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Do visas hinder international trade in goods?☆

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A B S T R A C T

Travel visas impose additional costs to firms engaging in international trade. This paper exploits a natural experiment provided by the Schengen Agreement to document a large causal negative impact of visas on goods trade. The introduction of a visa, requested by a single Schengen Area member, considerably reduced bilateral trade flows of Ecuador and Bolivia with the members of the border-control free zone other than Spain. I show that the negative impact of visas is much larger for differentiated than for homogeneous products. By applying a general equilibrium framework, the paper shows that removing visas would increase welfare by 5% or more for some Sub-Saharan African countries and by 1,1% on average for developing countries. For policy makers this paper highlights the importance of including visa facilitation schemes into the provisions of trade agreements and economic partnerships.

1. Introduction

A wide range of non-tariff barriers to trade has been thoroughly studied. Visas however, understood as a non-tariff trade barrier, have to the best of our knowledge not received much attention in the economic literature. This occurs despite the claims of numerous developing countries regarding the difficulties imposed by visas on their exporters. In a recent high-level meeting, Mthuli Ncube, Chief Economist and Vice-President of the African Development Bank, declared for instance that "Africa is one of the regions in the world with the highest visa requirements. Visa restrictions imply missed economic opportunities for intra-regional trade" (Michelle DeFreese, 2017).

For example, Ethiopian entrepreneurs require visas to travel to most countries in the world. Fig. 1 shows the world as seen by Ethiopian nationals when planning to travel abroad. The countries in red require Ethiopian citizens to apply for a visa prior to arrival. While there is a small number of visa-free countries for Ethiopians, most of these countries are not connected to Addis Ababa through direct flights. All the countries in which connecting flights take place require transit visas for Ethiopians. Ethiopia is not even the country suffering the most from visa restrictions. There is a considerable number of other countries whose nationals can travel to even fewer countries visa-free.

There are two main reasons why visa restrictions might affect international trade in goods. First, there is recent empirical evidence of the importance of face to face contact in international trade (e.g. Cristea (2011); Oxford Economics (2012); Startz (2017)). Visas might thus reduce international trade by hindering or impeding the exports of firms whose managers or owners cannot travel to conduct business. A survey conducted by Oxford Economics shows the importance given to in-person meetings by firms when engaging in exporting. Fig. 2 is taken from this survey. It shows the conversion rate from prospective customers to costumers with and without in-person meetings. The results were obtained using the answers to a survey conducted among 300 executives and 500 business travelers. According to the obtained answers, the percentage of prospective customers who become actual customers nearly triples when an in-person meeting takes place.

Second, by imposing an additional cost to firms, both in terms of time and resources, visas might make firms less competitive when compared to firms from countries whose nationals do not need visas to enter a given market. Applying for a visa takes time. Time delays can hamper business deals and impose additional risks for the buyer in terms of the seller's capacity to respect the terms of the contract. A number of papers show indeed that time acts as a trade barrier (Hummels and Schaur (2012); Djankov et al. (2010)). Moreover, for firms not located in capital cities where consulates and embassies are usually found the costs might be even higher.[1] Finally, visas are sometimes issued for short periods of time. For example, one year is the maximum recommended length for short stay visas in the Schengen Area. Applying for

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[1] The argument becomes even stronger in such cases where there are no diplomatic representations in a given country.

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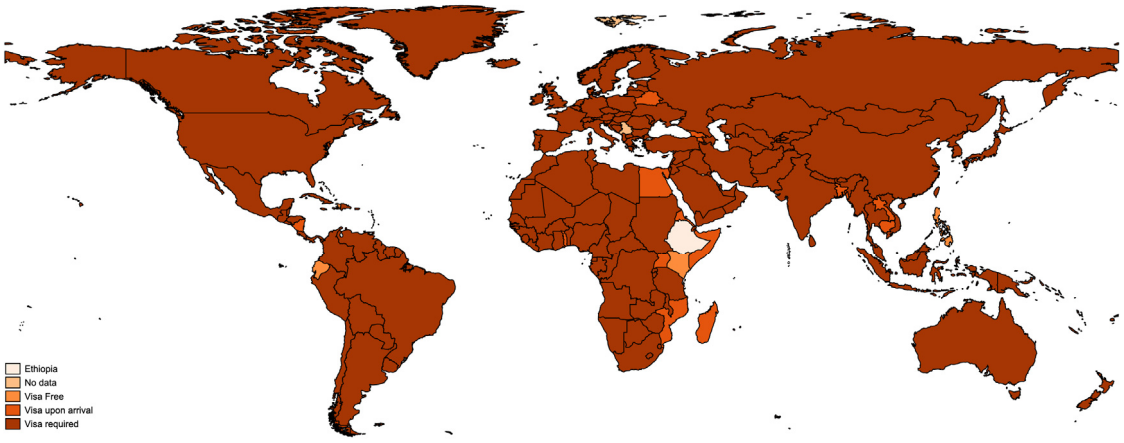
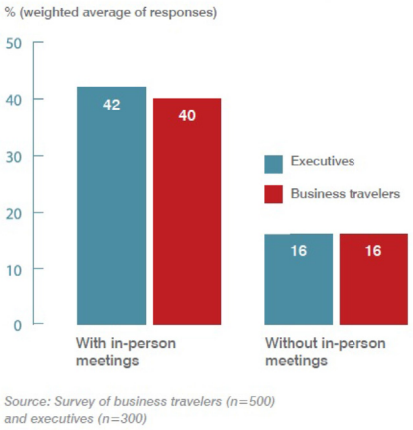


Source: Based on data from http://www.doyouneedvisa.com

Note: This map shows short-stay visa requirements for Ethiopian citizens by destination country

Fig. 1. Visa restrictions for an Ethiopian national.



Source: Oxford Economics USA (2010), "The Return on Investment of U.S. business travel."

Note: This graph is taken from an Oxford Economics survey on business travels. It shows the conversion rate of potential customers into actual consumers with and without in-person meetings. The average customer conversion rate is around three times higher with face to face meetings than without them.

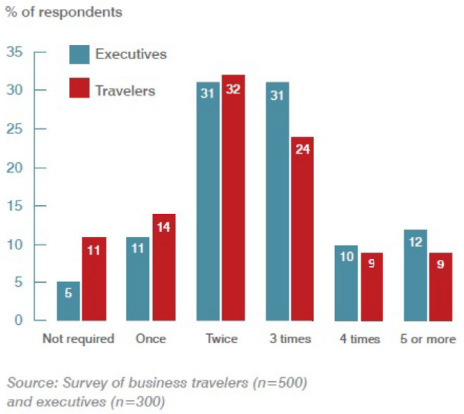
Fig. 2. Conversion rate of prospects to customers with and without in-person meeting.

a visa repeatedly can be extremely burdensome. Fig. 3 shows that most business deals require more than a single business travel to be competitive. All in all, visas could potentially constitute a considerable burden to trade.

The impact of visas on trade has received little attention. To the best of our knowledge, Neumayer (2011) and Czaika and Neumayer (2017) are the only two papers that examine the question. Neumayer (2011) results document a strong negative correlation between visas and bilateral trade and FDI flows. The visa measure used by the author is however time invariant, which does not allow controlling for multilateral resistance terms. Czaika and Neumayer (2017) address this problem by constructing a time variant visa measure and by including a set of fixed effects. This corrects the bias stemming from the exclusion of multilateral resistance terms and controls for omitted variables that are fixed over time at the country pair level.

The estimates of these two papers cannot be interpreted however as capturing the causal impact of visas. The inclusion of fixed effects does not rule out the possibility of reverse causation and other forms of endogeneity of visa restrictions. In particular, it is plausible that countries might impose visas to countries with whom bilateral relationships are deteriorating and this might in turn impact trade flows. Similarly, countries might not want to impose visa restrictions between each other when trade is increasing or when bilateral trade flows are important. Reverse causation might therefore bias the results. The questions concerning the causal impact of visas on bilateral trade and the extent to which they do remain therefore virtually unanswered.

In order to examine whether visas have a causal impact on trade flows I exploit here a natural experiment provided by the Schengen Area common visa policy. The Schengen Area is a space free of systematic border controls constituted by 26 European countries. In 2001, Schengen members agreed upon a list of third countries whose national



Source: Oxford Economics USA (2010), "The Return on Investment of U.S. business travel."

Note: This graph taken from Oxford Economics' survey on business travels shows the optimal number of in-person meetings for potential customer to become an actual customer. The average optimal number of face to face meetings is around 2,4.

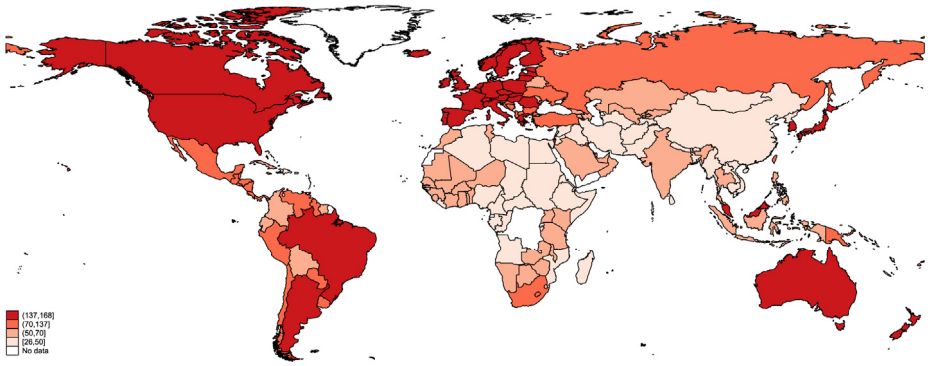
Fig. 3. Optimal number of in-person meetings to win a new customer.

must apply for a visa prior to arrival to any member country. Conversely, a positive list of countries whose nationals can travel visa-free to any Schengen destination was also drafted. While a number of countries have been shifted to the positive list, only two countries have ever been changed from the positive to the negative. These two countries, Ecuador and Bolivia, were added to the list per the request of the Spanish government. As explained in detail below, this addition was driven by increasing immigration from Ecuador and Bolivia to Spain but not to other European countries. The introduction of a visa for nationals of these two countries by Spain implied therefore the introduction of visas by all the other Schengen Area members. I hence use the external shock provided by the introduction of visas for Ecuadorian and Bolivian nationals by Schengen Members, other than Spain, to estimate the causal impact of visas on trade flows. It should be noted that there is a single type of visa both for tourism or business purposes in the Schengen Space (Uniform Schengen Visa Type C). The external shock implied therefore the introduction of visas both for business and tourism purposes.

I then use this same shock to provide new evidence on the heterogeneous impact of visa restrictions on different categories of products. I show that visas have a larger impact on differentiated products than on homogeneous products as expected in a Melitz-Chaney framework. I present also suggestive evidence that visas reduce the number of new products exported to a given market. These findings indicate that visas might affect the diversification and sophistication of developing countries' exports.

Figs. 4 and 5 show that visas are probably the most asymmetric trade barrier. Using the estimated impact of visas, I perform a general equilibrium counter-factual exercise in which all short-stay visas would be removed. The results of this exercise show that welfare in the developing world would increase by 1.1% on average. Some Sub-Saharan African countries would experience a large increase of economic welfare of around 5%.

A more in depth analysis of visas can also shed light upon whether face to face contact is important for trade as some recent evidence suggests. Studying firm-to-firm trade in Nigeria Startz (2017) shows that traveling reduces information problems affecting trade. Cristea (2011)



Source: Author's own calculations based on Henley and Partners' Visas Restriction Index (Henley & Partners (2018)).

Note: This map is based on Henley and Partners' Visas Restriction Index which captures the number of countries a national of a given country can travel to visa free for business purposes. Nationals from OECD countries and some Latin American countries can travel visa-free to the largest number of destinations.

Fig. 4. Number of visa-free destinations.

Note: This figure plots countries' log of GDP per capita (WB Development Indicators 2011) against the log of Henley and Partners' Visas Restriction Index (Henley & Partners (2018)). The index captures the number of countries a given country can travel to visa free for business purposes.

Fig. 5. Log of the number of visa free destinations vs. log of per capita income.

as well as Poole (2010) study the effect of business travels on internal and international trade in the US. Kulendran and Wilson (2000) and Shan and Wilson (2001) perform a similar exercise for Australia and China respectively. In addition, two different papers study the impact of direct flights on trade. Alderighi et al. (2012) examine whether the increase of direct flights led to an increase of Italian exports while Yilmazkuday and Yilmazkuday (2017) analyze the impact of direct flights on trade costs. Similarly, Cristea et al. (2017) study the effects of Open Skies Agreements.

Last, there is an increasing literature on the link between migration and trade. However, the causal impact that I document in this paper is not directly related to migration. Migration flows between the countries in the natural experiment used in this paper are, as explained in section 4, orthogonal to the introduction of a visa (Tables 1 and 2). The effect of visas examined here should therefore be interpreted as additional to any impact originating from the change in immigration subsequent to the introduction of a visa.[2]

The remainder of the paper is organized as follows. Section 2 describes the natural experiment. Section 3 lays out the estimation strategy while section 4 presents the main results. The following section discusses a number of performed robustness tests. Section 6 examines the impact of visas on homogeneous vs. differentiated products. Section 7 presents the general equilibrium and welfare analysis. Section 8 concludes.

2. The Schengen Area as a natural experiment

Unobserved variables may affect the probability of the introduction of a visa between two trading partners. This might lead to a selection bias and thus hinder the estimation of the effect of visas. An example of such variables is migration. There is well established evidence on the impact of immigration on trade (e.g. Head and Ries (1998); Girma and Yu (2002); Parsons and Vézina (2014)). If those countries whose nationals are more prone to migrate are selected for visa requirements, then the assessment of the impact of visas on trade might be positively biased. Other unobserved factors might of course also affect the probability of the introduction of a visa between two trading partners.

In order to offer an answer to this question and avoid the pitfalls of previous research I exploit some features of the Schengen Agreement as a natural experiment. The Schengen Agreement was signed in 1985 with the goal of creating a borderless area between 5 European countries.[3] The agreement then led to the creation of the Schengen Area in 1995 encompassing the territory of eight European countries: Austria, Belgium, France, Germany, Greece, Italy, Luxembourg, and the Netherlands. Progressively, new countries, including new members of the European Union[4] but not exclusively, signed the Schengen Agreement. Today the Schengen Area consists of the territories of 26 European countries.

The agreement abolished border controls among the signatory States. Naturally, it included the adoption of a common visa policy. The latter led to the introduction of positive, EC 539/2001 Annex II,

[2] This is confirmed by the results presented in Table A11 where bilateral migration flows are included in the estimation.

[3] This first five members of the Schengen Agreement were Belgium, France, Germany, Luxembourg and the Netherlands.

[4] With the exception of the newest members -Bulgaria, Croatia and Romania- which are not yet part of the Schengen Space.

Table 1
Ecuadorian immigration to Europe.

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	42	77	89	58	48	36	33	35			
Belgium							410			472	847
Bulgaria							0	0			
Cyprus		0	0	0	0	0	0	0			
Czech Republic		8	17	11	19	17	12	10	8	2	9
Denmark	33	30	22	22	25	21	15	19	20	21	12
Estonia				0	0	0	1	0	1	0	0
Finland	8	3	7	7	13	13	8	11	21	13	14
France											
Germany	0	0	894	653	665	580	580	578			
Greece						9	4				
Hungary	4	3	5	12	7	4	8	11	2		
Ireland								3	1	1	6
Italy		2531	17870	18135	8278	6047	4414	6874	6324	6168	4164
Latvia		0	0	0	0	0	0	0	0	0	
Lithuania	0	0	0	2	0	2	0	2	2	0	0
Luxembourg	5	5	13	9	2	4	16	4	6	13	5
Malta							0				
Netherlands	107	140	138	126	129	121	119	128	97		
Poland						4	2	5			
Portugal											
Romania											
Slovakia		0	1	6	1	2	6	6	17	12	1
Slovenia	1	2	4	0	0	0	1	1	5	1	0
Spain	82639	88967	99380	17202	15234	21387	30162	37752	18212	14599	11947
Sweden	67	109	105	84	94	202	145	106	97	112	90
United Kingdom	541	0	751	0	136						

Note: this chart presents the total number of new immigrants, by destination country, holding an Ecuadorian passport. A blank space represents a figure not reported by a given country. The figures exclude short-term visitors.
Source: Eurostat (migr_imm1ctz).

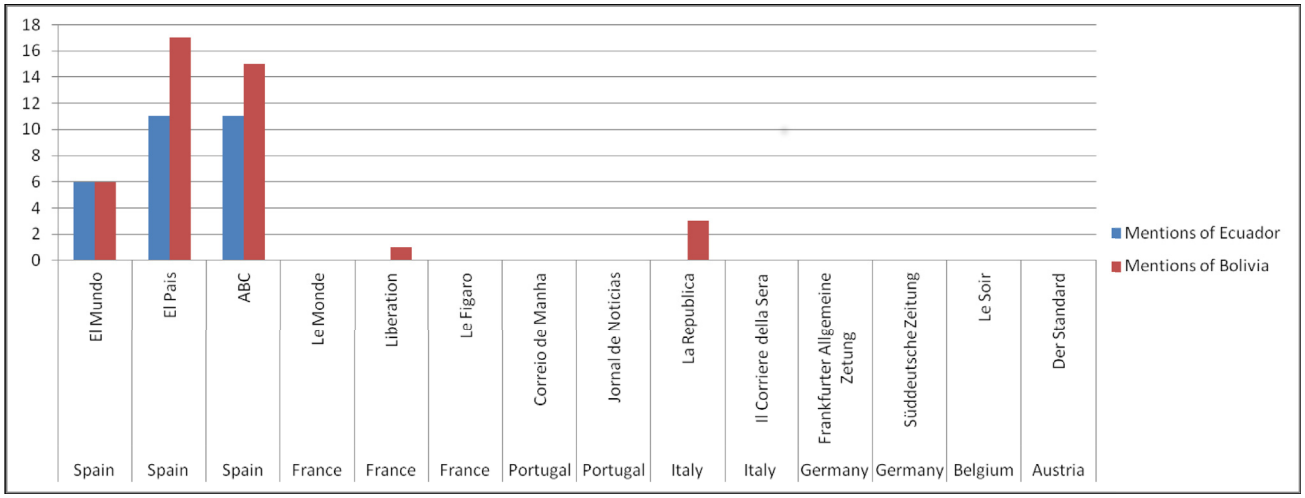
Table 2
Bolivian immigration to Europe.

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	16	26	35	37	33	26	16	15			
Belgium										78	94
Bulgaria							0	0			
Cyprus		0	0	0	0	0	0	0			
Czech Republic		9	6	9	11	11	19	9	5	1	2
Denmark	29	35	25	32	25	15	18	8	13	5	11
Estonia				0	0	1	0	0	0	0	0
Finland	6	28	4	9	3	6	3	5	6	8	6
France											
Germany	0	0	322	334	334	352	330	284			
Greece						2	0				
Hungary	2	1	2	0	1	3	1	8	2		
Ireland								3	1	1	17
Italy		150	1071	1363	738	625	842	1143	1625	3362	1670
Latvia		0	0	0	0	0	0	0	0	0	
Lithuania	2	1	0	1	2	1	1	0	0	0	0
Luxembourg	0	2	1	1	4	2	5	1	0	2	3
Malta							0				
Netherlands	37	43	51	47	29	59	50	54	47		
Poland						1	1	7			
Portugal											
Romania											
Slovakia		1	1	3	1	3	1	1	3	0	2
Slovenia	1	2	0	0	0	0	1	0	1	1	1
Spain	4863	10625	24433	44049	44985	77755	51797	14120	9484	8692	8982
Sweden	61	94	92	94	78	215	186	205	282	320	284
United Kingdom	747	0	0	57	45						

Note: this chart presents the total number of new immigrants, by destination country, holding a Bolivian passport. A blank space represents a figure not reported by a given country. The figures exclude short-term visitors.
Source: Eurostat (migr_imm1ctz).

and negative, EC 539/2001 Annex I, country lists in 2001. The negative list enumerates all the countries whose nationals are required to obtain a visa, prior to arrival, to enter any of the Schengen Area countries. The changes introduced to these two lists have been since then extremely limited. Only two countries, both located in South America, have ever been shifted from the positive to the negative list since their first publication in 2001: Ecuador and Bolivia. All the countries changed from one list to the other, between 2001 and 2015, are reported in Tables A1 and A2 presented in the appendix.

These changes share two characteristics that render them ideal to examine the impact of a visa. First, they take place in years, 2003 and 2006, for Ecuador and Bolivia, respectively, at which the Schen-



Source: Major European Newspapers archives. Author's own calculations.

Note: This chart reports the number of times the introduction of short-stay visas by Schengen members for Ecuadorian or Bolivian nationals was mentioned in a newspaper article in printed or online versions. The introduction of visa measures for these two countries nationals featured in a large number of press releases in Spain (28 and 38 single press articles for Ecuador and Bolivia respectively). There were no mentions of the introduction of introduction of short stay visas for Ecuadorian nationals in any major EU newspaper outside Spain. There were only four mentions in single press articles of the introduction of short-stay visas for Bolivian nationals outside Spain.

Fig. 6. Mentions of the introduction of Visas for Bolivian and Ecuadorian Citizens in major European newspapers.

gen Area already counted a considerable number of members. The second and most important consideration is the reason for the introduction of these visa measures. In order for a third country to be included in the negative list, the European Commission has to propose an amendment to Council Regulation 539/2001 based on the request of a member state. The Council of the European Union has then to adopt the amendment by consensus.[5] A particular feature of the decision making process is that the states requesting the amendment and the deliberations of the European Council to the lists are not made public.

Spain maintains particular links with its former colonies due to historical and cultural reasons but also because these countries have been traditional destinations for Spanish migrants. As a consequence, Spain had signed treaties which forbade the requirement of visas for nationals of these countries. When Spain introduced visa requirements for Colombian nationals in 2001, before the first publication of Annex I, the decision was widely debated and stirred up public opinion in Spain and in most of the Iberoamerican countries. At the time when the decision was adopted an open letter was addressed to the Spanish prime minister by a number of prominent Latin American intellectuals among whom the Nobel prize laureate Gabriel Garcia Marquez.[6] The letter obtained the support of a great number of Spanish intellectual and political figures[7]

Eager to avoid a similar debate when introducing visas for Ecuadorian and Bolivian nationals in 2003 and 2006 respectively, the Spanish government tried to suggest that the introduction of a visa was a request coming from its European partners. This however provoked a debate among Spanish officials which, paradoxically, made clear that Spain had requested the European Council to amend Council Regulation 539/2001. This fact was made public by a declaration of the Spanish government delegate for migratory matters.[8]

The main justification for the introduction of visas was the increasing immigration originating in Bolivia and Ecuador.[9] Tables 1 and 2 offer evidence in favour of the hypothesis that the introduction of visas for Ecuadorians and Bolivians was pushed for exclusively by Spain. These two tables present the number of new immigrants, by destination country, holding respectively an Ecuadorian or Bolivian passport. The figures exclude short-term visitors such as tourists or business travelers. As it can be observed in Table 1, Ecuadorian immigration is only considerable in Spain. Moreover, a noticeable reduction of immigration, which was the main goal of the introduction of visas, is observed only in Spain in 2004 and not in other members of the Schengen Space. The same is true for Bolivian immigration. Table 2 shows that Spain is the only destination country in Europe receiving large numbers of Bolivian nationals in Europe. Once again, Spain is the only country where the introduction of the visa requirement reduces immigration. As mentioned above, Bolivian and Ecuadorian immigration was considerable in Spain due to strong cultural and historical links but weak to the rest of the Schengen Space. Since Spain, as explained in the next section, will be excluded from the estimation sample, Tables 1 and 2 suggests that the effect of visas on trade is not conveyed through changes in the stock of migrants. However, since this analysis omits short-term visitors, it remains possible that the effects on trade are driven by declines in business travel.

In addition, migration is often a polemic subject in Europe. Fig. 6 shows the number of press articles on the introduction of visas for

[5] The European Parliament has now the same power of decision as the Council of the European Union. This was not however the case when Ecuador and Bolivia shifted to the negative list. At that time the European Parliament voted the amendments to Council Regulation 539/2001 but the vote had only a 'consultation value'.

[6] http://www.jornada.unam.mx/2001/03/19/028n1mun.html.

[7] http://elpais.com/diario/2001/03/23/espana/985302013_850215.html.

[8] "The Government delegate for Immigration, Ignacio Gonzalez, said yesterday in Melilla that Spain will promote the visa requirement to travelers from all countries that exercise a special irregular migratory pressure to the EU, and included Ecuador in this group." (https://elpais.com/diario/2002/11/14/espana/1037228414_850215.html).

[9] http://elpais.com/diario/2006/09/08/espana/1157666416_850215.html, http://www.abc.es/hemeroteca/historico-04-12-2006/abc/Internacional/la-ue-exigira-visado-a-los-bolivianos-a-partir-del-uno-de-abril-de-2007_153293158161.html.

Ecuadorian and Bolivian nationals in the major European newspapers. The figure shows that there were 28 articles on the introduction of visas for Ecuadorian nationals in the three major Spanish newspapers and none in other major European newspapers. The evidence is similar for the introduction of visas for Bolivian nationals. There were 38 single press papers in the three major Spanish newspapers and only 4 in other European dailies (one in the French *Liberation*, and three in the Italian *La Reppublica*). Moreover, the three articles published in the Italian daily narrate the journey of 82 Bolivian nationals who embarked on the Italian MSC Sinfonia cruise ship in Genoa to reach Spain. The interest of the article for Italian readers seems to reside in the Italian ownership of the cruise ship and the Italian origin of the journey rather than in the introduction of visa requirements for Bolivian citizens.

The introduction of visa requirements by a Schengen country, having no former intentions to introduce a visa, but pushed by the requests of a Schengen partner (Spain in this case), can thus be seen as an external shock. Using this fact in order to avoid endogeneity problems, I estimate the causal impact of visa restrictions on bilateral trade flows in goods.

3. Empirical strategy

Gravity equations have become the most used empirical approach in the trade literature. It has indeed been shown that several theoretical models of international trade, and among them the Melitz-Chaney model, yield gravity equations. Moreover, the question of how to correctly estimate gravity equations is at the center of a very large, and growing, body of research. For these reasons, the empirical strategy follows the functional form, control variables and estimation techniques recommended by this literature. The strategy I use to identify the effect of visas assumes also that, conditional on the functional form, control variables and fixed effects, Ecuador's and Bolivia's trade flows would have grown, in the absence of a visa, at the rate of other countries in the sample. For this reason, the empirical strategy is based as well on a differences-in-differences analysis. I develop these points below.

Starting from the first estimations of the gravity equation in Tinbergen (1962), the tool became the most widely used empirical method in international trade. However, despite its empirical success, the lack of theoretical foundations was seen as a major drawback by many trade economists. Anderson (1979) was the first to show that the gravity equation could be derived from a theoretical model. As other theoretical models followed, and in particular Eaton and Kortum (2002) and Anderson and van Wincoop (2003), it became clear that the gravity equation could be obtained from a large class of models. Moreover most models with heterogeneous firms also yield gravity equations (Melitz and Ottaviano (2008); Chaney (2008)).

These theoretical foundations of the gravity equation had major implications in the estimation of gravity equations. It became apparent that multilateral resistance terms had to be accounted for (Anderson and van Wincoop (2003)) and that many of the previous estimations of the gravity equation where thus biased or theoretically inconsistent (Baldwin and Taglioni (2006)). Multilateral resistance terms absorb a number of observable and unobservable characteristics of trade partners. In a very general manner, gravity equations can be written in the following way (Head and Mayer (2013)):

$$X_{nit} = G_t S_{it} M_{nt} \Phi_{nit} \tag{1}$$

where Φ_{nit} represents the trade costs between the exporter i and the importer n at time t. S_{it} and M_{nt} are the multilateral resistance terms. S_{it} can be thought as representing the "capabilities of exporter i as a supplier to all destinations" at time t (Head and Mayer (2013, p. 137)). M_{nt} "captures all characteristics of destination market n that promote imports from all sources" at time t (Head and Mayer (2013, p. 137)). G_t can take diverse forms in different models. In most models it is a function of countries expenditures and production values. Not accounting for S_{it} and M_{nt} creates therefore an omitted variable bias.

An additional problem in most estimations of the gravity equation is highlighted in Santos Silva and Tenreyro (2006) and Westerlund and Wilhelmsson (2009). The bias these two papers point to is of particular importance in samples containing a large number of zeros. In such cases, using ordinary least squares to estimate a log-linearized gravity equation implies dropping all zeros that account for a considerable share of the data. Dropping this share of the data can bias the estimations as zero trade flows are not randomly distributed and their incidence is highly correlated with distance. Additionally, Santos Silva and Tenreyro (2006) also point out that estimations of the log-linearized gravity equation are unbiased only under the assumption that the error term is statistically independent from the regressors. Homoscedasticity is however often violated by the data samples used to estimate gravity equations.

The empirical strategy implemented here takes advantage of a natural experiment to circumvent these pitfalls. First, to avoid the omitted variable bias stemming from the unobservable multilateral resistance terms, S_{it} and M_{nt}, most of the specifications presented below include country-year fixed effects. I also present a number of specifications, including on top of country-year fixed effects, pair fixed effects. At this level, fixed effects capture omitted variables that affect bilateral trade and are fixed over time. The identification comes therefore from changes at the pair level.

Second, following Santos Silva and Tenreyro (2006), we use in our preferred estimation method the Poisson Pseudo-Maximum Likelihood estimator (PPML). Other than allowing to include zero trade flows, the estimations using PPML are robust to several common patterns of heteroskedascity arising in gravity-like settings.

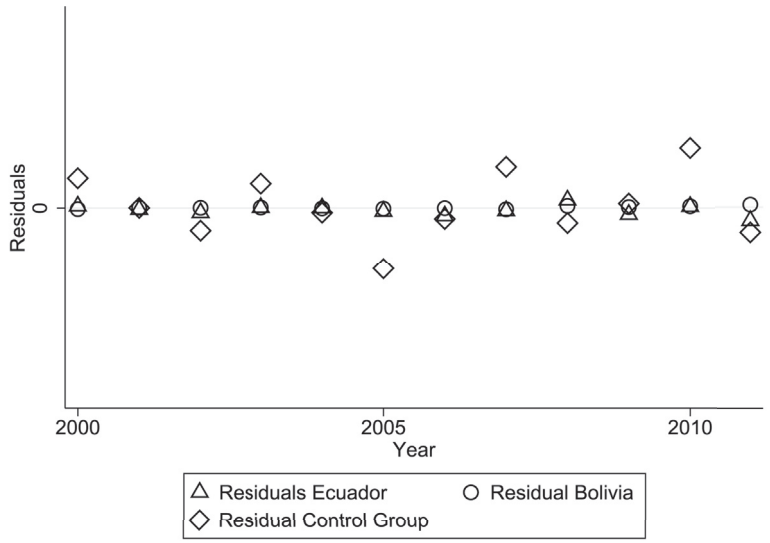
Third, in order to identify a causal link between the introduction of a visa and its impact on bilateral flows of goods, I take advantage of the exogeneity of visas between Ecuador and Bolivia respectively and members of the Schengen Space other than Spain. Therefore, I exclude from the estimation all trade flows between Ecuador and Spain or Bolivia and Spain. I perform most estimations using two different control groups. In a first specification, besides Ecuador and Bolivia, I include all the countries that were listed in the positive list during the entire period (2001–2011) and all the countries that were Schengen members since 2001. The estimation sample includes therefore all trade flows between third countries always listed in the positive list and Schengen Members as well as intra-Schengen trade flows. I include intra-Schengen trade flows because the agreement excludes visas between signatory States and it increases the sample size.

The second estimation sample is similar to the first. I exclude this time however intra-Schengen trade flows. While excluding intra-Schengen flows reduces the sample size, it also reduces the concern that trade flows between Schengen members, which are all located in Europe and are not subject to systematic border controls, could be driving the results. The detailed list of countries included in the estimation samples is presented in Table A3 included in the appendix.

Finally, as mentioned above, in order to identify the impact we use the two only available shifts to the negative list: Ecuador in 2003 and Bolivia in 2006.

The data used in this paper comes from various sources. Aggregate trade data at the bilateral level comes from COMTRADE while detailed data at the six digits level of the Harmonized System is taken from the BACI database (Gaulier and Zignago (2010)). Data on GDPs and population is taken from World Bank's World Development Indicators database. Bilateral distances are provided by Mayer and Zignago (2011).

I construct the visa variable using Annexes I and II of Regulation 539 of the Council of the European Union and its subsequent amend-



Note: this graph plots the residuals obtained from the estimation of equation 2 which includes country-year fixed effects. The estimation sample includes only countries listed in the positive list during the entire period. Intra-Schengen trade flows are excluded from the estimation sample. The mean residuals are computed as the simple average of all residuals for a given year. Ecuador's and Bolivia's mean residuals exclude residuals obtained from trade flows with non-Schengen partners. The control group's mean residuals exclude residuals obtained from trade flows involving Ecuador or Bolivia.

Fig. 7. Mean residuals from equation (2).

ing acts[10]. Annex I, the negative list, enumerates third countries whose nationals must be in possession of visa when entering the Schengen Space. Annex II, the positive list, specifies all the countries that are exempted from visa requirements for up to three consecutive months. The subsequent amendments introduced a limited number of changes to the positive and negative lists. An important point is that there is a single type of visa both for tourism or business purposes in the Schengen Space: Uniform Schengen Visa Type C. In other words, a third country shift to the negative list meant the mandatory introduction of the same visa both for tourism and business purposes by all members of the Schengen Area. This natural experiment triggered therefore the introduction of the same visa type for tourism or business motives for nationals of Ecuador in 2003 and for nationals of Bolivia in 2006. All the estimations are performed on a 10-year window, starting with the first publication of Annexes I and II: 2001. 2001 to 2011 constitutes therefore the estimation sample period.

Fig. 7 offers graphical evidence suggesting that pre-trends do not affect Ecuador's and Bolivia's trade flows. The figure plots the residuals resulting from equation (2). When country-year fixed effects are included, this equation is identical to equation (3), used in the next section to assess the impact of visas, with the sole exception that the visa variable is excluded from equation (2). The specification used to obtain the residuals includes country-year fixed effects and excludes intra-Schengen trade flows.

$$X_{i,j,t} = Exp[\beta_0 + \beta_1 LnDist_{i,j}] * \eta_{ijt} \quad (2)$$

where $X_{i,j,t}$ is the trade flow from i to j in period t. $LnDist_{i,j}$ is the log of the distance between i and j and η_{ijt} is the error term.

Fig. 7 shows that average residuals of equation (2) are, as expected, very close to 0. More importantly, there are no noticeable trends before or around the years 2003 and 2006 when visas where introduced for Ecuador and Bolivia.

[10] (EC) No 2414/2001, (EC) No 453/2003, (EC) No 851/2005, (EC) No 1791/2006, (EC) No 1932/2006, (EC) No 1244/2009, (EU) No 1211/2010, (EU) No 517/2013, (EU) No 610/2013, (EU) No 1289/2013.

4. Main results

To estimate the causal impact of visas on trade flows, I begin by estimating the following gravity equation:

$$X_{i,j,t} = Exp[\beta_0 + \beta_1 \cdot LnGDPcap_{i,t} + \beta_2 \cdot LnPop_{i,t} + \beta_3 \cdot LnGDPcap_{j,t} + \beta_4 \cdot LnPop_{j,t} + \beta_5 LnDist_{i,j} + \beta_6 \cdot visa_{i,j,t}] * \eta_{ijt} \quad (3)$$

where $X_{i,j,t}$ is the trade flow from i to j in period t, $visa_{i,j,t}$ is a dummy variable equal to 1 when the visa restrictions are in place and to zero otherwise. $LnGDPcap_{i,t}$ and $LnPop_{i,t}$ are the logs of the per capita income and of the population of the exporter country. Similarly, $LnGDPcap_{j,t}$ and $LnPop_{j,t}$ are the logs of the per capita income and of the population of the importer country. $LnDist_{i,j}$ is the log of the distance between i and j and η_{ijt} is the error term.

Equation (3) is estimated using the Poisson Pseudo Maximum Likelihood estimator. The estimator is robust to the presence of heteroskedasticity arising from the log linearization of the gravity equation (Santos Silva and Tenreyro (2006)). In addition, it permits to include zero trade flows in the estimation which would have otherwise been dropped when the gravity equation is log-linerealized. Notice that equation (3) is identical to equation (2) with the sole exception of the visa dummy.

Table 3 presents the results of the PPML estimation. Columns 1 to 4 include intra-Schengen trade flows whereas columns 5 to 8 exclude them. Columns 2 and 6 are similar to columns 1 and 5 but include a number of control variables. The specifications presented in these columns do not control for multilateral resistance terms. In order to correct for the bias stemming from the exclusion of S_{it} and M_{it}, the specifications presented in columns 3,4,7 and 8 include country-year fixed effects. The third and seventh columns follow exactly equation (2), used to obtain the residuals presented in Fig. 7 but this time including the visa variable. Columns 4 and 8 include, on top of country-year fixed effects, pair fixed effects.

The results are in line with those usually found in the gravity equation literature. The GDP per capita and the population of both the importer and exporter countries have positive and statistically signif-

Table 3
Gravity regression results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln. GDP/Pop, origin	0.717[a]	0.696[a]			0.696[a]	0.696[a]		
	(0.043)	(0.043)			(0.056)	(0.055)		
Ln. GDP/Pop, dest.	0.696[a]	0.673[a]			0.750[a]	0.750[a]		
	(0.039)	(0.039)			(0.053)	(0.052)		
Ln. Pop., origin	0.864[a]	0.841[a]			0.830[a]	0.835[a]		
	(0.024)	(0.027)			(0.039)	(0.044)		
Ln. Pop., dest.	0.841[a]	0.818[a]			0.825[a]	0.829[a]		
	(0.027)	(0.031)			(0.052)	(0.056)		
Ln. Dist.	−0.950[a]	−0.930[a]	−0.854[a]		−0.628[a]	−0.639[a]	−1.673[a]	
	(0.034)	(0.055)	(0.106)		(0.076)	(0.096)	(0.238)	
Visa Dummy	−0.326[c]	−0.515[a]	−0.393[a]	−0.677[c]	−0.502[a]	−0.515[a]	−0.229[c]	−0.679[a]
	(0.169)	(0.170)	(0.130)	(0.396)	(0.176)	(0.179)	(0.135)	(0.249)
European Union		0.166[c]	−0.353[a]	−0.175		0.311[b]	0.890[b]	1.659[a]
		(0.089)	(0.102)	(0.139)		(0.145)	(0.369)	(0.478)
Common border		0.156	0.143[c]			0.989[a]	0.877[c]	
		(0.097)	(0.081)			(0.178)	(0.448)	
Common official language		0.294[a]	0.273[b]			−0.147	0.112	
		(0.098)	(0.122)			(0.184)	(0.174)	
Former colonia rel.		−0.086	0.144[b]			−0.142	0.095	
		(0.091)	(0.058)			(0.144)	(0.078)	
Free Trade Agreement		−0.397[a]	0.356[b]	0.196		−0.128	0.662[a]	0.512[a]
		(0.119)	(0.163)	(0.171)		(0.138)	(0.163)	(0.163)
Common currency		0.007	−0.029	0.372[b]		0.066	0.313	0.499[b]
		(0.084)	(0.101)	(0.188)		(0.296)	(0.344)	(0.247)
Pair Fixed Effects	No	No	No	Yes	No	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No	No	No
Country-Year Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	Yes	No	No	No	No
Pseudo R2	0.861	0.887	0.945	0.959	0.825	0.835	0.990	0.994
Observations	14685	14685	14758	14758	9143	9143	9216	9216

Note: The dependent variable is the trade flow between origin and destination. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

icant close to 1 coefficients in all the specifications were these variables are included. Similarly, distance has a negative impact close to −1.

The coefficient associated with the existence of a visa has the expected sign and is statistically significant at the 10% level in all tested specifications. Standard errors are clustered at the country pair level. This first set of results shows a large causal impact of visas. The introduction of a visa has a negative and statistically significant effect in all the tested specifications of the gravity equation. Choosing a preferred specification is however not straightforward. On the one hand, the inclusion of pair fixed effects controls for omitted variables at the country pair level, which are fixed over time. On the other hand, adding pair fixed effects reduces the precision of the estimation of the visa coefficient. For example, the confidence interval at the 90% level of the visa coefficient presented in column 8, which includes pair fixed-effects, is [-1.08,-0.27].

The specifications presented in columns 3 and 7 do not include pair fixed effects. They provide nonetheless more precise estimations of the visa coefficient. Additionally, because of the exogenous nature of the introduction of visas for Ecuador and Bolivia to Schengen destinations other than Spain, omitted variables at the pair level should be, in principle, less of a concern. For these reasons I prefer the specification including only country-year fixed effects. The specification including both country-year and pair fixed effects confirms however that omitted variables at the pair level do not drive the results. The implied effect of the average of the two estimates that include country-year fixed effects only is −26.7%. Based on the coefficient on distance in column (7) of Table 3, the decline in trade due to the visa restriction was equivalent to moving Ecuador and Bolivia 1567.8 and 1687 kilometers respectively further from the Schengen area.

5. Robustness tests

In order to assess the robustness of the coefficients associated with the visa variable in Table 3, this section discusses the results of a number of alternative estimations.

I examine first whether the results hold when the control group is restricted to countries which are very similar to Ecuador and Bolivia. Table A5 presents the results obtained when limiting the control group to Latin American countries always present in Annex I (the positive list). I use only the sample without intra-Schengen trade flows since there are no Latin American countries in the Schengen Space. Similarly, Table A6 presents the results obtained when I drop all OECD countries from the control group. The only OECD countries that remain in the sample have been Schengen members since at least 2001. Table A7 shows the results I obtain by restricting the sample to countries that in 2011 were in the same two World Bank income categories as Bolivia and Ecuador. These two categories are lower-middle income and upper-middle income. Finally, Table A8 shows the estimates obtained when I restrict the sample to countries that have a similar average GDP per capita to Bolivia and Ecuador between 2001 and 2011 (i.e. between 1000 and 7500 US dollars). In this case as well, the sample does not contain any intra-Schengen flows since no Schengen countries fall inside the GDP per capita interval. In all the 18 specifications tested the visa coefficient remains negative. In 12 of them the visa coefficient is statistically significant at the 10% level.

The appendix presents then a number of more varied robustness tests. Table A9 shows the results of estimating the same gravity equation but excluding from the control group trade flows between EU countries. It can indeed be argued that EU and non-EU countries are intrinsically different. The coefficient associated with the visa variable is once again negative and statistically significant in all the tested specifications. Furthermore, its magnitude remains very similar to the estimates presented in Table 3. Similarly, Table A10 presents the results obtained when the sample is split into samples containing only exports or imports to Schengen destinations. The visa coefficient remains negative and statistically significant at the 10% level in 5 of the 6 specifications. Table A11, included also in the appendix, presents the results obtained when adding bilateral migration flows to the estimation.

Migration flows are taken from the World Bank's Global Bilateral Migration Database. Due to limitations stemming from migration data, the number of observations diminishes significantly. All the coefficients associated with the visa variable remain nonetheless negative and statistically significant at the 5% level. These results confirm what the data presented in Tables 1 and 2 suggest: the effect identified in this paper differs from the effect of migration on trade. Table A12 presents the results of excluding, one at a time, each of the three European countries with the largest ports in the continent. The reason for this is that an important share of trade flows of the European Union enter through these ports. Even if the final destination of the good is not the same as the country where the port is located, trade flows are registered sometimes as having as final destination the country where the port is located.

A note of caution should be applied nonetheless to the interpretation of these results. The external validity of our preferred estimate is likely to hold for small and mid-size developing countries. These represent the vast majority of developing countries but might for example not hold for a hypothetical introduction of visas for US citizens by Schengen Members.

6. Which products?

What should be the expected impact of a visa restriction according to theoretical models? When using the theoretical model that has become the workhorse of international trade the answer is unambiguous. In models with heterogeneous firms where the productivity of firms is Pareto distributed and there is a fixed production cost component, the elasticity of aggregate bilateral flows is negative to both variable and fixed costs. However, should differentiated goods be more sensitive than homogeneous goods to the introduction of a visa? The answer depends on whether visas act as variable or fixed trade costs. In a Melitz-Chaney model, it can be then shown that (Chaney (2008)):

$$\frac{\partial T}{\partial \sigma} = 0 \quad and \quad \frac{\partial F}{\partial \sigma} < 0 \tag{4}$$

where T is the elasticity of aggregated bilateral exports to variable costs ($T \equiv -\frac{d \ln X_{ij}}{d \ln \tau_{ij}}$) and F is the elasticity to variable fixed costs ($F \equiv -\frac{d \ln X_{ij}}{d \ln f_{ij}}$).

Therefore, the theory implies that the negative effect of visas on bilateral trade should be strongest in sectors with strong product differentiation. Additionally, evidence provided by the survey conducted by Oxford Economics points to visas acting as fixed rather than variable trade costs. The survey highlights indeed the importance of business travels to gain new customers, which can be interpreted as a fixed cost. As we move toward more differentiated goods, the impact of an increase in fixed costs becomes larger. Moreover, if the imposition of a visa increases the cost of face-to-face contacts, this can be seen as an increase of informational frictions. In this case, through the mechanisms modelled in Chaney (2014) for instance, visas could reduce the network of buyers firms can access.[11] The impact could potentially be larger for differentiated products, for which information about the particular characteristics of a product are more important than for homogenous products.

In order to answer this question I use the classification proposed in Rauch (1999). Rauch classifies products using the Standard International Trade Classification (SITC). Products are divided into three categories: organized exchange, reference priced, and differentiated commodities. Organized exchange and referenced price are similar categories. Organized exchange groups together all commodities for which there is some sort of centralized market that fixes prices. Similarly, referenced priced groups products for which reference prices are listed in trade publications. Products that are not classified under referenced priced and organized exchange categories are considered to be differentiated products.

In order to examine the impact of the implementation of a visa on the different categories I group together the referenced priced and organized exchange categories. The difference between these two categories does not seem relevant for the present exercise. I classify both categories as homogenous products. The remaining products are classified as differentiated products.

I estimate the following equation:

$$\begin{aligned} ln(X_{i,j,h,t}) = \beta_0 &+ \beta_1 \cdot LnGDPcap_{i,t} + \beta_2 \cdot LnPop_{i,t} \\ &+ \beta_3 \cdot LnGDPcap_{j,t} + \beta_4 \cdot LnPop_{j,t} + \beta_5 LnDist_{i,j} \\ &+ \beta_6 \cdot visa_{i,j,t} + \beta_7 \cdot visa_{i,j,t} \times diff_h + \epsilon_{i,j,t,h} \end{aligned} \tag{5}$$

where $\ln(X_{i,j,t})$ is the log of the trade flow for product h from i to j in period t and $diff_h$ is a dummy variable equal to one when a product is classified as differentiated in Rauch (1999). $\epsilon_{i,j,t,h}$ is the error term.

Our preferred estimator is PPML. However, given the subdivision of products that greatly increases the number of observations, estimating a gravity equation using the PPML estimator with the required fixed effects raises a number of issues. First, the colinearity problems triggered by the introduction of a large number of fixed effects makes calculating the covariance matrix and clustering standard errors a computationally extremely challenging problem. Second, in the specifications that include country-year-product fixed effects, the severity of the incidental parameter bias arising in this setting with such a large number of regressors has, to the best of our knowledge, not yet been examined. For these reasons instead of using the PPML estimator, I estimate a fixed effects linear gravity equation using ordinary least squares. The results are presented in Table 4.

Columns 1 and 6 are presented for comparison purposes. The estimation presented in columns (2) and (7) do not include any fixed effects. Columns (3) and (8) include country-year-product fixed effects while columns (4) and (9) include both country-year and pair fixed effects. The interaction between visa and differentiated products dummies is negative and statistically significant at the 5% level in all tested specifications. The negative effect of visas is larger -in absolute terms- for differentiated products than for homogeneous products.

According to the survey conducted by Oxford Economics, business trips appear to be especially important to gain new customers. I also test the impact of the introduction of a visa on the number of new products traded. Ideally, one would use product-level data for this purpose. However, bilateral trade data at the product level covering all the countries included in our sample is not readily available. Instead I use data provide by the BACI database developed by CEPII. BACI provides trade data at the 6 digit level of the Harmonized System.

In order to identify the export of a new product I proceed in the following way. Every time a new 6-digit product data line changes from 0 to a positive value from one year to the next I code this change as the export of a new product. This is of course an imperfect proxy for the number of new products. For example, it does not take into account reporting thresholds. A change from 0 to a positive value, might be the result of attaining the reporting threshold and not necessarily the export of a new product.

In order to examine this hypothesis we estimate the following equation:

$$\begin{aligned} \#\ of\ new\ products_{j,i,t} = Exp[&\beta_0 + \beta_1 \cdot LnGDPcap_{i,t} + \beta_2 \cdot LnPop_{i,t} \\ &+ \beta_3 \cdot LnGDPcap_{j,t} + \beta_4 \cdot LnPop_{j,t} + \beta_5 \cdot visa_{i,j,t}] * \eta_{ijt} \end{aligned} \tag{6}$$

Table A4 in the appendix summarizes the results obtained by estimating equation (6) with different set of fixed effects. Overall, the results suggest a negative impact on the number of new products exported.

[11] In Chaney (2014) the remote search of consumers can be related "generally to the notion that exporting entails some amount of traveling and communicating with business partners".

Table 4
Homogenous vs. Differentiated Goods.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln. Dist.	−0.889[a]	−0.889[a]	−0.939[a]		−0.652[a]	−0.652[a]	−0.293[a]	
	(0.033)	(0.033)	(0.085)		(0.059)	(0.059)	(0.112)	
Ln. GDP/Pop, origin	0.517[a]	0.516[a]			0.527[a]	0.527[a]		
	(0.031)	(0.031)			(0.037)	(0.037)		
Ln. Pop., origin	0.191[a]	0.191[a]			0.141[b]	0.141[b]		
	(0.045)	(0.045)			(0.058)	(0.058)		
Ln. GDP/Pop, dest.	0.646[a]	0.646[a]			0.621[a]	0.622[a]		
	(0.031)	(0.031)			(0.037)	(0.037)		
Ln. Pop., dest.	0.134[a]	0.133[a]			0.048	0.047		
	(0.038)	(0.038)			(0.045)	(0.045)		
Visa Dummy	−0.525[a]	−0.121	−0.210	−0.024	−0.605[a]	−0.190	−0.749[a]	−0.076
	(0.139)	(0.250)	(0.214)	(0.379)	(0.134)	(0.231)	(0.171)	(0.249)
Visa × Diff. Dummy		−0.559[b]	−2.174[a]	−0.496[b]		−0.574[b]	−1.600[a]	−0.493[b]
		(0.252)	(0.219)	(0.244)		(0.250)	(0.211)	(0.244)
Country-Year-Product Fixed Effects	No	No	Yes	No	No	No	Yes	No
Pair & Country-Year Fixed Effects	No	No	No	Yes	No	No	No	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	Yes	No	No	No	No
R2	0.250	0.250	0.374	0.788	0.196	0.196	0.396	0.746
rmse	2.819	2.819	2.705	2.725	2.847	2.847	2.646	2.731
Observations	2972792	2972792	2957908	2978312	1573323	1573323	1557369	1578843

Note: The estimation is performed on trade flows at the four digit level of the Standard Trade Classification. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1% Visa × Diff. Dummy is the interaction between de the visa dummy and a dummy variable equal to 1 when a product is classified in the differentiated commodities category according to Rauch's product classification.

7. General equilibrium and welfare analysis

This section explores the general equilibrium and welfare impact of removing all visa requirements for short stay travel. In this sense, I take advantage of the procedure developed in Dekle et al. (2007). The method's robustness has indeed been recently highlighted by Arkolakis et al. (2012). One particularly interesting feature is that it allows for changes in income through changes in wages. The results obtained can thus be rightly considered as general equilibrium results. While in Dekle et al. (2007) the procedure is derived from a Ricardian model, similar procedures can be implemented with most models yielding a structural gravity equation.

Dekle et al. (2008) reexpress Eaton and Kortum (2002) gravity-consistent model in term of changes. This has the advantage of considerably reducing data requirements. In particular, this eliminates the need to know the actual level of trade costs. Only relative changes are required. In our case the change simply corresponds to exponentiating the coefficient we have obtained for the visa dummy in our estimations.

Another important feature is that two observable endogenous parameters of the model, trade shares and income, perfectly identify the two main endogenous unobservables: trade costs and multilateral resistance terms. In a nutshell, the method, which is in the vein of "exact hat" algebra, consists on using observed data on income and the ratio of a country's expenditure devoted to the purchase of other countries' goods in order to solve for multilateral resistance terms (Head and Mayer (2013)).

Assuming that labor is the only source of income in the model and that there are constant markups, then in most models yielding a gravity equation, trade shares π_{ni} can be expressed in the following way (Arkolakis et al. (2012)):

$$\pi_{ni} = \frac{\chi_{ni} N_i (w_i \tau_{ni})^{\epsilon}}{\sum_l \chi_{nl} N_l (w_l \tau_{nl})^{\epsilon}} \tag{7}$$

where χ_{ni} can be a particular parameter of some model yielding a gravity equation and N_i the number of goods produced in country i. w_i is the wage in i and τ_{ni} are the trade costs between n and i.

Similarly in the counterfactual world trade shares can be written as:

$$\pi'_{ni} = \frac{\chi_{ni} N'_i (w_i \tau_{ni})^{\epsilon}}{\sum_l \chi_{nl} N'_l (w_l \tau_{nl})^{\epsilon}} \tag{8}$$

where $'$ denotes counterfactual values. Assuming that the number of goods produced in i, N_i, is constant, and dividing the actual expenditure by counterfactual expenditure shares, as showed first in Dekle et al. (2007) and reexpressed in a more general way in Head and Mayer (2013), changes in the share of country i in country n's spending are given by:

$$\hat{\pi}_{ni} = \frac{\left(\hat{Y}_i \hat{\tau}_{ni}\right)^{\epsilon}}{\sum_l \pi_{nl} \left(\hat{Y}_i \hat{\tau}_{ni}\right)^{\epsilon}} \tag{9}$$

where $\hat{Y}_i$ denotes changes in income of country i and $\hat{\tau}_{ni}$ changes in bilateral trade costs. Plugging equation (9) into the market clearing condition yields changes in income. Since the model has a unique equilibrium as shown in Alvarez and Lucas Jr (2007), the counterfactual can be solved by an iterative procedure.

I apply this procedure to examine the result of removing all visa requirements for short stay travel for a large number of countries (175 countries).[12] For this purpose I use the visas database constructed by Neumayer (2011). Because they yield more precise estimates while correctly accounting for multilateral resistance terms, I use the average coefficient of specifications in Table 4 that include only country-year fixed effects (i.e. −0.311). I set the value of the elasticity of substitution at −5.03, which is the average value obtained in more than 100 papers reviewed by Head and Mayer (2013).

Table 5 shows the top ten countries by welfare gains. The second column of the table gives the welfare change under the no short-stay visa scenario. It is remarkable that the top four countries in welfare gains are sub-Saharan African countries. Also more than half of the countries listed in the table are actually from Sub Saharan Africa. Removing short-stay visas would increase welfare by 6% in Equatorial Guinea and 5% in Congo and Angola. For the remaining countries in the top ten table, removing visas would increase welfare by at least 3%.

Similarly, Table 6 shows that welfare gains from removing short-stay visas are concentrated among developing countries. The table shows average welfare gains for the different income categories of the World Bank. The highest average welfare increase, 1.3%, would in fact be attained by Lower Middle Income countries. The lowest average welfare increase, around 1%, is for high income countries. In section 5, I

[12] The iterative procedure is taken from Head and Mayer (2013).

Table 5
Largest welfare changes.

Country	Welfare ratio
Equatorial Guinea	1.06
Congo	1.05
Angola	1.05
Libya	1.04
Suriname	1.04
Mauritania	1.04
Cambodia	1.03
Vietnam	1.03
Guyana	1.03
Guinea	1.03

Note: This table presents the general equilibrium welfare changes (New welfare/Old welfare) that would be triggered by removing short stay visas. Only the ten largest welfare changes are presented.

Table 6
Welfare changes by income category.

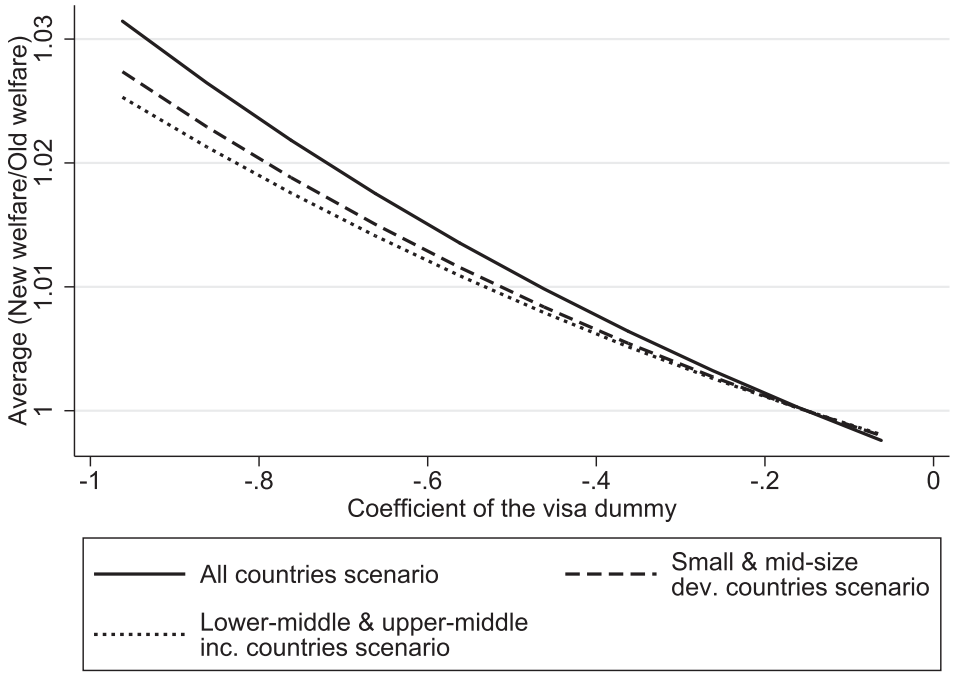
Income Category	Welfare ratio
LIC	1.0077
LMIC	1.0134
UMC	1.0116
HIC	1.0066

Note: This table presents average general equilibrium welfare changes (New welfare/Old welfare) by the World's Bank income categories. LIC: Lower income countries. LMIC: Lower middle income countries. UMC: Upper-middle income countries. HIC: High income countries.

argued that the external validity of our preferred estimate is likely to hold for small and mid-size developing countries. Visa measures are often asymmetrical and highly correlated with the per capita income of the origin country. The removal of visas in this counterfactual exercise concerns therefore mostly developing countries. Nonetheless, in order to assess how these results change when we remove visas only for developing countries that share similar characteristics with Bolivia and Ecuador, I perform two additional counterfactual exercises. First, I remove visas when the origin or destination country is a small or mid-size developing country. I classify countries as small or mid-size and developing if they had in 2005 a GDP per capita lower than 10,000 US dollars and a population of less than 100 million. Table A13 in the appendix presents the countries with 10 largest welfare gains and Table A14, also in the appendix, presents average welfare changes according to the WB income categories. In a second additional exercise, I remove visas for countries that were in 2005 in the same WB income categories as Bolivia and Ecuador (lower-middle and upper-middle income). In line with the two previous exercises, Tables A15 and A16 show the results.

In these two alternative cases, the results remain very close to those presented in the counterfactual exercise consisting in removing short-stay visas for all countries (Tables 5 and 6). This is mainly due to the fact that visas are considerably more prevalent for -and among- developing countries.

Finally, Fig. 8 shows the average welfare gain of removing visas for different coefficients. The results are presented for the main counterfactual scenario as well as for the two exercises included in the appendix. The graph allows to compare the welfare gains obtained when using the coefficients from the different specifications presented in this paper,



Note: This graph plots average general equilibrium welfare changes (New welfare/Old welfare) for different values of the coefficient associated to the visa dummy. It presents three different counterfactual scenarios. "All countries scenario" removes short-stay visas between all countries. "Small & mid-size dev. countries scenario" removes short stay-visas when the origin or destination country had in 2005 a GDP per capita lower than 10,000 US dollars and a population of less than 100 million. "Lower-middle & upper-middle inc. countries scenario" removes short-stay visas that were classified as lower-middle or upper-middle income countries by the World Bank in 2005.

Fig. 8. Average welfare for gains for different visa coefficient values.

but also those obtained in Neumayer (2011) [-0.192 to −0.586] and Czaika and Neumayer (2017) [-0.220 to −0.203]. For the mean of our preferred fixed effects specification, 1.0% is the average welfare increase.

8. Conclusions

Although having been signaled by numerous government officials as a barrier to trade, the impact of visas on international trade in goods has received little attention. This paper uses a natural experiment provided by the Schengen Area in order to show that visas have a large negative impact on bilateral trade flows. More specifically, I use the Schengen Area rules to establish the causal link between visas and trade. The introduction of a visa to enter the Schengen Space reduced bilateral trade flows of Ecuador and Bolivia with the members of the Schengen Area, other than Spain, which is excluded from the estimation sample. The large and negative results are robust to the inclusion of a large set of fixed effects.

The paper also provides additional evidence in favour of the hypothesis of the importance of face to face contact in international trade. The effect of the introduction of a visa is indeed larger for differentiated products than for homogeneous products for both Bolivia and Ecuador. These findings suggest that the introduction of visas might affect the diversification and sophistication of exports of developing countries.

Results are also relevant for policy makers in that they show the importance of including visa facilitation schemes into FTAs and other economic agreements. Visas are likely the most asymmetric of trade barriers and, according to our preferred specification, their negative impact is large. Moreover, the general equilibrium counterfactual carried out in this paper suggests that removing short-stay visas would increase welfare in the developing world by 1.1% on average. Some Sub-Saharan countries would see a considerable increase of economic welfare of around 5%. Countries will most likely not abolish short-stay visa requirements in the near future but facilitating visas for business purposes would certainly bring about some of these welfare gains. Further research could examine whether the extensive margin of trade is more affected than the intensive margin.

Appendix

Table A1
Countries shifted from the Positive to the Negative list between 2001 and 2015.

Country	Year
Ecuador	2003
Bolivia	2006

Notes: list of all countries shifted from the positive (Annex II) to the negative (Annex I) list between 2001 and 2015. “Kosovo as defined by the United Nations Security Council Resolution 1244 of 10 June 1999” was added to Annex I in 2010. This addition does not constitute a change in the visa policy because nationals from Kosovo required visas before 2010 as Kosovo was considered part of Serbia for the purposes of Annex I.

Table A2
Countries shifted from the Negative to the Positive list between 2001 and 2015.

Country	Year
Mauritius	2006
Seychelles	2006
Bahamas	2006
Barbados	2006
Saint Kitts and Nevis	2006
Antigua and Barbuda	2006
Bosnia and Herzegovina	2010
Macedonia	2010
Montenegro	2010
Taiwan	2010
Yugoslavia	2010
Albania	2010
Palau	2015
Solomon Islands	2015
Saint Vincent and the Grenadines	2015
Tonga	2015
Dominica	2015
Marshall Islands	2015
Saint Lucia	2015
Colombia	2015
Trinidad and Tobago	2015
Peru	2015
Moldova	2015

(*continued on next page*)

Table A2 *(continued)*

Country	Year
Nauru	2015
Kiribati	2015
Tuvalu	2015
Timor	2015
Vanuatu	2015
Grenada	2015
Micronesia	2015
United Arab Emirates	2015
Samoa	2015

Notes: list of all countries changed from the negative (Annex I) to the positive (Annex II) list between 2001 and 2015.

Table A3
Countries included in the estimation sample.

Country	Schengen Member since 2001	Always in Annex II	Bolivia or Ecuador
Argentina	–	Yes	–
Australia	–	Yes	–
Austria	Yes	–	–
Belgium	Yes	–	–
Bulgaria	–	Yes	–
Bolivia	–	–	Yes
Brazil	–	Yes	–
Brunei Darussalam	–	Yes	–
Canada	–	Yes	–
Switzerland	–	Yes	–
Chile	–	Yes	–
Costa Rica	–	Yes	–
Cyprus	–	Yes	–
Czech Republic	–	Yes	–
Germany	Yes	–	–
Denmark	Yes	–	–
Ecuador	–	–	Yes
Estonia	–	Yes	–
Finland	Yes	–	–
France	Yes	–	–
Greece	Yes	–	–
Guatemala	–	Yes	–
Honduras	–	Yes	–
Croatia	–	Yes	–
Hungary	–	Yes	–
Iceland	Yes	–	–
Israel	–	Yes	–
Italy	Yes	–	–
Japan	–	Yes	–
Korea, Rep.	–	Yes	–
Lithuania	–	Yes	–
Luxembourg	Yes	–	–
Latvia	–	Yes	–
Mexico	–	Yes	–
Malta	–	Yes	–
Malaysia	–	Yes	–
Nicaragua	–	Yes	–
Netherlands	Yes	–	–
Norway	Yes	–	–
New Zealand	–	Yes	–
Panama	–	Yes	–
Poland	–	Yes	–
Portugal	Yes	–	–
Paraguay	–	Yes	–
Singapore	–	Yes	–
El Salvador	–	Yes	–
San Marino	–	Yes	–
Slovak Republic	–	Yes	–
Slovenia	–	Yes	–
Sweden	Yes	–	–
Uruguay	–	Yes	–
United States	–	Yes	–
Venezuela	–	Yes	–

Notes: list of all countries included in the estimation sample. The first column shows if a country was a Schengen member in 2001. The second column shows whether a country has always been in the positive list of countries that do not require visas to enter the Schengen Space.

Table A4
Newly exported products.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln. Dist.	−0.288[a]	−0.291[a]			−0.359[a]	−0.365[a]		
	(0.027)	(0.026)			(0.045)	(0.047)		
lnGDPcap_exp	0.359[a]	0.478[a]	0.500[a]		0.447[a]	0.536[a]	0.618[a]	
	(0.027)	(0.035)	(0.046)		(0.034)	(0.042)	(0.054)	
lnGDPcap_imp	0.117[a]	0.221[a]	0.195[a]		0.133[a]	0.202[a]	0.183[a]	
	(0.021)	(0.029)	(0.036)		(0.025)	(0.031)	(0.039)	
Ln. Pop., origin	0.231[a]	0.233[a]	0.175[a]		0.277[a]	0.278[a]	0.205[a]	
	(0.021)	(0.022)	(0.027)		(0.023)	(0.025)	(0.031)	
Ln. Pop., dest.	0.157[a]	0.159[a]	0.124[a]		0.182[a]	0.182[a]	0.176[a]	
	(0.019)	(0.020)	(0.027)		(0.024)	(0.024)	(0.033)	
Visa Dummy	−0.743[a]	−0.449[b]	0.104[c]	−0.255	−0.541[a]	−0.288	0.049	−0.207
	(0.201)	(0.198)	(0.063)	(0.231)	(0.196)	(0.198)	(0.063)	(0.216)
Year Fixed Effects	No	Yes	Yes	No	No	Yes	Yes	No
Pair Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Country Fixed Effects	No	No	No	No	No	No	No	No
Country-Year Fixed Effects	No	No	No	Yes	No	No	No	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	Yes	No	No	No	No
Pseudo R2	0.427	0.486	0.680	0.925	0.493	0.531	0.762	0.954
Observations	5953	5953	5953	5969	4369	4369	4369	4385

The dependent variable is a proxy for number of newly exported products. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A5
Gravity Regression Results: Latin American countries control group.

	(1)	(2)	(3)
Ln. Dist.	1.384[a]	−1.242	
	(0.521)	(0.940)	
Ln. GDP/Pop, origin	0.636[a]		
	(0.048)		
Ln. GDP/Pop, dest.	0.707[a]		
	(0.055)		
Ln. Pop., origin	0.926[a]		
	(0.064)		
Ln. Pop., dest.	0.948[a]		
	(0.055)		
Visa Dummy	−0.161	−0.316	−0.672[a]
	(0.155)	(0.237)	(0.212)
Pair Fixed Effects	No	No	Yes
Country Fixed Effects	No	No	No
Country-Year Fixed Effects	No	Yes	Yes
Pseudo R2	0.770	0.970	0.991
Observations	4891	4891	4891

Note: the dependent variable is the trade flow between origin and destination. The estimation sample includes only trade flows involving a Latin American country. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A6
Gravity Regression Results: OECD countries dropped from control group.

	(1)	(2)	(3)	(4)	(5)	(6)
Ln. Dist.	−0.501[a]	−2.247[a]		−0.474[a]	−2.498[a]	
	(0.075)	(0.157)		(0.082)	(0.180)	
Ln. GDP/Pop, origin	0.930[a]			0.939[a]		
	(0.100)			(0.104)		
Ln. GDP/Pop, dest.	0.996[a]			1.007[a]		
	(0.091)			(0.095)		
Ln. Pop., origin	0.828[a]			0.824[a]		
	(0.045)			(0.051)		
Ln. Pop., dest.	0.673[a]			0.673[a]		
	(0.042)			(0.047)		
Visa Dummy	−0.503[a]	−0.113	−0.677[a]	−0.502[a]	−0.063	−0.672[a]
	(0.181)	(0.161)	(0.181)	(0.183)	(0.173)	(0.174)
Pair Fixed Effects	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No
Pseudo R2	0.568	0.921	0.964	0.566	0.924	0.961
Observations	6820	6865	6865	6150	6195	6195

Note: the dependent variable is the trade flow between origin and destination. OECD countries have been dropped from the estimation sample. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A7
Gravity Regression Results: World Bank's lower-middle and upper-middle income countries control group.

	(1)	(2)	(3)	(4)	(5)	(6)
Ln. Dist.	−1.102[a]	−1.826[a]		−0.791[a]	−2.311[a]	
	(0.117)	(0.157)		(0.107)	(0.245)	
Ln. GDP/Pop, origin	0.583[a]			0.483[a]		
	(0.067)			(0.069)		
Ln. GDP/Pop, dest.	0.626[a]			0.531[a]		
	(0.060)			(0.063)		
Ln. Pop., origin	0.898[a]			0.827[a]		
	(0.079)			(0.075)		
Ln. Pop., dest.	0.869[a]			0.794[a]		
	(0.080)			(0.062)		
Visa Dummy	−0.150	−0.198	−0.673[a]	−0.384[c]	−0.102	−0.664[a]
	(0.230)	(0.180)	(0.171)	(0.216)	(0.164)	(0.213)
Pair Fixed Effects	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No
Pseudo R2	0.700	0.958	0.964	0.632	0.952	0.979
Observations	3313	3313	3313	2977	2977	2977

Note: The dependent variable is the trade flow between origin and destination. The estimation sample is limited to countries in the lower-middle income and and upper-middle income 2005 World Bank's income groups. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A8
Gravity Regression Results: countries with a similar GDP per capita.

	(1)	(2)	(3)
Ln. Dist.	−0.838[a]		
	(0.095)		
Ln. GDP/Pop, origin	0.557[a]		
	(0.041)		
Ln. GDP/Pop, dest.	0.692[a]		
	(0.064)		
Ln. Pop., origin	0.878[a]		
	(0.060)		
Ln. Pop., dest.	0.797[a]		
	(0.054)		
Visa Dummy	−0.439[b]	−0.563[a]	−0.668[a]
	(0.189)	(0.136)	(0.214)
Pair Fixed Effects	No	No	Yes
Country Fixed Effects	No	No	No
Country-Year Fixed Effects	No	Yes	Yes
Pseudo R2	0.670	0.940	0.990
Observations	4565	4565	4565

Note: The dependent variable is the trade flow between origin and destination. The estimation sample includes only countries with an average GDP per capita, for the 2001–2011 time period, similar to Bolivia and Ecuador (i.e. between 1000 and 7500 2010 US dollars). Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A9
Gravity Regression Results: intra-EU flows excluded

	(1)	(2)	(3)	(4)	(5)	(6)
Ln. Dist.	−0.873[a]	−1.531[a]		−0.582[a]	−1.571[a]	
	(0.051)	(0.104)		(0.082)	(0.192)	
Ln. GDP/Pop, origin	0.693[a]			0.696[a]		
	(0.048)			(0.058)		
Ln. GDP/Pop, dest.	0.719[a]			0.761[a]		
	(0.044)			(0.054)		
Ln. Pop., origin	0.845[a]			0.830[a]		
	(0.036)			(0.040)		
Ln. Pop., dest.	0.848[a]			0.828[a]		
	(0.041)			(0.053)		
Visa Dummy	−0.439[b]	−0.258[b]	−0.679[b]	−0.497[a]	−0.250[c]	−0.679[a]
	(0.172)	(0.130)	(0.270)	(0.175)	(0.136)	(0.259)
Pair Fixed Effects	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No
Pseudo R2	0.857	0.631	0.824	0.735	0.505	0.274
Observations	11301	11374	11374	8831	8904	8904

Note: The dependent variable is the trade flow between origin and destination. All intra-EU flows are excluded from the estimation sample. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A10
Gravity Regression Results: exports or imports only sample.

	(1)	(2)	(3)	(4)	(5)	(6)
Ln. Dist.	−0.427[a]	−2.007[a]		−0.636[a]		
	(0.111)	(0.258)		(0.095)		
Ln. GDP/Pop, origin	0.709[a]			0.768[a]		
	(0.076)			(0.098)		
Ln. GDP/Pop, dest.	0.760[a]			0.906[a]		
	(0.096)			(0.068)		
Ln. Pop., origin	0.754[a]			0.985[a]		
	(0.062)			(0.064)		
Ln. Pop., dest.	0.885[a]			0.698[a]		
	(0.063)			(0.061)		
Visa Dummy	−0.557[a]	1.490[a]	−0.774[a]	−0.482[b]	−0.563[a]	−1.243[a]
	(0.199)	(0.259)	(0.065)	(0.210)	(0.131)	(0.122)
Pair Fixed Effects	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No
Trade Flow	Exports	Exports	Exports	Imports	Imports	Imports
Pseudo R2	0.807	0.987	0.997	0.860	0.992	0.999
Observations	5010	5069	5069	4789	4803	4803

The dependent variable is the trade flow between origin and destination. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A11
Gravity Regression Results: migration flows included in the explanatory variables.

	(1)	(2)	(3)	(4)	(5)	(6)
Ln. Dist.	−0.829[a]	−0.664[a]		−0.484[a]	−1.872[a]	
	(0.034)	(0.074)		(0.069)	(0.204)	
Ln. GDP/Pop, origin	0.725[a]			0.632[a]		
	(0.046)			(0.060)		
Ln. GDP/Pop, dest.	0.488[a]			0.574[a]		
	(0.040)			(0.048)		
Ln. Pop., origin	0.742[a]			0.753[a]		
	(0.028)			(0.042)		
Ln. Pop., dest.	0.706[a]			0.716[a]		
	(0.032)			(0.038)		
Ln. Number of Migrants	0.148[a]	0.232[a]	0.336[a]	0.137[a]	0.111[a]	0.149[a]
	(0.024)	(0.025)	(0.040)	(0.029)	(0.024)	(0.044)
Visa Dummy	−0.538[a]	−0.728[a]	−0.840[a]	−0.651[a]	−0.491[b]	−0.866[a]
	(0.171)	(0.205)	(0.317)	(0.157)	(0.217)	(0.261)
Pair Fixed Effects	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No
Pseudo R2	0.883	0.958	0.975	0.740	0.392	0.294
Observations	2152	2158	2158	1295	1301	1301

Note: The dependent variable is the trade flow between origin and destination. Migration flows are taken from the World Bank's Global Bilateral Migration Database. Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A12
Gravity Regression Results: Schengen countries with largest ports excluded from the estimation sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Ln. Dist.	−0.954[a]	−1.183[a]		−0.678[a]	−1.937[a]		−0.925[a]	−1.036[a]		−0.633[a]	−2.035[a]		−0.924[a]	−1.088[a]		−0.639[a]	−1.809[a]	
	(0.035)	(0.092)		(0.080)	(0.212)		(0.032)	(0.095)		(0.083)	(0.183)		(0.059)	(0.071)		(0.073)	(0.212)	
Ln. GDP/Pop, origin	0.722[a]			0.718[a]			0.709[a]			0.689[a]			0.748[a]			0.706[a]		
	(0.045)			(0.054)			(0.047)			(0.059)			(0.045)			(0.067)		
Ln. GDP/Pop, dest.	0.688[a]			0.710[a]			0.680[a]			0.726[a]			0.741[a]			0.802[a]		
	(0.043)			(0.055)			(0.043)			(0.056)			(0.032)			(0.043)		
Ln. Pop., origin	0.872[a]			0.839[a]			0.869[a]			0.842[a]			0.805[a]			0.768[a]		
	(0.026)			(0.039)			(0.025)			(0.041)			(0.030)			(0.041)		
Ln. Pop., dest.	0.854[a]			0.865[a]			0.862[a]			0.859[a]			0.803[a]			0.761[a]		
	(0.030)			(0.056)			(0.029)			(0.055)			(0.028)			(0.037)		
Visa Dummy	−0.323[c]	−0.343[b]	−0.866[b]	−0.449[b]	−0.192	−0.868[b]	−0.456[a]	−0.364[b]	−0.617[b]	−0.574[a]	−0.164	−0.618[a]	−0.264	−0.445[b]	−0.764[b]	−0.499[b]	−0.300[c]	−0.760[a]
	(0.187)	(0.155)	(0.409)	(0.193)	(0.151)	(0.347)	(0.169)	(0.151)	(0.314)	(0.180)	(0.145)	(0.231)	(0.215)	(0.192)	(0.372)	(0.204)	(0.182)	(0.267)
Pair Fixed Effects	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Country Fixed Effects	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Country-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Intra-Schengen trade flows	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	No	No	No
Country Dropped	The Nether-lands	The Nether-lands	The Nether-lands	The Nether-lands	The Nether-lands	The Nether-lands	Belgium	Belgium	Belgium	Belgium	Belgium	Belgium	Germany	Germany	Germany	Germany	Germany	Germany
Pseudo R2	0.860	0.938	0.983	0.838	0.992	0.995	0.875	0.950	0.971	0.835	0.991	0.994	0.771	0.922	0.867	0.805	0.978	0.986
Observations	13466	13533	13533	8476	8543	8543	13471	13538	13538	8481	8548	8548	13473	13540	13540	8483	8550	8550

Note: The dependent variable is the trade flow between origin and destination. One of each of the Schengen countries with the three busiest ports excluded at each time: The Netherlands (Rotterdam), Belgium (Antwerp) and Germany (Hamburg). Visa dummy is a variable equal to 1 when there is a visa in place and 0 otherwise. Standard errors in parentheses are robust and clustered at country pair level. Statistically signicant at [c] 10% [b] 5% [a] 1%.

Table A13
Largest welfare changes: visas removed only when origin or destination country is a small or mid-size developping country.

Country	Welfare ratio
Angola	1.06
Congo	1.06
Suriname	1.04
Libya	1.04
Cambodia	1.04
Guyana	1.04
Malaysia	1.04
Mauritania	1.04
Vietnam	1.04
Mongolia	1.03

Note: This table presents the general equilibrium welfare changes (New welfare/Old welfare) that would be triggered by removing short stay visas. Visas are removed only when the origin or destination country had in 2005 a GDP per capita lower than 10 000 US dollars and a population lower than 100 million. Only the ten largest welfare changes are presented.

Table A14
Welfare Changes by Income Category: visas removed only when origin or destination country is a small or mid-size developping country.

Income Category	Welfare ratio
LIC	1.008
LMIC	1.0137
UMC	1.0119
HIC	1.0012

Note: This table presents average general equilibrium welfare changes (New welfare/Old welfare) by the World's Bank income categories. LIC: Lower income countries. LMIC: Lower middle income countries. UMC: Upper-middle income countries. HIC: High income countries. Visas are removed only when the origin or destination country had in 2005 a GDP per capita lower than 10 000 US dollars and a population lower than 100 million.

Table A15
Largest welfare changes: visas removed only when origin or destination country is a WB lower-middle or upper-middle income country.

Country	Welfare ratio
Angola	1.05
Congo	1.05
Mauritania	1.04
Libya	1.04
Guyana	1.04
Suriname	1.04
Malaysia	1.03
Vietnam	1.03
Gabon	1.03
China	1.03

Note: This table presents the general equilibrium welfare changes (New welfare/Old welfare) that would be triggered by removing short stay visas. Visas removed only when origin or destination country is a WB lower-middle or upper-middle income country. Only the ten largest welfare changes are presented.

Table A16
Welfare Changes by Income Category: visas removed only when origin or destination country is a WB lower-middle or upper-middle income country.

Income Category	Welfare ratio
LIC	1.0017
LMIC	1.0139
UMC	1.0121
HIC	1.0025

Note: This table presents average general equilibrium welfare changes (New welfare/Old welfare) by the World's Bank income categories. LIC: Lower income countries. LMIC: Lower middle income countries. UMC: Upper-middle income countries. HIC: High income countries. Visas removed only when origin or destination country is a WB lower-middle or upper-middle income country.

Table A17
World Bank income categories.

Low-income economies ($1045 or less)		
Afghanistan	Gambia,The	Niger
Benin	Guinea	Rwanda
Burkina Faso	Guinea-Bisau	Sierra Leone
Burundi	Haiti	Somalia
Cambodia	Korea, Dem Rep.	South Sudan
Central African Republic	Liberia	Tanzania
Chad	Madagascar	Togo
Comoros	Malawi	Uganda
Congo, Dem. Rep	Mali	Zimbabwe
Eritrea	Mozambique	Ethiopia
Nepal		
Lower-middle-income economies (1046 to $4125)		
Armenia	Indonesia	Samoa
Bangladesh	Kenya	Sao Tome and Principe
Bhutan	Kiribati	Senegal
Bolivia	Kosovo	Solomon Islands
Cabo Verde	KyrgyzRepublic	Sri Lanka
Cameroon	Lao PDR	Sudan
Congo,Rep.	Lesotho	Swaziland
Cote d'Ivoire	Mauritania	Syrian Arab Republic
Djibouti Micronesia,Fed. Sts.	Tajikistan	
Egypt, Arab Rep.	Moldova	Timor-Leste
El Salvador	Morocco	Ukraine
Georgia	Myanmar	Uzbekistan
Ghana	Nicaragua	Vanuatu
Guatemala	Nigeria	Vietnam
Guyana	Pakistan	West Bank and Gaza
Honduras	Papua New Guinea	Yemen,Rep.
India	Philippines	Zambia
Upper-middle-income economies (4126 to $12,735)		
Albania	Fiji	Namibia
Algeria	Gabon	Palau
American Samoa	Grenada	Panama
Angola	Iran, Islamic Rep.	Paraguay
Azerbaijan	Iraq	Peru
Belarus	Jamaica	Romania
Belize	Jordan	Serbia
Bosnia and Herzegovina	Kazakhstan	South Africa
Botswana	Lebanon	St. Lucia
Brazil	Libya	St. Vincent and the Grenadines
Bulgaria	Macedonia,FYR	Suriname
China	Malaysia	Thailand
Colombia	Maldives	Tonga
Costa Rica	Marshall Islands	Tunisia
Cuba	Mauritius	Turkey

(*continued on next page*)

Table A17 *(continued)*

Dominica	Mexico	Turkmenistan
Dominican Republic	Mongolia	Tuvalu
Ecuador	Montenegro	
High-income economies ($12,736 or more)		
Andorra	Germany	Poland
Antigua and Barbuda	Greece	Portugal
Argentina	Greenland	Puerto Rico
Aruba	Guam	Qatar
Australia	Hong Kong SAR,China	Russian Federation
Austria	Hungary	San Marino
Bahamas,The	Iceland	Saudi Arabia
Bahrain	Ireland	Seychelles
Barbados	Isle of Man	Singapore
Belgium	Israel	Sint Maarten (Dutch part)
Bermuda	Italy	Slovak Republic
Brunei Darussalam	Japan	Slovenia
Canada	Korea,Rep.	Spain
Cayman Islands	Kuwait	St.Kitts and Nevis
Channel Islands	Latvia	St. Martin (French part)
Chile	Liechtenstein	Sweden
Croatia	Lithuania	Switzerland
Curaçao	Luxembourg	Taiwan, China
Cyprus	Macao SAR,China	Trinidad and Tobago
Czech Republic	Malta	Turks and Caicos Islands
Denmark	Monaco	United Arab Emirates
Estonia	Netherlands	United Kingdom
Equatorial Guinea	New Caledonia	United States
Faeroe Islands	New Zealand	Uruguay
Finland	Northern Mariana Islands	Venezuela,RB
France	Norway	Virgin Islands (U.S.)
French Polynesia	Oman	

Note: This table presents the World Bank income categories used for the general equilibrium welfare analysis.

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