

# The Trade Effects of Border Controls: Evidence from the European Schengen Agreement

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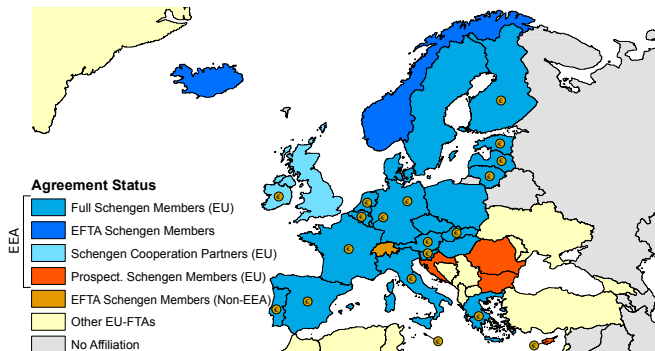
# Motivation

## The Schengen Agreement: A milestone of European integration

- ▶ Purpose: Facilitate the flow of goods, services, and persons across borders.
- ▶ Lower waiting times at borders reduce trade costs.
  - ⇒ increase the mobility of service providers and consumers.
  - ⇒ stimulate cross border exchange.
  - ⇒ promote regional specialization.
  - ⇒ improve scale economies and variety.
- ▶ Schengen should yield higher welfare for citizens.

**European refugee crisis of 2015: The reintroduction of identity checks at internal Schengen borders may put these gains at risk.**

# The Schengen Area Today



- ▶ First signed June 1985 by BENELUX, France, Germany.
- ▶ June 1990: Convention Implementing the Schengen agreement.
- ▶ Enforced March 1995 by BENELUX, France, Germany, Spain, Portugal.
- ▶ Covers 26 countries with 4.3 million km<sup>2</sup> and about 400 million citizens.

# Empirical Literature on Schengen's Trade Effects

## Magnitude of Findings

- ▶ Schengen increases international trade between 10% and 23% (Davis and Gift, 2014; Chen and Novy, 2011; Aussilloux and Le Hir, 2016).
- ▶ Strong impact of the Schengen on welfare *assuming* an AVTE of 3% (Aussilloux and Le Hir, 2016; Boehmer et al., 2016).

## Widely-Used Methodology

- ▶ Schengen typically modeled as a binary indicator.
- ▶ Exception: Chen and Novy (2011) use a  $[0;0.5;1]$  indicator.

# Accuracy of Measuring Trade Integration

- ▶ Most integration measures: bilateral scope (customs union, single market, Eurozone, other RTAs).
- ▶ Schengen agreement: obvious and important spatial dimension.
- ▶ Schengen treats country pairs heterogeneously (depending on the number of internal Schengen borders crossed).
- ▶ Direct/partial effects not limited to Schengen insiders! Trade between
  - ▶ two Schengen outsiders (e.g., Romania and the UK) or
  - ▶ one Schengen outsider and one insider (e.g., Turkey and Germany)can also benefit if it transits Schengen space.

# This Paper

## Research Question

- ▶ How does Schengen affect international trade, also compared to other steps of regional integration (EU, Euro, and other RTAs)?

## Approach

- ▶ Use a more accurate definition of treatment for Schengen.
- ▶ Employ the most recent and most adequate data (services and goods trade).
- ▶ Apply newest methodological advances, strictly adhering to structural gravity theory (i.e., country-year and pair fixed effects, internal trade, PPML).

## Preview of Findings

### Regional Integration Measures Ranked by Trade-Creating Effects

1. Mutual EU membership: 79.9% (goods), 39.8% (services).
2. Other RTAs: 35.9% (goods), 20.2% (services).
3. Mutual Eurozone membership: 15.1% (goods), 8.8% (services).
4. Schengen: 2.8% on average ( $\equiv$  drop in tariffs by 0.5 percentage points).

### Heterogeneous Schengen Effects

- ▶ Services trade > goods trade (but at larger parameter uncertainty).
- ▶ Peripheral countries > central countries.

### Direct Schengen Effects on Third Countries

- ▶ Outsiders are also positively affected by Schengen.

## General Structural Gravity

$$X_{ij,t}^s = \frac{Y_{i,t}^s E_{j,t}^s}{Y_t^s} \cdot \left( \frac{\phi_{ij,t}^s}{\Omega_{i,t}^s \Pi_{j,t}^s} \right)^{-\epsilon},$$

- ▶  $X_{ij,t}^s$  is the value of exports of  $i$  to  $j$  in sector  $s$  at time  $t$ ,
- ▶  $Y_{i,t}^s$  is  $i$ 's value of production,
- ▶  $E_{j,t}^s$  is  $j$ 's expenditure,
- ▶  $Y_t^s$  is the value of global output,
- ▶  $\phi_{ij,t}^s > 1$  measures bilateral trade costs,
- ▶  $\Omega_{i,t}^s$  and  $\Pi_{j,t}^s$  are multilateral resistance terms, and
- ▶  $\epsilon$  is the trade elasticity.

## Trade Costs

Except for tariffs  $\tau_{ij,t}^s$ , trade costs cannot be directly measured in the data but must be estimated:

$$\phi_{ij,t}^s = \tau_{ij,t}^s \cdot \mathbf{T}_{ij,t}^{\tilde{\delta}^s} \cdot \exp \left( \tilde{\beta}^s \text{Schengen}_{ij,t} + \tilde{\alpha}^s \mathbf{Z}_{ij,t}^s \right),$$

- ▶  $\mathbf{T}_{ij}^s \geq 1$  measures trade costs unrelated to trade policy (e.g., caused by geographical or cultural distance between countries).
- ▶  $\text{Schengen}_{ij,t}$  is our variable of key interest.
- ▶  $\mathbf{Z}_{ij,t}^s$  is a vector of other trade policy variables.

# Empirical Gravity Model

We estimate:

$$X_{ij,t}^s = \exp \left[ \beta^s \text{Schengen}_{ij,t} + \alpha^s \mathbf{Z}_{ij,t}^s + \nu_{ij}^s + \nu_{i,t}^s + \nu_{j,t}^s \right] + \varepsilon_{ij,t}^s,$$

- ▶  $\text{Schengen}_{ij,t} = \{x \in \mathbb{N} \mid 1 \leq x \leq 8\}$ .
- ▶  $\mathbf{Z}_{ij,t}^s$  collects policy controls:
  - ▶ binary indicators for mutual EU, Eurozone, or other RTA membership.
  - ▶ MFN tariffs, identified via own trade:  $\ln(1 + \text{MFN}_{j,t}) \times \text{INTER}_{ij,t}$   
(following Piermartini and Yotov, 2016).
- ▶  $\nu_{ij}^s$  and  $\nu_{i,t}^s, \nu_{j,t}^s$  are country-pair and year-specific importer and exporter fixed effects.
- ▶  $\varepsilon_{ij,t}^s$  is a random disturbance.

# Data

## World Input Output Database (WIOD)

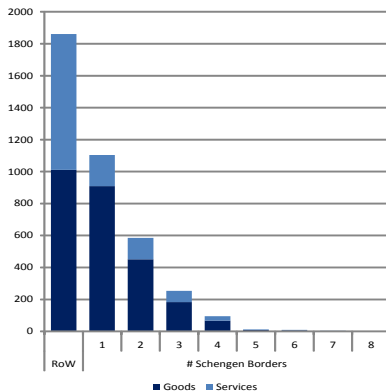
- ▶ International and domestic trade data.
- ▶ Supply and demand data.
- ▶ 40 countries for 1995 to 2011.
- ▶ 35 sectors, 16 for goods trade and 19 for services trade.

## Other Data Sources

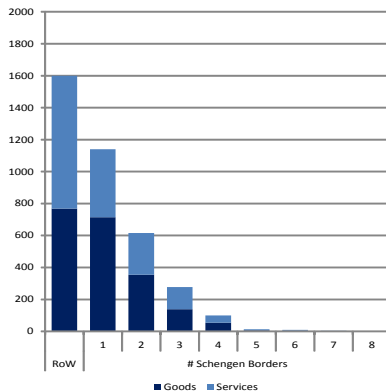
- ▶ EU, Euro, and Schengen membership from European Commission.
- ▶ RTA from WTO RTA-Gateway.
- ▶ MFN tariffs on goods trade from WITS-TRAINS
- ▶ Schengen <sub>$ij,t$</sub>  is calculated using GIS and Google Maps to count Schengen borders crossed by truck (and ferry) along shortest road distance between trading partners.

# Total EU-27 Trade along Number of Schengen Borders Crossed, 2011

(a) Exports in bn. US Dollars



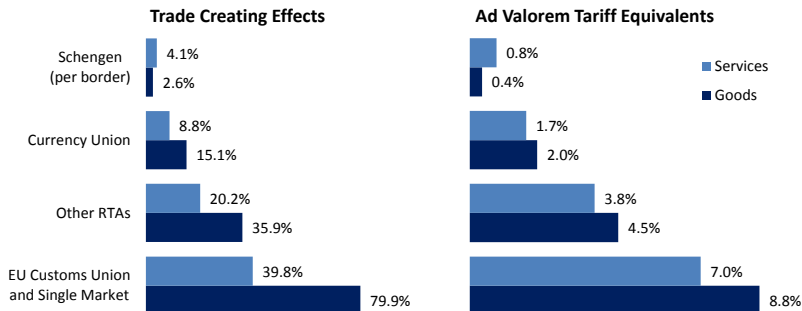
(b) Imports in bn. US Dollars



# The Impact of Schengen on Bilateral Exports (1995 - 2011)

Dep. var.:	Bilateral Exports					
	Total Trade		Goods		Services	
	(1)	(2)	(3)	(4)	(5)	(6)
Schengen <sub>ij,t</sub>	0.054*** (0.01)	0.0003 (0.01)	0.106*** (0.02)	0.026*** (0.01)	0.067*** (0.02)	0.040* (0.02)
Both EU <sub>ij,t</sub>		0.617*** (0.07)		0.587*** (0.10)		0.335*** (0.08)
Both Euro <sub>ij,t</sub>		0.030 (0.02)		0.141*** (0.03)		0.084* (0.04)
Other RTA <sub>ij,t</sub>		0.250*** (0.07)		0.307*** (0.06)		0.184** (0.07)
MFN <sub>ij,t</sub>				-1.814*** (0.45)		
Loglikelihood	-2.34e+04	-2.34e+04	-1.94e+04	-1.93e+04	-1.43e+04	-1.43e+04

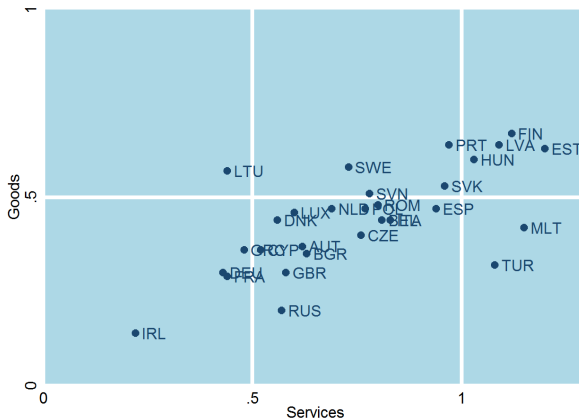
## Trade Creation Effects and Implied Ad Valorem Tariff Equivalents



Note: AVTEs in percentage points. Sectoral elasticity of substitution by Egger et al. (2012); trade elasticity of  $\epsilon^G = 6.9849$  for goods and  $\epsilon^S = 4.9591$  for services.

- Accounting for the different trade structures of EU-27 country pairs, the total average trade creating effect of Schengen is 2.81%.  
 ⇒ AVTE of 0.46 percentage points.

## Average Trade Costs Savings from Schengen, 2011



- The spatial dimension matters for the identification of the Schengen effect and is preferable over using a simple indicator variable.

## Robustness: Trade Integration Effects in Alternative Models

Dep. var.: Bilateral Exports			
	Total Trade	Goods	Services
	(1)	(2)	(3)
<b>PANEL A: Alternative Sample Composition</b>			
[1] Including mining, gas, petrol	0.007 (0.01)	0.035*** (0.01)	0.040* (0.02)
[2] Excluding main bilateral trade partners	-0.003 (0.01)	0.017*** (0.01)	0.043** (0.02)
[3] Intracontinental trade only (European Sample)	0.005 (0.01)	0.034*** (0.01)	0.057*** (0.02)
<b>PANEL B: Alternative Measurement of Treatment</b>			
[4] Treating intercontinental trade flows	0.024** (0.01)	0.048*** (0.01)	0.073*** (0.03)
[5] Schengen as binary variable [0;1]	0.030** (0.01)	0.071*** (0.02)	0.065 (0.04)
[6] Chen and Novy (2011) indicator [0;0.5;1]	0.161*** (0.03)	0.248*** (0.03)	0.300*** (0.06)
<b>PANEL C: Alternative Econometric Choices</b>			
[7] Pooled over sectors	0.0003 (0.01)	0.026*** (0.01)	0.040** (0.02)
[8] Baier and Bergstrand (2009) MR-Terms	0.005 (0.01)	0.038*** (0.01)	0.034 (0.02)
[9] No bilateral fixed effects	-0.130 (0.08)	-0.128*** (0.03)	-0.148 (0.09)

## Conclusion

- ▶ We analyze the impact of trade policy variables (the Schengen agreement, the EU, the Euro, and other RTAs) on trade in goods and services.
- ▶ By counting the number of Schengen borders crossed along transit routes, we recognize the spatial structure of the Schengen agreement.
- ▶ We find a ranking of trade policy effects, where EU membership, other RTAs, and the Eurozone are more important than Schengen.
- ▶ We find substantial heterogeneity across countries:  
Peripheral countries benefit most, central ones less, outsiders benefit, too.
- ▶ By example of Schengen, we show how trade policies can *directly* affect third countries.
- ▶ Policy variables are highly interwoven and their trade effects are hard to disentangle, particularly when deviating from state-of-the-art methodology.

# Summary Statistics

Table: Summary Statistics

variable	N	mean	sd	max	min
Exports <sub><i>ij,t</i></sub>	27,200	20.39	272.13	12385.98	0.00
Schengen <sub><i>ij,t</i></sub>	27,200	0.79	1.31	8.00	0.00
Both EU <sub><i>ij,t</i></sub>	27,200	0.26	0.44	1.00	0.00
Both Euro <sub><i>ij,t</i></sub>	27,200	0.08	0.27	1.00	0.00
Other RTA <sub><i>ij,t</i></sub>	27,200	0.23	0.42	1.00	0.00
MFN	27,200	1.07	0.20	1.65	0.00
ln Supply <sub><i>i,t</i></sub>	27,200	13.03	1.82	17.06	8.78
ln Demand <sub><i>j,t</i></sub>	27,200	12.33	1.82	16.54	8.26

Note: Summary statistics for the complete sample and total trade.

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# Heterogeneity Across Member States

Country	Average Tariff Equivalents ( $\epsilon = 5$ )			Share of Schengen Trade in Total Trade		
	Goods	Services	Total	Goods	Services	Total
EST	0.63%	1.20%	0.83%	68.87%	52.50%	61.04%
LVA	0.64%	1.09%	0.81%	67.76%	50.20%	57.51%
FIN	0.67%	1.12%	0.80%	52.29%	43.26%	49.35%
MLT	0.42%	1.15%	0.74%	51.16%	59.95%	56.52%
PRT	0.64%	0.97%	0.74%	79.40%	58.41%	70.27%
HUN	0.60%	1.03%	0.72%	73.13%	55.39%	67.53%
SVK	0.53%	0.96%	0.65%	79.37%	69.53%	76.60%
SWE	0.58%	0.73%	0.62%	60.83%	36.08%	50.36%
ESP	0.47%	0.94%	0.62%	67.12%	58.03%	63.36%
ROM	0.48%	0.80%	0.59%	57.13%	42.77%	50.03%
SVN	0.51%	0.78%	0.59%	73.98%	53.29%	67.00%
BEL	0.44%	0.81%	0.56%	74.40%	59.89%	68.12%
POL	0.47%	0.77%	0.56%	72.23%	49.66%	64.60%
ITA	0.44%	0.83%	0.55%	60.68%	48.83%	56.53%
NLD	0.47%	0.69%	0.54%	72.05%	45.39%	59.77%
TUR	0.32%	1.08%	0.51%	40.60%	59.00%	46.10%
CZE	0.40%	0.76%	0.49%	75.69%	60.18%	72.01%
LUX	0.46%	0.60%	0.48%	86.06%	42.98%	47.30%
DNK	0.44%	0.56%	0.47%	69.89%	38.09%	50.05%
LTU	0.57%	0.44%	0.45%	78.92%	28.26%	45.45%
BGR	0.35%	0.63%	0.45%	47.00%	37.70%	42.83%
AUT	0.37%	0.62%	0.45%	72.71%	50.68%	64.16%
CYP	0.36%	0.52%	0.41%	44.87%	28.53%	32.81%
GBR	0.30%	0.58%	0.41%	45.58%	38.03%	41.22%
GRC	0.36%	0.48%	0.39%	45.04%	28.27%	32.67%
RUS	0.20%	0.57%	0.36%	30.71%	33.99%	32.68%
DEU	0.30%	0.43%	0.34%	60.02%	42.55%	55.85%
FRA	0.29%	0.44%	0.34%	58.87%	39.88%	52.89%
IRL	0.14%	0.22%	0.17%	23.79%	15.96%	19.62%
EU 27 Mean	0.46%	0.75%	0.55%	63.66%	45.71%	54.65%
EU 27 Median	0.46%	0.76%	0.55%	67.76%	45.39%	56.52%
EU 27	0.38%	0.64%	0.46%	62.03%	43.92%	54.96%