit value								
Treatment	0.073	0.162	-0.160	0.096	0.092	0.099	-0.256	0.080
	(0.128)	(0.205)	(0.295)	(0.174)	(0.126)	(0.203)	(0.292)	(0.171)
Obs.	1858	1858	1858	1743	1858	1858	1858	1743
Cent. R-squ./Bandwidth	0.015	0.019	0.020	43	0.036	0.041	0.042	43
Log value per transaction								
Treatment	-0.111	-0.182	-0.294	-0.149	-0.120	-0.171	-0.279	-0.149
	(0.110)	(0.177)	(0.254)	(0.117)	(0.110)	(0.177)	(0.255)	(0.117)
Obs.	1858	1858	1858	1779	1858	1858	1858	1779
Cent. R-squ./Bandwidth	0.008	0.008	0.009	45	0.010	0.010	0.011	45
Log quantity per transaction								
Treatment	-0.058	-0.322	-0.314	-0.249	-0.098	-0.279	-0.256	-0.234
	(0.201)	(0.323)	(0.465)	(0.237)	(0.199)	(0.322)	(0.463)	(0.236)
Obs.	1858	1858	1858	1430	1858	1858	1858	1430
Cent. R-squ./Bandwidth	0.002	0.004	0.004	34	0.014	0.015	0.015	34

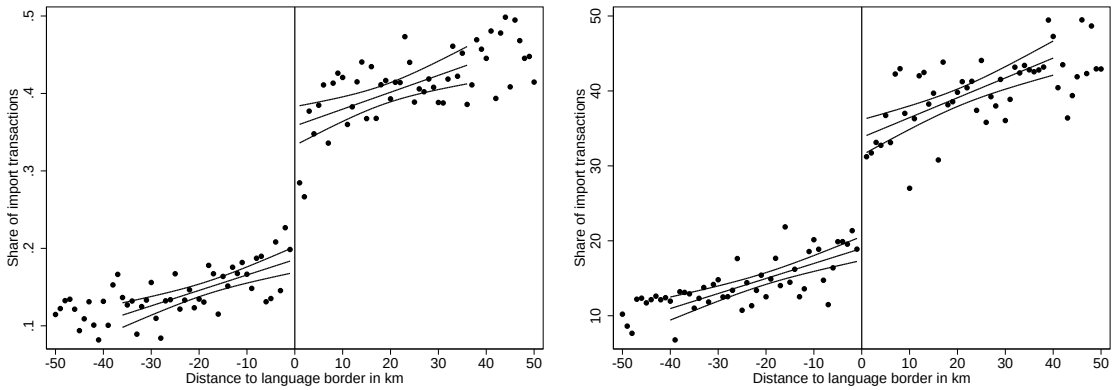
Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Figure 12: Outcomes by great circle (left) and road distance (right) to language border

(a) Import value share



(b) Import transactions share



(c) Number of products (HS 8 tariff lines)

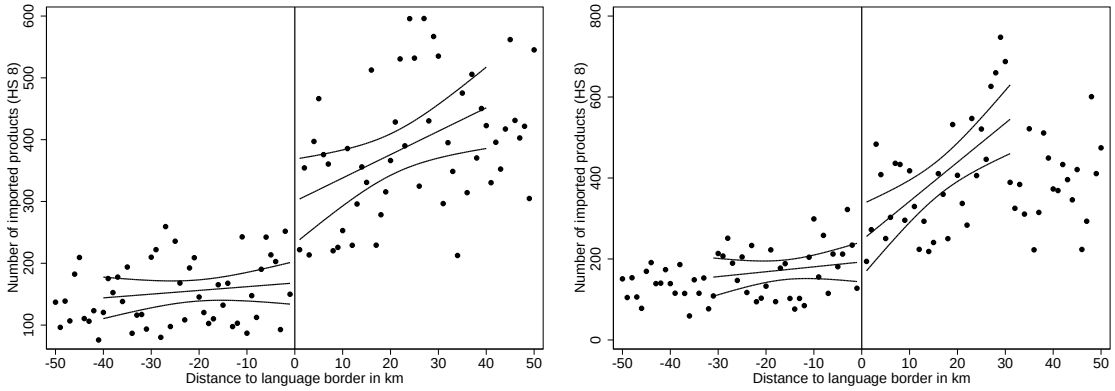
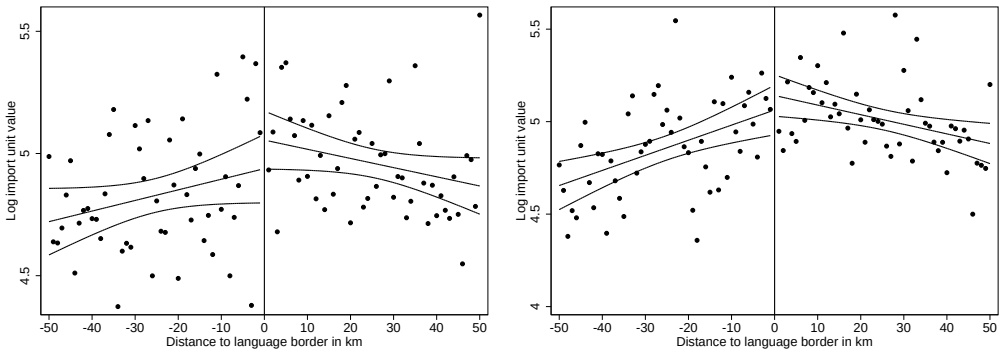
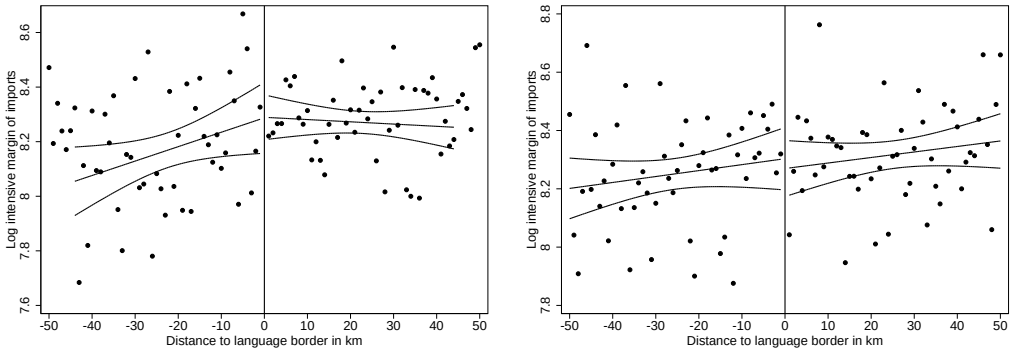


Figure 12: (continued)

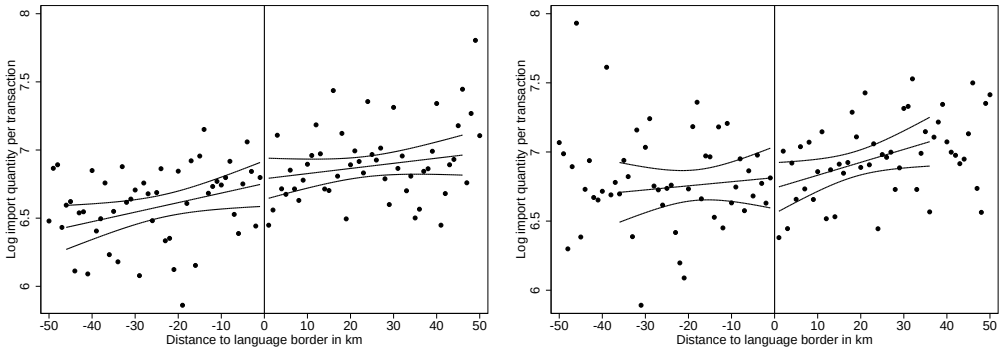
(d) Log unit value



(e) Log value per transaction



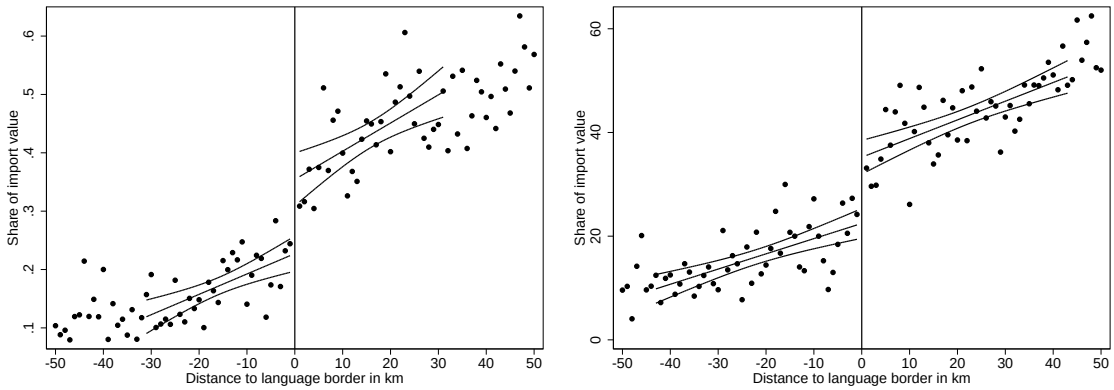
(f) Log quantity per transaction



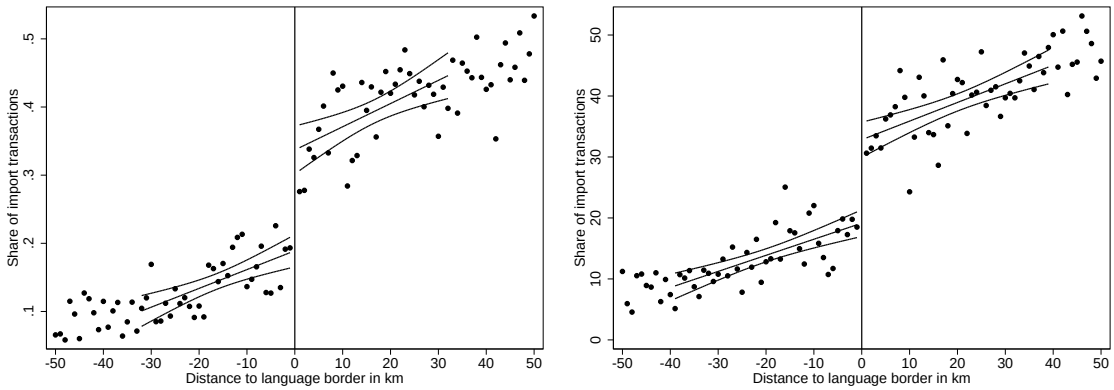
Notes: Treated observations (common language) to the right side of the language border (positive distance) and control observations (non-common language) to the left side of the language border (negative distance) in all figures. Linear predictions and 95% confidence intervals for average outcomes represented by scatter points are displayed for one optimal bandwidth (which is estimated from all observations).

Figure 13: Outcomes by great circle (left) and road distance (right) to language border in cantons through which internal language borders run

(a) Import value share



(b) Import transactions share



(c) Number of products (HS 8 tariff lines)

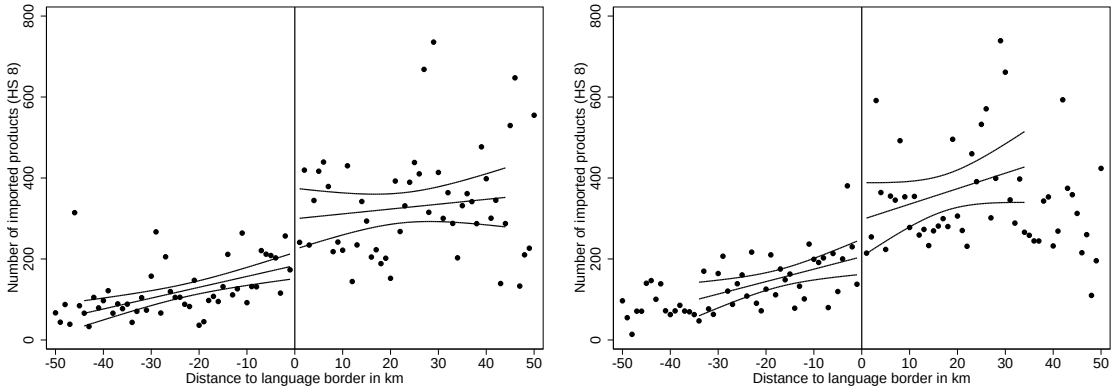
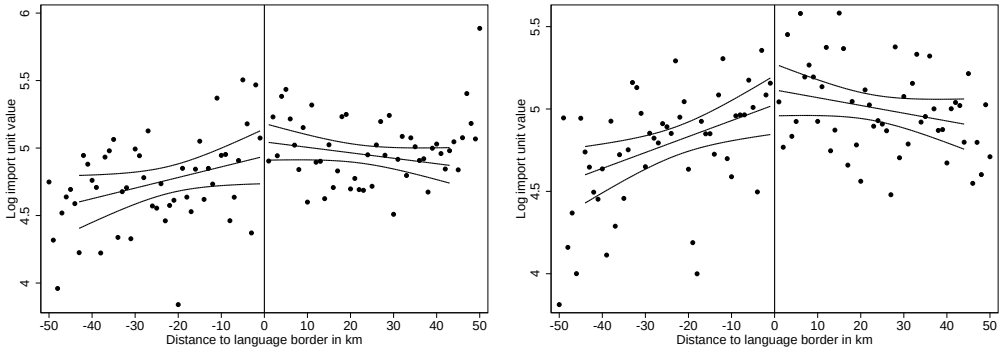
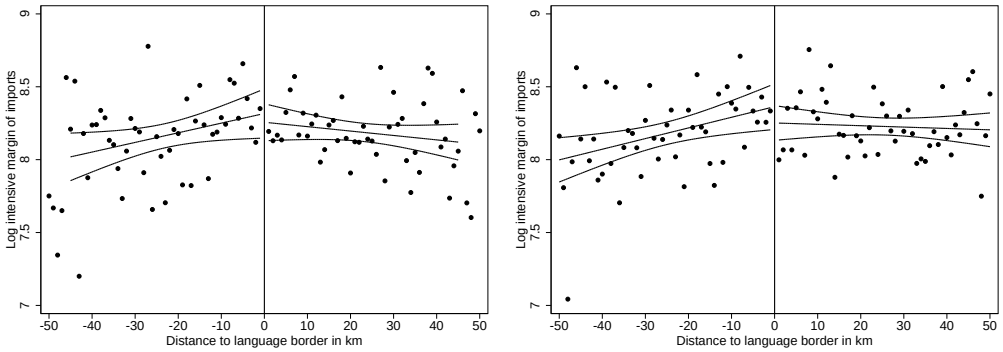


Figure 13: (continued)

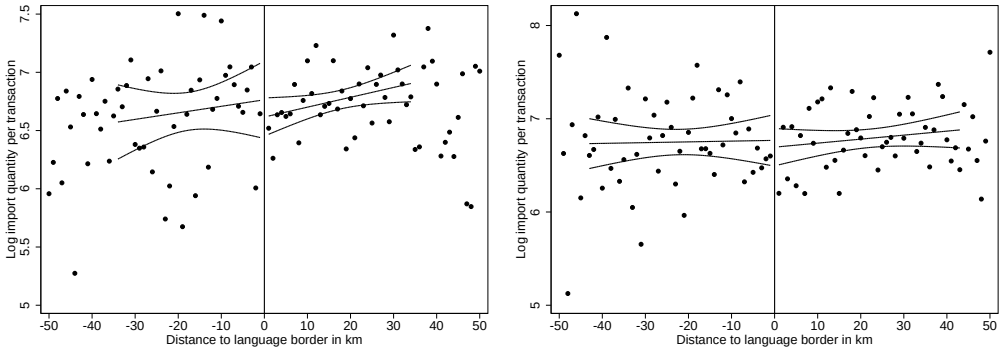
(d) Log unit value



(e) Log value per transaction

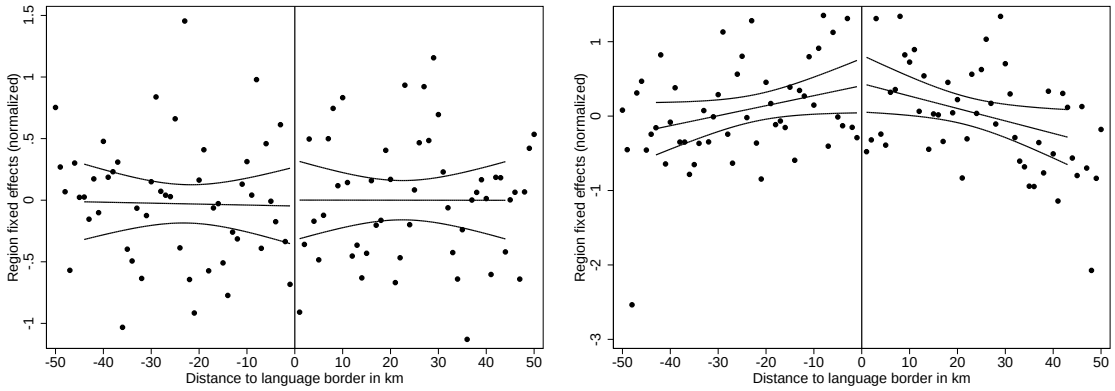


(f) Log quantity per transaction



Notes: Treated observations (common language) to the right side of the language border (positive distance) and control observations (non-common language) to the left side of the language border (negative distance) in all figures. Linear predictions and 95% confidence intervals for average outcomes represented by scatter points are displayed for one optimal bandwidth (which is estimated from all observations).

Figure 14: Average Swiss zip code fixed effects from naïve gravity regressions



Notes: Fixed effects averaged over road distance bins within 50 km from the language border from gravity regressions including fixed zip code and country of origin effects, log bilateral distance and common language. Full sample on the left-hand side (1,483 zip codes and 4 countries of origin) and sample from cantons through which internal language borders run on the right-hand side (821 zip codes and 4 countries of origin). Treated observations (common language) to the right side of the language border (positive distance) and control observations (non-common language) to the left side of the language border (negative distance) in all figures. Linear predictions and 95% confidence intervals for average outcomes represented by scatter points are displayed for one optimal bandwidth (which is estimated from all observations as in Table 6).

Table 8: Sensitivity of nonparametric LATE estimates to bandwidth choice (using road distance to the language border)

Common native language effect with nonparametric control function	Baseline regression: Opt. bandwidth	Baseline regression: Fixed bandwidth		Including distance to external border: Opt. bandwidth	Including distance to external border: Fixed bandwidth		
	All regions within the two respective language districts to left and right of language border						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.179	0.068	0.133	0.165	0.186	0.077	0.134	0.170
	(0.025)***	(0.063)	(0.042)***	(0.032)***	(0.025)***	(0.062)	(0.042)***	(0.032)***
Obs.	2623	533	1103	1762	2623	533	1103	1762
Bandwidth	44	10	20	30	44	10	20	30
Transactions share								
Treatment	0.196	0.171	0.186	0.192	0.202	0.176	0.188	0.196
	(0.022)***	(0.051)***	(0.034)***	(0.026)***	(0.022)***	(0.051)***	(0.034)***	(0.026)***
Obs.	2355	533	1103	1762	2355	533	1103	1762
Bandwidth	40	10	20	30	40	10	20	30
Number of products (HS8 tariff lines)								
Treatment	102.085	93.788	133.578	106.610	107.576	111.670	136.401	112.011
	(53.857)*	(84.409)	(68.526)*	(54.890)*	(52.893)**	(81.246)	(67.260)**	(53.884)**
Obs.	1836	533	1103	1762	1836	533	1103	1762
Bandwidth	31	10	20	30	31	10	20	30
Log unit value								
Treatment	0.081	-0.303	-0.202	0.017	0.089	-0.265	-0.194	0.035
	(0.125)	(0.405)	(0.263)	(0.198)	(0.124)	(0.406)	(0.263)	(0.199)
Obs.	2954	533	1103	1762	2954	533	1103	1762
Bandwidth	50	10	20	30	50	10	20	30
Log value per transaction								
Treatment	-0.059	-0.400	-0.217	-0.109	-0.068	-0.381	-0.214	-0.108
	(0.092)	(0.271)	(0.180)	(0.138)	(0.092)	(0.266)	(0.180)	(0.138)
Obs.	2954	533	1103	1762	2954	533	1103	1762
Bandwidth	50	10	20	30	50	10	20	30
Log quantity per transaction								
Treatment	-0.177	-0.407	-0.159	-0.188	-0.183	-0.431	-0.159	-0.192
	(0.210)	(0.471)	(0.310)	(0.237)	(0.210)	(0.466)	(0.308)	(0.236)
Obs.	2163	533	1103	1762	2163	533	1103	1762
Bandwidth	36	10	20	30	36	10	20	30
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.163	0.059	0.144	0.161	0.160	0.062	0.135	0.154
	(0.031)***	(0.071)	(0.049)***	(0.038)***	(0.031)***	(0.071)	(0.049)***	(0.038)***
Obs.	1468	377	706	1061	1468	377	706	1061
Bandwidth	43	10	20	30	43	10	20	30
Transactions share								
Treatment	0.193	0.168	0.211	0.200	0.189	0.169	0.204	0.195
	(0.026)***	(0.057)***	(0.039)***	(0.030)***	(0.026)***	(0.057)***	(0.039)***	(0.030)***
Obs.	1352	377	706	1061	1352	377	706	1061
Bandwidth	39	10	20	30	39	10	20	30
Number of products (HS8 tariff lines)								
Treatment	133.725	96.941	159.228	141.695	128.002	101.550	148.899	134.363
	(62.082)**	(99.547)	(82.497)*	(66.451)**	(61.903)**	(97.013)	(82.949)*	(66.334)**
Obs.	1205	377	706	1061	1205	377	706	1061
Bandwidth	34	10	20	30	34	10	20	30
Log unit value								
Treatment	0.109	-0.270	-0.073	0.088	0.099	-0.256	-0.107	0.066
	(0.197)	(0.468)	(0.315)	(0.245)	(0.195)	(0.464)	(0.314)	(0.243)
Obs.	1492	377	706	1061	1492	377	706	1061
Bandwidth	44	10	20	30	44	10	20	30
Log value per transaction								
Treatment	-0.173	-0.533	-0.360	-0.247	-0.177	-0.529	-0.356	-0.241
	(0.121)	(0.313)*	(0.212)*	(0.165)	(0.121)	(0.311)*	(0.214)*	(0.166)
Obs.	1633	377	706	1061	1633	377	706	1061
Bandwidth	50	10	20	30	50	10	20	30
Log quantity per transaction								
Treatment	-0.181	-0.306	-0.177	-0.169	-0.173	-0.313	-0.137	-0.136
	(0.237)	(0.549)	(0.372)	(0.287)	(0.236)	(0.545)	(0.372)	(0.287)
Obs.	1466	377	706	1061	1466	377	706	1061
Bandwidth	43	10	20	30	43	10	20	30

Notes: *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012).

Table 9: Sharp parametric LATE estimates of the impact of common language on imports from the rest of the world to Switzerland (using road distance to the language border)

Sharp treatment effect with parametric polynomial or nonparametric control function	Treatment=Roman language							
	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
	All regions within the two respective language districts to left and right of language border				All regions to left and right of language border within the same canton			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	-0.050	-0.001	-0.003	-1.316	-0.063	-0.028	-0.023	-3.495
	(0.021)**	(0.031)	(0.040)	(5.369)	(0.027)**	(0.037)	(0.047)	(6.625)
Obs.	1483	1483	1483	943	821	821	821	602
Cent. R-squ./Bandwidth	0.004	0.006	0.005	32	0.006	0.006	0.005	34
Transactions share								
Treatment	-0.029	-0.001	-0.001	-0.629	-0.025	-0.009	-0.003	-1.123
	(0.015)**	(0.022)	(0.028)	(3.697)	(0.019)	(0.026)	(0.032)	(4.721)
Obs.	1483	1483	1483	983	821	821	821	655
Cent. R-squ./Bandwidth	0.011	0.012	0.010	33	0.004	0.003	0.001	37
Number of products (HS8 tariff lines)								
Treatment	-133.886	137.120	106.494	21.676	-121.162	81.316	91.833	26.740
	(51.655)***	(75.343)*	(96.630)	(122.406)	(56.462)**	(78.035)	(97.444)	(147.684)
Obs.	1483	1483	1483	579	821	821	821	419
Cent. R-squ./Bandwidth	0.015	0.032	0.030	21	0.007	0.022	0.020	24
Log unit value								
Treatment	0.029	0.176	-0.023	0.096	0.021	-0.013	0.100	0.008
	(0.121)	(0.178)	(0.228)	(0.291)	(0.136)	(0.189)	(0.236)	(0.364)
Obs.	1483	1483	1483	1221	821	821	821	821
Cent. R-squ./Bandwidth	0.012	0.012	0.012	41	0.007	0.006	0.004	50
Log value per transaction								
Treatment	-0.063	0.071	0.239	0.011	-0.105	0.048	0.187	-0.005
	(0.126)	(0.186)	(0.238)	(0.290)	(0.161)	(0.224)	(0.279)	(0.392)
Obs.	1483	1483	1483	1375	821	821	821	729
Cent. R-squ./Bandwidth	0.004	0.003	0.003	46	0.000	0.000	-0.002	42
Log quantity per transaction								
Treatment	0.133	0.107	0.668	0.124	0.160	0.415	0.726	0.327
	(0.202)	(0.298)	(0.381)*	(0.454)	(0.261)	(0.363)	(0.453)	(0.643)
Obs.	1483	1483	1483	1483	821	821	821	737
Cent. R-squ./Bandwidth	0.002	0.001	0.005	50	0.002	0.003	0.005	43

Notes: Treatment effect from OLS regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions without distance to external border. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 10: Testing for jumps at non-discontinuity points (at the median of the forcing variable)

Common native language	Common native language=0				Common native language=1			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or	All regions within the two respective language districts to left and right of language border							
nonparametric control	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.297	1.172	1.777	-0.219	1.066	-0.134	3.155	4.950
	(0.602)	(2.139)	(2.975)	(6.378)	(0.764)	(2.681)	(4.752)	(10.469)
Obs.	1486	1486	1486	1067	1482	1482	1482	1074
Cent. R-squ./Bandwidth	0.185	0.189	0.065	18	0.078	0.065	-0.484	18
Transactions share								
Treatment	0.311	-0.252	-0.178	0.735	0.517	0.206	0.885	1.271
	(0.434)	(1.718)	(2.186)	(4.292)	(0.609)	(2.142)	(3.012)	(5.928)
Obs.	1486	1486	1486	1201	1482	1482	1482	1243
Cent. R-squ./Bandwidth	0.262	0.091	0.122	20	0.122	0.107	0.108	21
Number of products (HS8 tariff lines)								
Treatment	1294.781	-4120.781	3530.918	1847.861	-3981.226	18772.504	-20781.068	-48924.348
	(998.335)	(5236.917)	(5798.642)	(1544.496)	(2024.701)**	(16771.380)	(24858.635)	(80945.273)
Obs.	1486	1486	1486	1472	1482	1482	1482	1174
Cent. R-squ./Bandwidth	-0.030	-1.231	-0.630	26	-0.190	-5.722	-6.457	19
Log unit value								
Treatment	3.870	0.718	-12.294	-4.458	-4.051	22.866	-2.637	-52.684
	(4.438)	(15.027)	(25.231)	(44.743)	(3.683)	(22.836)	(17.664)	(93.767)
Obs.	1472	1472	1472	1149	1482	1482	1482	1176
Cent. R-squ./Bandwidth	0.028	0.039	-0.565	19	-0.047	-2.313	-0.001	19
Log value per transaction								
Treatment	1.029	-1.068	5.095	1.323	0.664	7.051	9.756	0.892
	(3.919)	(13.296)	(18.533)	(5.698)	(2.621)	(10.817)	(17.081)	(22.958)
Obs.	1472	1472	1472	1472	1482	1482	1482	1026
Cent. R-squ./Bandwidth	-0.002	0.006	-0.116	26	0.015	-0.380	-0.738	17
Log quantity per transaction								
Treatment	3.778	-27.831	44.023	83.941	0.950	1.564	18.673	3.247
	(7.117)	(32.971)	(59.230)	(159.776)	(4.653)	(16.235)	(30.734)	(30.622)
Obs.	1472	1472	1472	1190	1482	1482	1482	1336
Cent. R-squ./Bandwidth	-0.021	-0.889	-2.520	20	0.043	0.041	-0.736	22
	All regions to left and right of language border within the same canton							
Value share								
Treatment	-0.819	17.167	0.101	-2.178	0.625	-10.001	-3.383	-1.210
	(0.840)	(113.364)	(2.187)	(3.244)	(0.757)	(37.890)	(5.419)	(2.469)
Obs.	824	824	824	651	820	820	820	618
Cent. R-squ./Bandwidth	-0.192	-39.614	0.151	20	0.120	-8.135	-0.941	19
Transactions share								
Treatment	-0.603	-3.484	1.250	-0.411	0.185	-2.124	-1.100	0.184
	(0.640)	(31.376)	(1.569)	(0.865)	(0.592)	(12.564)	(3.244)	(0.839)
Obs.	824	824	824	813	820	820	820	820
Cent. R-squ./Bandwidth	-0.166	-4.244	0.264	23	0.141	-0.603	-0.110	23
Number of products (HS8 tariff lines)								
Treatment	-13.047	-4486.866	-1109.626	75.424	-2737.863	-41099.600	-3968.690	-8429.986
	(987.566)	(41224.402)	(3362.415)	(1149.528)	(1591.552)*	(142504.695)	(8080.382)	(8480.532)
Obs.	824	824	824	813	820	820	820	574
Cent. R-squ./Bandwidth	0.072	-2.027	-0.130	23	-0.069	-34.546	-0.187	17
Log unit value								
Treatment	9.722	-29.546	-1.730	14.859	-1.244	-10.132	6.489	-1.087
	(5.613)*	(141.463)	(16.050)	(15.436)	(3.275)	(59.460)	(17.756)	(4.480)
Obs.	813	813	813	692	820	820	820	820
Cent. R-squ./Bandwidth	-0.137	-3.087	0.017	21	0.016	-0.345	-0.246	23
Log value per transaction								
Treatment	0.353	-0.641	0.006	0.262	1.369	-66.642	-4.059	-8.793
	(4.546)	(60.392)	(13.959)	(5.534)	(2.668)	(234.402)	(13.226)	(12.377)
Obs.	813	813	813	813	820	820	820	500
Cent. R-squ./Bandwidth	0.008	0.010	0.012	23	-0.008	-31.264	-0.067	15
Log quantity per transaction								
Treatment	-7.935	-25.526	8.988	-5.724	4.821	-1.180	25.158	4.870
	(8.671)	(147.669)	(27.439)	(15.901)	(4.577)	(69.661)	(34.286)	(9.178)
Obs.	813	813	813	783	820	820	820	791
Cent. R-squ./Bandwidth	-0.050	-0.722	-0.111	23	0.007	0.046	-1.401	23

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions include distance to external border. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials. Artifical breakpoint at median of forcing variable from true language border for common native language=0 and common native language=1: 26 km in upper and 23 km in lower panel.

Table 11: Testing for jumps at non-discontinuity points (at 15 km from the language border)

Common native language	Common native language=0				Common native language=1			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	1.622	-24.690	-2.935	74.676	1.703	6.072	0.264	3.929
	(0.640)**	(181.484)	(3.343)	(818.919)	(0.838)**	(16.101)	(3.398)	(4.799)
Obs.	1486	1486	1486	637	1482	1482	1482	786
Cent. R-squ./Bandwidth	0.102	-91.251	-1.692	11	-0.008	-2.467	0.100	13
Transactions share								
Treatment	0.668	-14.216	-0.787	4.811	0.855	5.941	-1.235	2.280
	(0.431)	(106.303)	(1.700)	(6.313)	(0.643)	(15.022)	(3.316)	(3.005)
Obs.	1486	1486	1486	738	1482	1482	1482	817
Cent. R-squ./Bandwidth	0.292	-54.032	-0.210	13	0.115	-3.511	-0.282	14
Number of products (HS8 tariff lines)								
Treatment	1677.203	-72941.638	-3323.046	-19828.055	-4932.135	-46788.025	2626.398	130510.660
	(1042.177)	(521280.463)	(4045.233)	(33092.434)	(2226.273)**	(118002.590)	(8835.979)	(1006240.300)
Obs.	1486	1486	1486	497	1482	1482	1482	467
Cent. R-squ./Bandwidth	-0.094	-348.259	-0.809	9	-0.305	-33.189	-0.118	8
Log unit value								
Treatment	5.269	0.012	14.907	-17.129	1.587	-4.901	2.854	3.138
	(4.582)	(67.402)	(18.066)	(20.015)	(3.804)	(40.205)	(16.564)	(5.670)
Obs.	1472	1472	1472	855	1482	1482	1482	1034
Cent. R-squ./Bandwidth	-0.001	0.028	-0.475	15	-0.013	-0.055	-0.044	20
Log value per transaction								
Treatment	3.938	-103.635	-17.686	-174.466	2.389	-54.781	9.479	-19.959
	(4.131)	(394.701)	(19.150)	(853.086)	(2.814)	(139.857)	(15.446)	(31.628)
Obs.	1472	1472	1472	592	1482	1482	1482	687
Cent. R-squ./Bandwidth	-0.075	-43.042	-1.190	10	-0.029	-22.705	-0.686	12
Log quantity per transaction								
Treatment	-5.552	14.841	-8.055	0.595	-3.052	-84.877	14.868	-58.024
	(7.223)	(122.473)	(23.840)	(14.296)	(4.968)	(220.365)	(25.633)	(101.378)
Obs.	1472	1472	1472	940	1482	1482	1482	646
Cent. R-squ./Bandwidth	-0.015	-0.310	-0.048	17	0.010	-17.155	-0.432	11
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.879	-1.807	-1.127	2.185	1.202	-4.009	2.369	0.713
	(0.786)	(4.608)	(1.687)	(1.455)	(0.954)	(13.793)	(2.877)	(1.503)
Obs.	824	824	824	616	820	820	820	640
Cent. R-squ./Bandwidth	0.228	-0.797	-0.333	20	0.078	-1.341	-0.169	22
Transactions share								
Treatment	-0.157	-0.342	-0.214	0.880	0.313	-2.345	1.343	0.064
	(0.654)	(2.631)	(1.079)	(2.032)	(0.726)	(9.465)	(2.067)	(1.520)
Obs.	824	824	824	552	820	820	820	590
Cent. R-squ./Bandwidth	0.101	0.013	0.080	16	0.148	-0.759	0.037	18
Number of products (HS8 tariff lines)								
Treatment	286.952	-6138.171	-832.922	-16205.225	-1951.067	-20834.663	-64.809	5508.079
	(1135.163)	(9891.011)	(2001.051)	(82557.305)	(1903.610)	(52712.996)	(5022.750)	(11545.376)
Obs.	824	824	824	476	820	820	820	343
Cent. R-squ./Bandwidth	0.092	-3.666	-0.057	14	-0.011	-8.404	0.020	10
Log unit value								
Treatment	2.132	18.390	6.664	-11.362	5.337	26.434	-2.869	8.049
	(5.881)	(26.937)	(10.789)	(11.861)	(4.395)	(77.861)	(10.805)	(12.379)
Obs.	813	813	813	599	820	820	820	556
Cent. R-squ./Bandwidth	0.055	-0.771	-0.002	19	-0.171	-3.460	0.014	16
Log value per transaction								
Treatment	1.503	-21.881	-15.942	-23.195	8.055	-19.697	3.801	8.298
	(5.259)	(30.166)	(13.286)	(30.557)	(3.985)**	(56.204)	(9.176)	(6.513)
Obs.	813	813	813	389	820	820	820	625
Cent. R-squ./Bandwidth	-0.005	-1.952	-1.020	11	-0.486	-2.587	-0.097	21
Log quantity per transaction								
Treatment	-7.763	-12.696	-19.187	-2.391	4.441	-58.609	16.764	-0.875
	(9.960)	(35.031)	(20.454)	(13.696)	(5.610)	(155.143)	(18.995)	(14.880)
Obs.	813	813	813	656	820	820	820	558
Cent. R-squ./Bandwidth	-0.048	-0.158	-0.393	23	0.014	-8.151	-0.575	17

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions include distance to external border. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials. Artifical breakpoint at 15 km from true language border for common native language=0 and common native language=1.

Table 12: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland (using road distance to the language border) on product intensive margins

Common native language		Baseline regression				Including distance to external border		
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log value per product (HS8 tariff lines)								
Treatment	0.004	-0.044	-0.076	-0.019	-0.018	-0.054	-0.078	-0.034
	(0.062)	(0.103)	(0.144)	(0.075)	(0.061)	(0.100)	(0.141)	(0.075)
Obs.	2954	2954	2954	2783	2954	2954	2954	2783
Cent. R-squ./Bandwidth	0.001	0.003	0.004	47	0.046	0.048	0.048	47
Log unit value per product								
Treatment	0.130	0.278	0.239	0.236	0.140	0.294	0.256	0.252
	(0.066)**	(0.108)**	(0.152)	(0.098)**	(0.065)**	(0.107)***	(0.151)*	(0.099)**
Obs.	2954	2954	2954	2044	2954	2954	2954	2044
Cent. R-squ./Bandwidth	0.009	0.014	0.014	34	0.029	0.033	0.033	34
Log quantity per product								
Treatment	-0.089	-0.292	-0.297	-0.237	-0.122	-0.315	-0.312	-0.262
	(0.100)	(0.165)*	(0.232)	(0.144)	(0.097)	(0.161)*	(0.227)	(0.143)*
Obs.	2954	2954	2954	2052	2954	2954	2954	2052
Cent. R-squ./Bandwidth	0.003	0.008	0.008	35	0.049	0.054	0.055	35
	All regions to left and right of language border within the same canton							
Log value per product (HS8 tariff lines)								
Treatment	-0.046	-0.076	-0.117	-0.056	-0.063	-0.049	-0.083	-0.058
	(0.080)	(0.126)	(0.170)	(0.087)	(0.079)	(0.124)	(0.167)	(0.085)
Obs.	1633	1633	1633	1633	1633	1633	1633	1633
Cent. R-squ./Bandwidth	0.004	0.006	0.008	50	0.038	0.039	0.040	50
Log unit value per product								
Treatment	0.177	0.384	0.306	0.300	0.183	0.354	0.273	0.280
	(0.088)**	(0.137)***	(0.184)*	(0.131)**	(0.086)**	(0.135)***	(0.182)	(0.128)**
Obs.	1633	1633	1633	1063	1633	1633	1633	1063
Cent. R-squ./Bandwidth	0.022	0.030	0.030	30	0.049	0.055	0.055	30
Log quantity per product								
Treatment	-0.188	-0.418	-0.376	-0.340	-0.212	-0.364	-0.310	-0.304
	(0.133)	(0.208)**	(0.280)	(0.177)*	(0.129)	(0.203)*	(0.275)	(0.171)*
Obs.	1633	1633	1633	1138	1633	1633	1633	1138
Cent. R-squ./Bandwidth	0.008	0.015	0.016	33	0.052	0.056	0.057	33

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 13: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland by language border region (using road distance to the language border)

Common native language	French-German speaking regions only				Italian-German speaking regions only			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.181	0.162	0.090	0.168	0.312	0.302	0.309	0.285
	(0.019)***	(0.031)***	(0.045)**	(0.023)***	(0.062)***	(0.093)***	(0.113)***	(0.082)***
Obs.	2578	2578	2578	2232	402	402	402	376
Cent. R-squ./Bandwidth	0.394	0.394	0.390	43	0.442	0.442	0.442	49
Transactions share								
Treatment	0.195	0.175	0.140	0.180	0.315	0.317	0.363	0.293
	(0.014)***	(0.024)***	(0.035)***	(0.020)***	(0.046)***	(0.068)***	(0.083)***	(0.059)***
Obs.	2578	2578	2578	2018	402	402	402	393
Cent. R-squ./Bandwidth	0.486	0.486	0.484	39	0.560	0.561	0.567	50
Number of products (HS8 tariff lines)								
Treatment	199.133	82.977	108.700	116.742	27.923	56.185	45.525	34.751
	(44.452)***	(74.473)	(107.428)	(60.163)*	(82.109)	(122.796)	(149.467)	(68.012)
Obs.	2578	2578	2578	1625	402	402	402	393
Cent. R-squ./Bandwidth	0.083	0.087	0.088	31	0.076	0.078	0.093	50
Log unit value								
Treatment	0.075	0.090	-0.030	0.078	0.157	0.249	-0.353	0.193
	(0.115)	(0.193)	(0.279)	(0.127)	(0.293)	(0.441)	(0.544)	(0.404)
Obs.	2573	2573	2573	2573	393	393	393	393
Cent. R-squ./Bandwidth	0.019	0.020	0.020	50	0.070	0.071	0.081	50
Log value per transaction								
Treatment	-0.080	-0.048	-0.216	-0.071	0.088	-0.175	-0.367	-0.045
	(0.091)	(0.153)	(0.220)	(0.095)	(0.312)	(0.469)	(0.579)	(0.377)
Obs.	2573	2573	2573	2573	393	393	393	340
Cent. R-squ./Bandwidth	0.016	0.017	0.017	50	0.011	0.017	0.023	45
Log quantity per transaction								
Treatment	-0.019	-0.200	-0.327	-0.138	0.267	-0.743	-0.401	-0.298
	(0.165)	(0.276)	(0.398)	(0.202)	(0.529)	(0.794)	(0.978)	(0.764)
Obs.	2573	2573	2573	2084	393	393	393	240
Cent. R-squ./Bandwidth	0.026	0.027	0.027	40	0.048	0.057	0.069	35
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.159	0.139	0.095	0.149	0.344	0.271	0.282	0.261
	(0.023)***	(0.037)***	(0.051)*	(0.028)***	(0.088)***	(0.127)**	(0.149)*	(0.117)**
Obs.	1388	1388	1388	1184	268	268	268	206
Cent. R-squ./Bandwidth	0.444	0.443	0.444	39	0.486	0.483	0.485	43
Transactions share								
Treatment	0.182	0.165	0.186	0.180	0.303	0.229	0.275	0.266
	(0.017)***	(0.027)***	(0.037)***	(0.022)***	(0.069)***	(0.100)**	(0.116)**	(0.082)***
Obs.	1388	1388	1388	1108	268	268	268	194
Cent. R-squ./Bandwidth	0.578	0.580	0.583	36	0.556	0.549	0.559	41
Number of products (HS8 tariff lines)								
Treatment	197.654	103.652	195.674	139.000	83.301	92.086	16.999	89.513
	(49.505)***	(78.024)	(107.625)*	(68.926)**	(99.146)	(142.109)	(160.048)	(102.305)
Obs.	1388	1388	1388	1070	268	268	268	260
Cent. R-squ./Bandwidth	0.097	0.101	0.103	34	0.079	0.080	0.155	50
Log unit value								
Treatment	0.042	0.214	0.157	0.124	-0.166	0.063	-0.962	-0.059
	(0.143)	(0.226)	(0.312)	(0.214)	(0.460)	(0.666)	(0.784)	(0.590)
Obs.	1385	1385	1385	1154	260	260	260	260
Cent. R-squ./Bandwidth	0.035	0.036	0.038	38	0.088	0.095	0.119	50
Log value per transaction								
Treatment	-0.177	-0.107	-0.441	-0.165	0.101	-0.177	-0.229	-0.170
	(0.121)	(0.190)	(0.262)*	(0.129)	(0.438)	(0.632)	(0.744)	(0.534)
Obs.	1385	1385	1385	1375	260	260	260	227
Cent. R-squ./Bandwidth	0.011	0.012	0.014	49	0.010	0.022	0.048	46
Log quantity per transaction								
Treatment	0.024	0.015	-0.197	-0.023	-0.063	-1.498	-0.140	-0.712
	(0.218)	(0.344)	(0.474)	(0.235)	(0.748)	(1.075)	(1.243)	(1.101)
Obs.	1385	1385	1385	1310	260	260	260	117
Cent. R-squ./Bandwidth	0.027	0.027	0.028	45	0.077	0.094	0.151	33

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions include distance to external border. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 14: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland for specific native languages (using road distance to the language border)

Common native language	Imports from France				Imports from Italy				Imports from Austria and Germany			
effect with parametric polynomial or nonparametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
	All regions within the two respective language districts to left and right of language border											
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Value share												
Treatment	0.185	0.168	0.126	0.167	0.437	0.310	0.273	0.394	0.147	0.157	0.064	0.149
	(0.020)***	(0.034)***	(0.048)***	(0.024)***	(0.076)***	(0.118)***	(0.151)*	(0.102)***	(0.027)***	(0.044)***	(0.062)	(0.030)***
Obs.	1287	1287	1287	1032	256	256	256	198	1482	1482	1482	1481
Cent. R-squ./Bandwidth	0.423	0.423	0.424	40	0.550	0.555	0.554	42	0.298	0.302	0.300	52
Transactions share												
Treatment	0.188	0.182	0.158	0.178	0.417	0.323	0.325	0.400	0.172	0.171	0.139	0.171
	(0.013)***	(0.021)***	(0.030)***	(0.016)***	(0.054)***	(0.084)***	(0.107)***	(0.078)***	(0.018)***	(0.030)***	(0.041)***	(0.023)***
Obs.	1287	1287	1287	928	256	256	256	209	1482	1482	1482	1303
Cent. R-squ./Bandwidth	0.553	0.554	0.555	35	0.706	0.705	0.705	44	0.470	0.473	0.473	44
Number of products (HS8 tariff lines)												
Treatment	87.356	217.513	178.986	161.229	-77.614	-10.615	38.269	-18.049	270.596	-3.050	49.233	111.254
	(34.441)**	(58.021)***	(82.894)**	(63.108)**	(94.987)	(147.340)	(185.572)	(84.710)	(69.148)***	(113.116)	(158.853)	(110.348)
Obs.	1287	1287	1287	707	256	256	256	241	1482	1482	1482	635
Cent. R-squ./Bandwidth	0.055	0.064	0.065	27	0.199	0.215	0.234	50	0.127	0.146	0.144	22
Log unit value												
Treatment	-0.213	-0.648	-0.892	0.129	0.731	0.020	0.259	0.969	-0.128	-0.192	-0.307	0.014
	(0.460)	(0.610)	(0.752)	(0.236)	(0.976)	(1.175)	(1.338)	(0.565)*	(0.279)	(0.362)	(0.427)	(0.141)
Obs.	1283	1283	1283	1283	247	247	247	239	1481	1481	1481	1481
Cent. R-squ./Bandwidth	0.042	0.040	0.039	50	0.053	0.057	0.059	49	0.017	0.018	0.022	50
Log value per transaction												
Treatment	-0.034	-0.192	-0.465	-0.059	0.542	1.272	1.168	0.492	-0.488	-0.583	-0.772	-0.076
	(0.347)	(0.460)	(0.566)	(0.145)	(1.013)	(1.217)	(1.387)	(0.472)	(0.261)*	(0.339)*	(0.400)*	(0.138)
Obs.	1283	1283	1283	1283	247	247	247	142	1481	1481	1481	1459
Cent. R-squ./Bandwidth	0.017	0.017	0.018	50	0.083	0.089	0.090	34	0.025	0.026	0.028	49
Log quantity per transaction												
Treatment	-0.136	0.820	0.642	-0.098	0.399	1.143	0.578	0.966	-0.548	-0.876	-1.401	-0.310
	(0.670)	(0.886)	(1.091)	(0.341)	(1.759)	(2.115)	(2.411)	(1.011)	(0.416)	(0.540)	(0.637)**	(0.216)
Obs.	1283	1283	1283	918	247	247	247	109	1481	1481	1481	1481
Cent. R-squ./Bandwidth	0.017	0.019	0.020	35	0.151	0.156	0.156	30	0.030	0.032	0.032	50
	All regions to left and right of language border within the same canton											
Value share												
Treatment	0.196	0.159	0.104	0.177	-0.751	-0.334	-0.661	0.011	0.108	0.114	0.033	0.116
	(0.026)***	(0.041)***	(0.056)*	(0.034)***	(1.092)	(0.811)	(1.093)	(0.366)	(0.036)***	(0.058)**	(0.078)	(0.038)***
Obs.	692	692	692	521	171	171	171	64	820	820	820	820
Cent. R-squ./Bandwidth	0.357	0.359	0.362	33	0.418	0.513	0.460	30	0.272	0.273	0.274	50
Transactions share												
Treatment	0.206	0.195	0.184	0.203	-1.150	-0.603	-1.374	-0.131	0.160	0.148	0.145	0.160
	(0.017)***	(0.026)***	(0.036)***	(0.023)***	(0.994)	(0.671)	(1.063)	(0.241)	(0.024)***	(0.038)***	(0.052)***	(0.031)***
Obs.	692	692	692	536	171	171	171	63	820	820	820	661
Cent. R-squ./Bandwidth	0.537	0.538	0.538	35	0.369	0.563	0.332	29	0.419	0.424	0.426	38
Number of products (HS8 tariff lines)												
Treatment	68.373	231.762	188.088	158.379	-616.862	82.415	-227.342	825.540	325.074	80.589	68.073	108.837
	(42.789)	(65.764)***	(90.023)**	(85.340)*	(1041.968)	(745.163)	(968.260)	(665.563)	(82.834)***	(130.130)	(175.542)	(127.495)
Obs.	692	692	692	401	171	171	171	117	820	820	820	437
Cent. R-squ./Bandwidth	0.064	0.094	0.095	25	-0.020	0.207	0.184	38	0.045	0.069	0.070	24
Log unit value												
Treatment	0.299	-0.167	-0.326	-0.046	5.563	2.845	2.908	0.846	-0.470	-0.628	-0.719	0.004
	(0.556)	(0.722)	(0.848)	(0.310)	(7.086)	(7.338)	(17.195)	(3.899)	(0.329)	(0.417)	(0.483)	(0.192)
Obs.	689	689	689	689	163	163	163	118	820	820	820	820
Cent. R-squ./Bandwidth	0.040	0.037	0.036	50	0.035	0.083	0.084	39	0.037	0.041	0.043	50
Log value per transaction												
Treatment	-0.375	-0.225	-0.655	-0.177	1.766	1.319	2.337	-2.032	-0.650	-0.778	-0.907	-0.186
	(0.445)	(0.576)	(0.676)	(0.225)	(6.627)	(7.007)	(16.508)	(1.520)	(0.324)**	(0.411)*	(0.475)*	(0.192)
Obs.	689	689	689	588	163	163	163	90	820	820	820	791
Cent. R-squ./Bandwidth	0.021	0.029	0.029	39	0.117	0.126	0.117	34	0.026	0.032	0.032	47
Log quantity per transaction												
Treatment	-0.013	1.036	0.378	0.297	-2.564	-1.176	-6.594	-1.878	-0.454	-0.755	-1.252	-0.368
	(0.858)	(1.112)	(1.302)	(0.366)	(11.291)	(11.899)	(29.027)	(2.523)	(0.511)	(0.649)	(0.750)*	(0.323)
Obs.	689	689	689	689	163	163	163	61	820	820	820	743
Cent. R-squ./Bandwidth	0.033	0.036	0.041	50	0.178	0.192	0.125	27	0.026	0.028	0.033	44

Notes: Treatment effect from instrumental variables regression. Non-common native language speaking regions to the left and common native language speaking regions to the right side of the language border. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 15: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland in different quartiles of the distribution of the dependent variables (using road distance to the language border)

Common native language effect with parametric polynomial or nonparametric control function	Effects across quartiles of the respective dependent variable															
	1st Quartile				2nd Quartile				3rd Quartile				4th Quartile			
	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
	All regional units within the two respective language districts to left and right of language border															
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Value share																
Treatment	0.332	0.311	0.261	0.308	0.315	0.310	0.278	0.295	0.366	0.338	0.315	0.343	0.289	0.257	0.174	0.260
	(0.021)***	(0.035)***	(0.050)***	(0.030)***	(0.021)***	(0.036)***	(0.051)***	(0.031)***	(0.021)***	(0.035)***	(0.049)***	(0.033)***	(0.022)***	(0.037)***	(0.053)***	(0.033)***
Obs.	2880	2880	2880	2212	2897	2897	2897	2332	2889	2889	2889	2183	2904	2904	2904	2251
Cent. R-squ./Bandwidth	0.533	0.533	0.530	40	0.520	0.521	0.519	42	0.529	0.528	0.527	40	0.456	0.455	0.451	41
Transactions share																
Treatment	0.329	0.297	0.250	0.299	0.313	0.296	0.255	0.285	0.362	0.335	0.311	0.339	0.315	0.276	0.226	0.282
	(0.019)***	(0.032)***	(0.046)***	(0.029)***	(0.021)***	(0.036)***	(0.051)***	(0.031)***	(0.021)***	(0.035)***	(0.049)***	(0.033)***	(0.020)***	(0.034)***	(0.048)***	(0.033)***
Obs.	2880	2880	2880	2148	2897	2897	2897	2328	2889	2889	2889	2204	2904	2904	2904	2031
Cent. R-squ./Bandwidth	0.557	0.556	0.554	39	0.518	0.518	0.516	42	0.525	0.525	0.523	40	0.507	0.506	0.504	36
Number of products (HS8 tariff lines)																
Treatment	47.658	1.119	13.886	25.579	100.128	28.675	37.569	52.286	103.729	40.147	46.056	50.373	73.068	24.008	30.058	31.549
	(14.112)***	(23.425)	(33.440)	(19.713)	(23.448)***	(38.961)	(55.142)	(32.573)	(25.958)***	(42.826)	(60.089)	(35.193)	(20.920)***	(34.709)	(48.957)	(26.773)
Obs.	2880	2880	2880	1256	2897	2897	2897	1585	2889	2889	2889	1671	2904	2904	2904	1732
Cent. R-squ./Bandwidth	0.055	0.061	0.061	23	0.066	0.072	0.072	28	0.065	0.069	0.069	30	0.055	0.059	0.059	31
Log unit value																
Treatment	0.209	0.149	0.145	0.164	0.060	0.126	0.173	0.032	0.126	0.194	0.202	0.061	0.082	0.006	-0.327	-0.067
	(0.069)***	(0.115)	(0.164)	(0.086)*	(0.067)	(0.111)	(0.158)	(0.070)	(0.121)	(0.200)	(0.281)	(0.119)	(0.183)	(0.304)	(0.430)	(0.211)
Obs.	2866	2866	2866	2455	2883	2883	2883	2755	2875	2875	2875	2755	2888	2888	2888	2755
Cent. R-squ./Bandwidth	0.037	0.038	0.038	44	0.002	0.005	0.005	50	0.029	0.032	0.032	50	0.032	0.031	0.031	50
Log value per transaction																
Treatment	0.143	0.195	0.196	0.145	-0.019	0.016	0.039	0.024	0.001	0.001	-0.005	-0.004	-3.77E-04	-0.034	-0.087	-0.016
	(0.038)***	(0.063)***	(0.091)**	(0.042)***	(0.016)	(0.027)	(0.039)	(0.023)	(0.018)	(0.030)	(0.041)	(0.017)	(0.059)	(0.098)	(0.139)	(0.063)
Obs.	2866	2866	2866	2299	2883	2883	2883	1742	2875	2875	2875	2755	2890	2890	2890	2755
Cent. R-squ./Bandwidth	0.088	0.09	0.09	41	0.014	0.014	0.014	31	0.049	0.049	0.049	50	0.015	0.016	0.016	50
Log quantity per transaction																
Treatment	-0.021	0.136	0.191	0.000	0.115	-0.028	-0.263	0.025	0.426	0.227	0.196	0.234	-0.041	-0.233	-0.111	-0.108
	(0.095)	(0.159)	(0.227)	(0.132)	(0.135)	(0.225)	(0.319)	(0.150)	(0.160)***	(0.265)	(0.372)	(0.219)	(0.125)	(0.208)	(0.294)	(0.158)
Obs.	2866	2866	2866	2326	2883	2883	2883	2672	2875	2875	2875	2074	2888	2888	2888	2185
Cent. R-squ./Bandwidth	0.008	0.012	0.012	42	0.050	0.050	0.049	48	0.060	0.061	0.061	37	0.003	0.004	0.005	40
	All regions to left and right of language border within the same canton															
Value share																
Treatment	0.316	0.309	0.344	0.317	0.284	0.302	0.361	0.310	0.329	0.336	0.405	0.356	0.248	0.233	0.198	0.240
	(0.025)***	(0.040)***	(0.055)***	(0.039)***	(0.026)***	(0.042)***	(0.057)***	(0.045)***	(0.027)***	(0.043)***	(0.057)***	(0.043)***	(0.029)***	(0.046)***	(0.062)***	(0.039)***
Obs.	1592	1592	1592	1123	1594	1594	1594	992	1594	1594	1594	1130	1603	1603	1603	1387
Cent. R-squ./Bandwidth	0.604	0.604	0.606	34	0.595	0.596	0.600	29	0.553	0.553	0.558	34	0.467	0.466	0.465	44
Transactions share																
Treatment	0.307	0.280	0.320	0.298	0.283	0.286	0.333	0.289	0.327	0.331	0.402	0.356	0.284	0.277	0.284	0.288
	(0.024)***	(0.038)***	(0.051)***	(0.036)***	(0.026)***	(0.042)***	(0.057)***	(0.043)***	(0.027)***	(0.042)***	(0.057)***	(0.043)***	(0.026)***	(0.042)***	(0.057)***	(0.038)***
Obs.	1592	1592	1592	1181	1594	1594	1594	1040	1594	1594	1594	1104	1603	1603	1603	1281
Cent. R-squ./Bandwidth	0.617	0.616	0.619	36	0.597	0.597	0.600	31	0.562	0.562	0.567	33	0.494	0.494	0.495	40
Number of products (HS8 tariff lines)																
Treatment	47.881	10.646	32.969	26.301	100.606	44.450	66.967	60.276	104.977	55.425	75.836	65.752	75.012	37.494	52.228	45.171
	(14.216)***	(22.405)	(30.817)	(21.583)	(25.295)***	(39.999)	(54.450)	(37.621)	(27.951)***	(43.964)	(59.321)	(40.696)	(21.908)***	(34.560)	(46.847)	(30.842)
Obs.	1592	1592	1592	1004	1594	1594	1594	1096	1594	1594	1594	1130	1603	1603	1603	1139
Cent. R-squ./Bandwidth	0.062	0.069	0.069	30	0.078	0.084	0.083	33	0.066	0.069	0.069	34	0.052	0.056	0.055	35
Log unit value																
Treatment	0.247	0.140	0.175	0.161	0.060	0.132	0.237	0.017	0.146	0.211	0.145	0.052	-0.058	-0.165	-0.280	-0.158
	(0.092)***	(0.146)	(0.201)	(0.109)	(0.087)	(0.138)	(0.189)	(0.092)	(0.151)	(0.238)	(0.322)	(0.167)	(0.233)	(0.368)	(0.500)	(0.267)
Obs.	1581	1581	1581	1309	1583	1583	1583	1509	1583	1583	1583	1367	1590	1590	1590	1509
Cent. R-squ./Bandwidth	0.049	0.048	0.049	41	0.002	0.004	0.005	50	0.055	0.057	0.057	43	0.061	0.061	0.062	50
Log value per transaction																
Treatment	0.156	0.174	0.233	0.134	-0.024	0.024	0.036	0.040	-0.013	0.002	0.01	-0.007	-8.80E-02	-0.133	-0.235	-0.097
	(0.050)***	(0.079)**	(0.109)**	(0.047)***	(0.022)	(0.035)	(0.047)	(0.028)	(0.024)	(0.038)	(0.051)	(0.023)	(0.076)	(0.121)	(0.164)	(0.082)
Obs.	1581	1581	1581	1383	1583	1583	1583	982	1583	1583	1583	1442	1592	1592	1592	1509
Cent. R-squ./Bandwidth	0.097	0.098	0.101	44	0.013	0.015	0.015	29	0.039	0.043	0.044	46	0.037	0.037	0.036	50
Log quantity per transaction																
Treatment	-0.079	0.056	0.092	-0.064	-0.023	-0.374	-0.275	-0.212	0.303	0.195	0.327	0.232	-0.034	-0.113	0.086	-0.054
	(0.121)	(0.190)	(0.263)	(0.163)	(0.166)	(0.263)	(0.359)	(0.216)	(0.208)	(0.329)	(0.444)	(0.268)	(0.160)	(0.253)	(0.344)	(0.181)
Obs.	1581	1581	1581	1353	1583	1583	1583	1056	1583	1583	1583	1061	1590	1590	1590	1467
Cent. R-squ./Bandwidth	0.022	0.027	0.028	42	0.045	0.046	0.047	32	0.051	0.051	0.053	32	0.004	0.005	0.008	47

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions include distance to external border. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 16: Sensitivity of LATE estimates of the impact of common language on imports from common-language speaking bordering countries to Switzerland to threshold variation at 5 km from baseline threshold (using road distance to the language border)

Common native language		Baseline regression			Including distance to external border			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.235	0.271	0.283	0.260	0.250	0.282	0.288	0.272
	(0.018)***	(0.029)***	(0.039)***	(0.025)***	(0.018)***	(0.028)***	(0.038)***	(0.024)***
Obs.	2682	2682	2682	1968	2682	2682	2682	1968
Cent. R-squ./Bandwidth	0.363	0.366	0.367	33	0.410	0.412	0.413	33
Transactions share								
Treatment	0.229	0.240	0.246	0.232	0.243	0.250	0.251	0.245
	(0.015)***	(0.023)***	(0.031)***	(0.017)***	(0.014)***	(0.022)***	(0.029)***	(0.016)***
Obs.	2682	2682	2682	2669	2682	2682	2682	2669
Cent. R-squ./Bandwidth	0.436	0.437	0.438	45	0.495	0.496	0.496	45
Number of products (HS8 tariff lines)								
Treatment	221.804	119.867	89.432	127.911	217.446	123.701	98.633	132.461
	(39.593)***	(62.291)*	(83.597)	(47.921)***	(39.435)***	(62.034)**	(83.462)	(47.752)***
Obs.	2682	2682	2682	1555	2682	2682	2682	1555
Cent. R-squ./Bandwidth	0.079	0.082	0.083	26	0.083	0.087	0.087	26
Log unit value								
Treatment	0.192	0.322	0.329	0.262	0.193	0.344	0.362	0.278
	(0.104)*	(0.164)*	(0.221)	(0.145)*	(0.104)*	(0.163)**	(0.220)*	(0.145)*
Obs.	2669	2669	2669	2320	2669	2669	2669	2320
Cent. R-squ./Bandwidth	0.012	0.013	0.013	39	0.022	0.023	0.024	39
Log value per transaction								
Treatment	0.035	0.120	0.122	0.076	0.008	0.102	0.120	0.057
	(0.086)	(0.136)	(0.183)	(0.098)	(0.086)	(0.135)	(0.182)	(0.099)
Obs.	2669	2669	2669	2423	2669	2669	2669	2423
Cent. R-squ./Bandwidth	0.002	0.003	0.003	40	0.011	0.012	0.012	40
Log quantity per transaction								
Treatment	0.137	-0.047	-0.035	0.018	0.064	-0.088	-0.037	-0.027
	(0.156)	(0.246)	(0.330)	(0.181)	(0.155)	(0.244)	(0.328)	(0.182)
Obs.	2669	2669	2669	2230	2669	2669	2669	2230
Cent. R-squ./Bandwidth	0.004	0.005	0.005	37	0.021	0.022	0.022	37
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.206	0.261	0.303	0.255	0.223	0.258	0.286	0.254
	(0.025)***	(0.037)***	(0.048)***	(0.034)***	(0.024)***	(0.036)***	(0.046)***	(0.033)***
Obs.	1422	1422	1422	984	1422	1422	1422	984
Cent. R-squ./Bandwidth	0.389	0.395	0.399	29	0.435	0.437	0.440	29
Transactions share								
Treatment	0.205	0.225	0.283	0.216	0.220	0.222	0.268	0.222
	(0.019)***	(0.029)***	(0.037)***	(0.024)***	(0.018)***	(0.027)***	(0.035)***	(0.023)***
Obs.	1422	1422	1422	1308	1422	1422	1422	1308
Cent. R-squ./Bandwidth	0.479	0.481	0.489	40	0.534	0.534	0.539	40
Number of products (HS8 tariff lines)								
Treatment	209.251	139.645	175.946	158.121	219.732	136.589	163.840	158.288
	(43.652)***	(66.302)**	(85.604)**	(52.187)***	(43.336)***	(65.865)**	(85.410)*	(51.737)***
Obs.	1422	1422	1422	1026	1422	1422	1422	1026
Cent. R-squ./Bandwidth	0.090	0.092	0.092	31	0.101	0.104	0.104	31
Log unit value								
Treatment	0.151	0.434	0.500	0.386	0.178	0.421	0.467	0.385
	(0.132)	(0.201)**	(0.258)*	(0.228)*	(0.131)	(0.199)**	(0.257)*	(0.227)*
Obs.	1412	1412	1412	1028	1412	1412	1412	1028
Cent. R-squ./Bandwidth	0.024	0.027	0.033	31	0.040	0.042	0.048	31
Log value per transaction								
Treatment	-0.051	0.073	-0.034	0.010	-0.071	0.075	-0.014	0.005
	(0.116)	(0.176)	(0.226)	(0.134)	(0.115)	(0.175)	(0.227)	(0.133)
Obs.	1412	1412	1412	1194	1412	1412	1412	1194
Cent. R-squ./Bandwidth	0.006	0.009	0.010	36	0.010	0.013	0.015	36
Log quantity per transaction								
Treatment	-0.052	-0.208	-0.197	-0.138	-0.133	-0.201	-0.123	-0.168
	(0.211)	(0.321)	(0.414)	(0.214)	(0.209)	(0.318)	(0.412)	(0.212)
Obs.	1412	1412	1412	1318	1412	1412	1412	1318
Cent. R-squ./Bandwidth	0.001	0.002	0.002	40	0.019	0.02	0.02	40

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 17: Sensitivity of LATE estimates of the impact of common language on imports from common-language speaking bordering countries to Switzerland to threshold variation at 10 km from baseline threshold (using road distance to the language border)

Common native language		Baseline regression			Including distance to external border			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.246	0.276	0.291	0.262	0.272	0.303	0.321	0.290
	(0.019)***	(0.029)***	(0.038)***	(0.025)***	(0.018)***	(0.027)***	(0.036)***	(0.024)***
Obs.	2434	2434	2434	1889	2434	2434	2434	1889
Cent. R-squ./Bandwidth	0.373	0.376	0.377	31	0.422	0.424	0.425	31
Transactions share								
Treatment	0.242	0.248	0.248	0.242	0.266	0.275	0.277	0.267
	(0.015)***	(0.023)***	(0.030)***	(0.016)***	(0.014)***	(0.021)***	(0.028)***	(0.015)***
Obs.	2434	2434	2434	2421	2434	2434	2434	2421
Cent. R-squ./Bandwidth	0.450	0.451	0.451	40	0.513	0.514	0.514	40
Number of products (HS8 tariff lines)								
Treatment	251.143	144.836	42.450	120.266	242.489	142.460	48.709	123.005
	(40.368)***	(62.412)**	(82.044)	(42.847)***	(40.278)***	(61.990)**	(81.445)	(43.854)***
Obs.	2434	2434	2434	1462	2434	2434	2434	1462
Cent. R-squ./Bandwidth	0.081	0.088	0.092	24	0.086	0.093	0.097	24
Log unit value								
Treatment	0.190	0.364	0.515	0.323	0.192	0.384	0.558	0.332
	(0.103)*	(0.160)**	(0.211)**	(0.139)**	(0.103)*	(0.159)**	(0.209)***	(0.139)**
Obs.	2421	2421	2421	1828	2421	2421	2421	1828
Cent. R-squ./Bandwidth	0.010	0.013	0.014	30	0.021	0.024	0.025	30
Log value per transaction								
Treatment	0.026	0.099	0.120	0.060	-0.027	0.045	0.068	0.007
	(0.087)	(0.136)	(0.179)	(0.095)	(0.087)	(0.134)	(0.177)	(0.096)
Obs.	2421	2421	2421	2224	2421	2421	2421	2224
Cent. R-squ./Bandwidth	0.003	0.003	0.003	36	0.014	0.014	0.014	36
Log quantity per transaction								
Treatment	0.163	-0.079	-0.274	-0.031	0.035	-0.207	-0.394	-0.153
	(0.159)	(0.246)	(0.325)	(0.191)	(0.157)	(0.243)	(0.320)	(0.191)
Obs.	2421	2421	2421	1826	2421	2421	2421	1826
Cent. R-squ./Bandwidth	0.004	0.006	0.007	30	0.023	0.024	0.025	30
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.207	0.227	0.240	0.214	0.238	0.253	0.266	0.244
	(0.025)***	(0.038)***	(0.048)***	(0.029)***	(0.024)***	(0.036)***	(0.046)***	(0.028)***
Obs.	1266	1266	1266	1215	1266	1266	1266	1215
Cent. R-squ./Bandwidth	0.405	0.408	0.409	38	0.450	0.453	0.453	38
Transactions share								
Treatment	0.203	0.181	0.194	0.189	0.232	0.206	0.218	0.219
	(0.019)***	(0.029)***	(0.037)***	(0.025)***	(0.018)***	(0.027)***	(0.034)***	(0.024)***
Obs.	1266	1266	1266	1069	1266	1266	1266	1069
Cent. R-squ./Bandwidth	0.498	0.497	0.498	32	0.555	0.555	0.556	32
Number of products (HS8 tariff lines)								
Treatment	213.642	111.106	77.604	116.103	232.863	127.426	94.238	135.820
	(45.531)***	(68.657)	(86.390)	(56.855)**	(45.377)***	(68.007)*	(85.460)	(57.425)**
Obs.	1266	1266	1266	862	1266	1266	1266	862
Cent. R-squ./Bandwidth	0.089	0.094	0.095	25	0.100	0.106	0.107	25
Log unit value								
Treatment	0.078	0.302	0.407	0.265	0.138	0.347	0.453	0.311
	(0.130)	(0.197)	(0.248)	(0.179)	(0.129)	(0.195)*	(0.245)*	(0.178)*
Obs.	1256	1256	1256	957	1256	1256	1256	957
Cent. R-squ./Bandwidth	0.020	0.025	0.029	29	0.039	0.043	0.047	29
Log value per transaction								
Treatment	-0.032	0.129	0.084	0.060	-0.076	0.088	0.044	-0.003
	(0.120)	(0.182)	(0.229)	(0.149)	(0.120)	(0.181)	(0.228)	(0.148)
Obs.	1256	1256	1256	997	1256	1256	1256	997
Cent. R-squ./Bandwidth	0.003	0.004	0.005	30	0.008	0.010	0.011	30
Log quantity per transaction								
Treatment	0.014	-0.133	-0.166	-0.060	-0.144	-0.274	-0.304	-0.227
	(0.221)	(0.334)	(0.421)	(0.231)	(0.219)	(0.330)	(0.415)	(0.228)
Obs.	1256	1256	1256	1198	1256	1256	1256	1198
Cent. R-squ./Bandwidth	0.001	0.002	0.002	37	0.022	0.023	0.023	37

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Table 18: Sensitivity of LATE estimates of the impact of common language on imports from common-language speaking bordering countries to Switzerland to threshold variation at 15 km from baseline threshold (using road distance to the language border)

Common native language		Baseline regression			Including distance to external border			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.239	0.231	0.197	0.236	0.270	0.265	0.240	0.268
	(0.019)***	(0.029)***	(0.039)***	(0.022)***	(0.018)***	(0.028)***	(0.037)***	(0.021)***
Obs.	2166	2166	2166	2155	2166	2166	2166	2155
Cent. R-squ./Bandwidth	0.380	0.379	0.378	35	0.431	0.431	0.430	35
Transactions share								
Treatment	0.246	0.239	0.221	0.243	0.276	0.271	0.261	0.274
	(0.015)***	(0.023)***	(0.031)***	(0.017)***	(0.014)***	(0.021)***	(0.029)***	(0.016)***
Obs.	2166	2166	2166	2155	2166	2166	2166	2155
Cent. R-squ./Bandwidth	0.460	0.460	0.459	35	0.525	0.525	0.524	35
Number of products (HS8 tariff lines)								
Treatment	311.353	254.290	117.718	259.476	299.460	246.287	124.571	251.633
	(43.110)***	(66.563)***	(88.404)	(51.870)***	(43.073)***	(66.086)***	(87.644)	(50.897)***
Obs.	2166	2166	2166	1722	2166	2166	2166	1722
Cent. R-squ./Bandwidth	0.082	0.084	0.090	28	0.089	0.091	0.097	28
Log unit value								
Treatment	0.140	0.283	0.543	0.238	0.143	0.296	0.597	0.226
	(0.106)	(0.163)*	(0.217)**	(0.132)*	(0.105)	(0.161)*	(0.214)***	(0.131)*
Obs.	2155	2155	2155	1722	2155	2155	2155	1722
Cent. R-squ./Bandwidth	0.011	0.013	0.017	28	0.020	0.023	0.027	28
Log value per transaction								
Treatment	-0.012	-0.008	-0.066	-0.012	-0.070	-0.068	-0.130	-0.067
	(0.090)	(0.139)	(0.185)	(0.086)	(0.090)	(0.138)	(0.183)	(0.087)
Obs.	2155	2155	2155	2155	2155	2155	2155	2155
Cent. R-squ./Bandwidth	0.003	0.003	0.004	35	0.012	0.013	0.013	35
Log quantity per transaction								
Treatment	0.312	0.204	-0.003	0.271	0.166	0.053	-0.159	0.137
	(0.164)*	(0.253)	(0.336)	(0.171)	(0.163)	(0.250)	(0.332)	(0.174)
Obs.	2155	2155	2155	2155	2155	2155	2155	2155
Cent. R-squ./Bandwidth	0.005	0.005	0.007	35	0.023	0.023	0.024	35
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.222	0.212	0.189	0.219	0.255	0.245	0.227	0.254
	(0.026)***	(0.039)***	(0.050)***	(0.030)***	(0.025)***	(0.038)***	(0.048)***	(0.028)***
Obs.	1110	1110	1110	1101	1110	1110	1110	1101
Cent. R-squ./Bandwidth	0.422	0.424	0.423	35	0.469	0.471	0.471	35
Transactions share								
Treatment	0.235	0.204	0.201	0.216	0.266	0.235	0.237	0.252
	(0.020)***	(0.030)***	(0.038)***	(0.029)***	(0.019)***	(0.028)***	(0.036)***	(0.027)***
Obs.	1110	1110	1110	860	1110	1110	1110	860
Cent. R-squ./Bandwidth	0.523	0.522	0.522	26	0.581	0.580	0.581	26
Number of products (HS8 tariff lines)								
Treatment	260.347	177.358	97.551	191.901	281.837	198.841	125.605	217.882
	(48.230)***	(73.170)**	(93.136)	(68.193)***	(48.094)***	(72.514)***	(92.168)	(66.938)***
Obs.	1110	1110	1110	848	1110	1110	1110	848
Cent. R-squ./Bandwidth	0.093	0.097	0.100	25	0.106	0.110	0.113	25
Log unit value								
Treatment	0.056	0.256	0.499	0.218	0.124	0.321	0.583	0.278
	(0.134)	(0.203)	(0.258)*	(0.171)	(0.133)	(0.200)	(0.254)**	(0.171)
Obs.	1101	1101	1101	869	1101	1101	1101	869
Cent. R-squ./Bandwidth	0.019	0.028	0.030	26	0.038	0.047	0.049	26
Log value per transaction								
Treatment	-0.111	-0.050	-0.202	-0.084	-0.142	-0.081	-0.233	-0.118
	(0.123)	(0.186)	(0.237)	(0.120)	(0.123)	(0.186)	(0.236)	(0.122)
Obs.	1101	1101	1101	1060	1101	1101	1101	1060
Cent. R-squ./Bandwidth	0.003	0.003	0.005	33	0.007	0.007	0.008	33
Log quantity per transaction								
Treatment	0.082	-0.045	-0.160	0.032	-0.062	-0.185	-0.306	-0.119
	(0.229)	(0.347)	(0.443)	(0.228)	(0.228)	(0.344)	(0.437)	(0.230)
Obs.	1101	1101	1101	1089	1101	1101	1101	1089
Cent. R-squ./Bandwidth	0	0.002	0.002	35	0.019	0.02	0.02	35

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

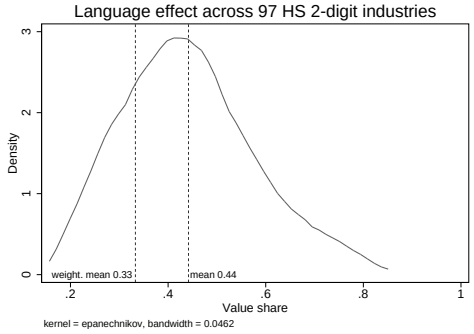
Table 19: LATE estimates of the impact of common language on imports of consumer goods only from common language speaking bordering countries to Switzerland (using road distance to the language border)

Common native language	Baseline regression				Including distance to external border			
effect with parametric	1st order	2nd order	3rd order	Nonparam.	1st order	2nd order	3rd order	Nonparam.
polynomial or nonparametric	All regions within the two respective language districts to left and right of language border							
control function	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Value share								
Treatment	0.186	0.179	0.140	0.179	0.193	0.184	0.143	0.185
	(0.019)***	(0.032)***	(0.045)***	(0.025)***	(0.019)***	(0.031)***	(0.043)***	(0.025)***
Obs.	2968	2968	2968	2641	2968	2968	2968	2641
Cent. R-squ./Bandwidth	0.338	0.337	0.334	44	0.380	0.380	0.377	44
Transactions share								
Treatment	0.195	0.190	0.182	0.189	0.202	0.194	0.185	0.195
	(0.016)***	(0.026)***	(0.037)***	(0.022)***	(0.015)***	(0.025)***	(0.035)***	(0.023)***
Obs.	2968	2968	2968	2404	2968	2968	2968	2404
Cent. R-squ./Bandwidth	0.383	0.383	0.382	41	0.434	0.433	0.433	41
Number of products (HS8 tariff lines)								
Treatment	193.534	81.539	82.418	106.357	191.573	89.237	94.021	112.111
	(41.756)***	(68.875)	(96.537)	(55.822)*	(41.556)***	(68.739)	(96.541)	(54.810)**
Obs.	2968	2968	2968	1830	2968	2968	2968	1830
Cent. R-squ./Bandwidth	0.075	0.078	0.078	31	0.080	0.083	0.083	31
Log unit value								
Treatment	0.066	0.032	-0.173	0.059	0.067	0.056	-0.141	0.066
	(0.111)	(0.184)	(0.258)	(0.128)	(0.110)	(0.183)	(0.257)	(0.128)
Obs.	2950	2950	2950	2950	2950	2950	2950	2950
Cent. R-squ./Bandwidth	0.009	0.010	0.010	50	0.016	0.017	0.017	50
Log value per transaction								
Treatment	-0.076	-0.117	-0.227	-0.088	-0.092	-0.123	-0.227	-0.099
	(0.085)	(0.141)	(0.198)	(0.093)	(0.085)	(0.140)	(0.197)	(0.093)
Obs.	2950	2950	2950	2950	2950	2950	2950	2950
Cent. R-squ./Bandwidth	0.002	0.002	0.004	50	0.014	0.015	0.016	50
Log quantity per transaction								
Treatment	-0.002	-0.313	-0.291	-0.222	-0.045	-0.323	-0.282	-0.230
	(0.157)	(0.259)	(0.364)	(0.214)	(0.155)	(0.257)	(0.361)	(0.213)
Obs.	2950	2950	2950	2033	2950	2950	2950	2033
Cent. R-squ./Bandwidth	0.004	0.006	0.006	34	0.025	0.026	0.026	34
	All regions to left and right of language border within the same canton							
Value share								
Treatment	0.153	0.174	0.159	0.162	0.158	0.161	0.141	0.160
	(0.025)***	(0.039)***	(0.052)***	(0.032)***	(0.024)***	(0.038)***	(0.052)***	(0.032)***
Obs.	1644	1644	1644	1450	1644	1644	1644	1450
Cent. R-squ./Bandwidth	0.355	0.357	0.357	42	0.393	0.393	0.393	42
Transactions share								
Treatment	0.173	0.191	0.228	0.186	0.179	0.179	0.214	0.183
	(0.020)***	(0.032)***	(0.042)***	(0.028)***	(0.020)***	(0.031)***	(0.041)***	(0.027)***
Obs.	1644	1644	1644	1380	1644	1644	1644	1380
Cent. R-squ./Bandwidth	0.415	0.417	0.422	40	0.458	0.458	0.462	40
Number of products (HS8 tariff lines)								
Treatment	188.804	117.088	156.900	139.448	198.871	110.760	148.644	133.478
	(45.825)***	(71.663)	(96.326)	(64.264)**	(45.827)***	(72.055)	(97.062)	(64.062)**
Obs.	1644	1644	1644	1206	1644	1644	1644	1206
Cent. R-squ./Bandwidth	0.080	0.082	0.082	34	0.092	0.096	0.096	34
Log unit value								
Treatment	0.008	0.105	-0.154	0.052	0.043	0.100	-0.165	0.045
	(0.139)	(0.218)	(0.294)	(0.194)	(0.139)	(0.219)	(0.296)	(0.191)
Obs.	1632	1632	1632	1549	1632	1632	1632	1549
Cent. R-squ./Bandwidth	0.017	0.019	0.020	46	0.031	0.032	0.034	46
Log value per transaction								
Treatment	-0.192	-0.210	-0.444	-0.197	-0.193	-0.185	-0.416	-0.201
	(0.112)*	(0.175)	(0.236)*	(0.119)*	(0.112)*	(0.177)	(0.239)*	(0.119)*
Obs.	1632	1632	1632	1632	1632	1632	1632	1632
Cent. R-squ./Bandwidth	0.006	0.006	0.010	50	0.011	0.011	0.014	50
Log quantity per transaction								
Treatment	-0.095	-0.257	-0.180	-0.192	-0.092	-0.161	-0.059	-0.179
	(0.206)	(0.323)	(0.434)	(0.240)	(0.205)	(0.324)	(0.436)	(0.238)
Obs.	1632	1632	1632	1413	1632	1632	1632	1413
Cent. R-squ./Bandwidth	0.001	0.002	0.006	41	0.021	0.021	0.025	41

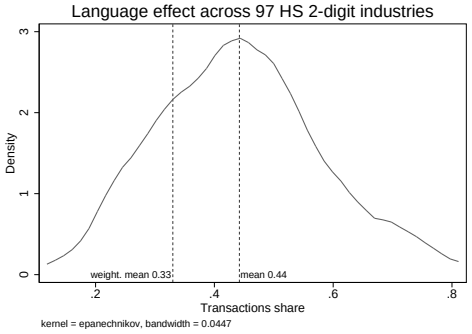
Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.

Figure 15: Kernel density of LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland by HS 2-digit industry (using road distance to the language borders)

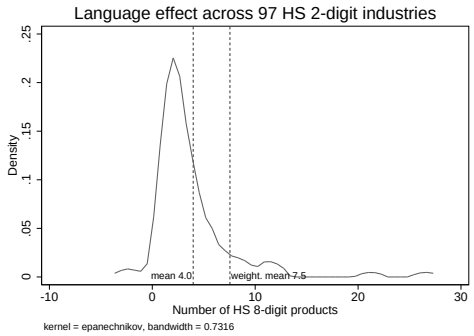
(a) Import value share



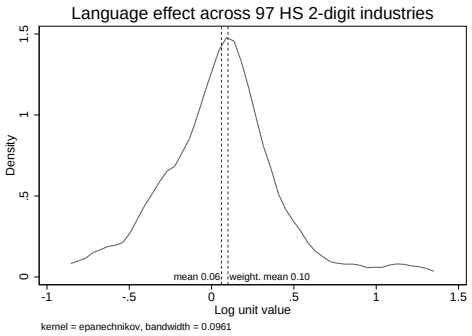
(b) Import transactions share



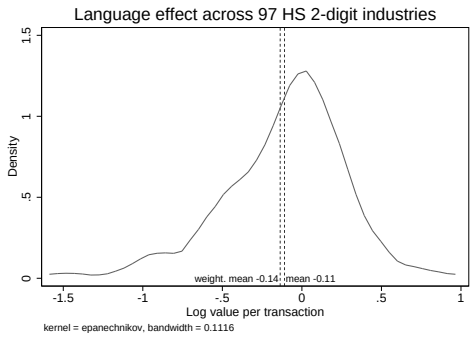
(c) Number of products (HS 8 tariff lines)



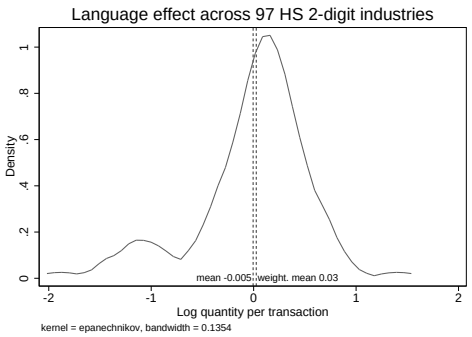
(d) Log import unit value



(e) Log value per transaction



(f) Log quantity per transaction



Notes: Parametric linear regressions including external border distance with all regional units within the two respective language districts to left and right of language border in all figures. We weight the mean across all 2-digit industries by the industry share in terms of import value in CHF.

Table 20: LATE estimates of the impact of common language on imports from common language speaking bordering countries to Switzerland according to (liberal) Rauch goods classification (using road distance to the language border)

Common native language effect with parametric polynomial or nonparametric control function	Effects across Rauch classified goods categories: homogenous goods 1st order	homogenous goods 2nd order	homogenous goods 3rd order	homogenous goods Nonparam.	reference priced goods 1st order	reference priced goods 2nd order	reference priced goods 3rd order	reference priced goods Nonparam.	differentiated goods 1st order	differentiated goods 2nd order	differentiated goods 3rd order	differentiated goods Nonparam.
	All regional units within the two respective language districts to left and right of language border											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Value share												
Treatment	0.157	0.115	0.103	0.119	0.158	0.155	0.138	0.157	0.202	0.169	0.116	0.175
	(0.048)***	(0.081)	(0.117)	(0.079)	(0.026)***	(0.042)***	(0.059)**	(0.031)***	(0.020)***	(0.033)***	(0.046)**	(0.029)***
Obs.	1576	1576	1576	1067	2766	2766	2766	2703	2958	2958	2958	2239
Cent. R-squ./Bandwidth	0.119	0.118	0.117	34	0.218	0.219	0.218	49	0.372	0.371	0.367	38
Transactions share												
Treatment	0.187	0.141	0.130	0.143	0.167	0.189	0.167	0.178	0.217	0.213	0.203	0.212
	(0.042)***	(0.072)*	(0.104)	(0.073)**	(0.020)***	(0.034)***	(0.047)***	(0.028)***	(0.015)***	(0.026)***	(0.036)***	(0.023)***
Obs.	1576	1576	1576	1057	2766	2766	2766	2386	2958	2958	2958	2367
Cent. R-squ./Bandwidth	0.177	0.175	0.174	34	0.263	0.264	0.264	43	0.452	0.452	0.451	40
Number of products (HS8 tariff lines)												
Treatment	1.451	-3.055	-1.642	0.336	19.318	6.122	8.875	9.525	120.792	58.235	61.331	72.447
	(2.025)	(3.447)	(4.947)	(2.733)	(7.326)***	(12.056)	(16.918)	(8.577)	(24.763)***	(40.923)	(57.452)	(33.332)**
Obs.	1576	1576	1576	636	2766	2766	2766	1738	2958	2958	2958	1826
Cent. R-squ./Bandwidth	0.042	0.048	0.049	22	0.050	0.053	0.053	32	0.083	0.086	0.086	31
Log unit value												
Treatment	0.538	-0.444	-1.062	-0.777	0.406	0.508	0.416	0.449	-0.014	-0.025	-0.070	-0.017
	(0.335)	(0.572)	(0.820)	(0.695)	(0.173)**	(0.284)*	(0.399)	(0.200)**	(0.098)	(0.163)	(0.229)	(0.115)
Obs.	1563	1563	1563	674	2740	2740	2740	2740	2932	2932	2932	2932
Cent. R-squ./Bandwidth	0.035	0.037	0.038	22	0.061	0.063	0.063	50	0.009	0.010	0.010	50
Log value per transaction												
Treatment	-0.224	-0.371	-0.490	-0.309	-0.125	0.011	0.174	-0.051	0.014	-0.186	-0.285	-0.134
	(0.234)	(0.399)	(0.572)	(0.352)	(0.129)	(0.213)	(0.299)	(0.153)	(0.093)	(0.154)	(0.216)	(0.137)
Obs.	1573	1573	1573	1256	2744	2744	2744	2611	2932	2932	2932	1974
Cent. R-squ./Bandwidth	0.012	0.015	0.017	40	0.022	0.022	0.022	47	0.009	0.011	0.011	33
Log quantity per transaction												
Treatment	-0.475	-0.028	0.202	-0.167	0.237	0.093	0.233	0.167	0.276	-0.034	0.119	0.118
	(0.400)	(0.683)	(0.980)	(0.635)	(0.238)	(0.392)	(0.550)	(0.279)	(0.165)*	(0.274)	(0.385)	(0.227)
Obs.	1563	1563	1563	1064	2740	2740	2740	2508	2932	2932	2932	2039
Cent. R-squ./Bandwidth	0.018	0.019	0.019	34	0.056	0.057	0.057	45	0.028	0.029	0.029	35
	All regions to left and right of language border within the same canton											
Value share												
Treatment	0.094	0.104	0.066	0.094	0.155	0.150	0.152	0.149	0.164	0.151	0.143	0.160
	(0.063)	(0.102)	(0.144)	(0.072)	(0.034)***	(0.053)***	(0.072)**	(0.040)***	(0.025)***	(0.040)***	(0.054)***	(0.031)***
Obs.	861	861	861	855	1535	1535	1535	1499	1637	1637	1637	1567
Cent. R-squ./Bandwidth	0.091	0.093	0.092	50	0.191	0.192	0.192	49	0.399	0.399	0.398	47
Transactions share												
Treatment	0.125	0.102	0.072	0.121	0.146	0.146	0.160	0.143	0.199	0.215	0.251	0.220
	(0.056)**	(0.091)	(0.128)	(0.076)	(0.027)***	(0.042)***	(0.057)***	(0.033)***	(0.020)***	(0.031)***	(0.042)***	(0.030)***
Obs.	861	861	861	730	1535	1535	1535	1462	1637	1637	1637	1193
Cent. R-squ./Bandwidth	0.143	0.143	0.141	40	0.213	0.214	0.214	47	0.480	0.482	0.486	34
Number of products (HS8 tariff lines)												
Treatment	2.091	-0.704	0.462	1.267	21.776	10.022	13.445	12.973	125.764	70.945	96.789	85.913
	(1.936)	(3.151)	(4.435)	(2.673)	(7.208)***	(11.339)	(15.368)	(9.849)	(28.016)***	(44.026)	(59.270)	(39.394)**
Obs.	861	861	861	486	1535	1535	1535	1123	1637	1637	1637	1197
Cent. R-squ./Bandwidth	0.028	0.033	0.033	25	0.047	0.050	0.050	34	0.094	0.098	0.097	34
Log unit value												
Treatment	-0.062	-0.752	-1.387	-0.587	0.319	0.608	0.890	0.552	0.017	0.062	-0.044	0.004
	(0.425)	(0.692)	(0.973)	(0.693)	(0.222)	(0.349)*	(0.473)*	(0.305)*	(0.122)	(0.192)	(0.259)	(0.153)
Obs.	855	855	855	580	1517	1517	1517	993	1618	1618	1618	1618
Cent. R-squ./Bandwidth	0.082	0.084	0.086	30	0.094	0.096	0.098	30	0.015	0.016	0.016	50
Log value per transaction												
Treatment	-0.506	-0.518	-0.429	-0.259	0.075	-0.207	0.071	0.120	-0.321	-0.523	-0.629	-0.196
	(0.701)	(0.900)	(1.062)	(0.392)	(0.365)	(0.471)	(0.549)	(0.208)	(0.261)	(0.337)	(0.394)	(0.152)
Obs.	858	858	858	787	1518	1518	1518	1365	1618	1618	1618	1428
Cent. R-squ./Bandwidth	0.014	0.015	0.015	44	0.014	0.017	0.017	43	0.020	0.022	0.022	42
Log intensive margin (value per transaction)												
Treatment	-0.107	0.078	0.678	-0.022	0.350	0.134	-0.132	0.161	0.146	0.029	0.537	2.719E-04
	(0.537)	(0.874)	(1.230)	(0.657)	(0.314)	(0.494)	(0.669)	(0.393)	(0.220)	(0.347)	(0.468)	(0.248)
Obs.	855	855	855	805	1517	1517	1517	1106	1618	1618	1618	1500
Cent. R-squ./Bandwidth	0.025	0.028	0.027	45	0.049	0.051	0.052	34	0.038	0.038	0.043	44

Notes: Treatment effect from instrumental variables regression. *** indicates statistical significance of parameters at 1% ** 5% * 10%. Regressions include distance to external border. Liberal Rauch Classification of Goods (matching data source: http://www.freit.org/Resources.html). Homogeneous goods refer to goods traded on an organized exchange. The optimal bandwidth in nonparametric regressions is estimated according to Imbens and Kalyanaraman (2012). Parametric specifications are chosen according to AIC/BIC among specifications including first-order to fifth-order polynomials.