Düsseldorf Institute
for Competition Economics

DISCUSSION PAPER

No 185

Border Effects without Borders: What Divides Japan's Internal Trade?

Jens Wrona

May 2015

HEINRICH HEINE
UNIVERSITÄT DÜSSELDORF

d|u|p düsseldorf university press

IMPRINT

DICE DISCUSSION PAPER

Published by

düsseldorf university press (dup) on behalf of
Heinrich-Heine-Universität Düsseldorf, Faculty of Economics,
Düsseldorf Institute for Competition Economics (DICE), Universitätsstraße 1,
40225 Düsseldorf, Germany
www.dice.hhu.de

Editor:

Prof. Dr. Hans-Theo Normann
Düsseldorf Institute for Competition Economics (DICE)
Phone: +49(0) 211-81-15125, e-mail: normann@dice.hhu.de

DICE DISCUSSION PAPER

ISSN 2190-9938 (online) – ISBN 978-3-86304-184-7

Border Effects without Borders: What Divides Japan's Internal Trade?*

Jens Wrona†

Düsseldorf Institute for Competition Economics (DICE)
Heinrich-Heine-University Düsseldorf

May 2015

Abstract

Over the last 20 years the trade literature repeatedly documented the trade-reducing effects of inter- and intra-national borders. Thereby, the puzzling size and persistence of observed border effects from the beginning raised doubts on the role of underlying political borders. However, when observed border effects are not caused by political trade barriers, why should their spatial dimension then inevitably coincide with the geography of present or past political borders? This paper identifies a "border effect" in the absence of a border. Thereby, the finding that trade between East- and West-Japan is 23.1% - 51.3% lower than trade within both country parts, is established in the absence of an obvious east-west division due to historical borders, cultural differences or past civil wars. From a rich set of explanatory variables post-war agglomeration processes, reflected by the contemporaneous structure of Japan's business and social networks, rather than cultural differences, shaped by long-lasting historical shocks, are identified as an explanation for the east-west bias in intra-Japanese trade.

JEL-Classification: F14, F15, F12
Keywords: Border Effects, Gravity Equation, Intra-national Trade, Japan

*This paper benefited from helpful comments and discussion by Benjamin Jung, Wilhelm Kohler, Udo Kreickemeier, Alfred Lameli, Yasusada Murata, Michael Ryan, Jens Südekum, Johannes Van Biesebroeck, Nikolaus Wolf, and Thilo Wrona. I thank Riccarda Langer, Yuka Manabe, and Leopold Schiele for providing excellent research assistance.

†Heinrich Heine University (HHU) Düsseldorf, Düsseldorf Institute for Competition Economics (DICE), Universitätsstr. 1, 40225 Düsseldorf, Germany; phone: +49 (0)211 81 11624; fax: +49 (0)211 81 15499; e-mail: jens.wrona@dice.hhu.de.

1 Introduction

Beginning with the seminal contribution of McCallum (1995), the literature in international economics (e.g. Anderson and van Wincoop, 2003; Chen, 2004) repeatedly has documented the trade-reducing effect of international borders. Observed border effects between Canada and the US as well as between the member states of the European Union thereby not only tend to be puzzlingly large but also immune against explanations in terms of political trade barriers (cf. Wei, 1996; Hillberry, 1999; Head and Mayer, 2000; Chen, 2004). More recent contributions, focussing on intra-national trade between former East- and West-Germany (cf. Nitsch and Wolf, 2013) as well as between northern and southern US states (cf. Felbermayr and Gröschl, 2014), suggest that defunct historical borders continue to have a trade-inhibiting effect, even when political barriers to trade are absent.

This paper is the first to identify a "border effect" without a border. Focussing on the illustrative example of Japan, it is demonstrated that inter-prefectural trade between East- and West-Japan is 23.1% to 51.3% lower than trade within both country parts. Remarkably, this finding is established in the absence of an obvious east-west division due to defunct historical borders, striking cultural differences or past civil wars. A wide range of sensitivity checks (including several millions of placebo regressions) robustly confirm the existence of a single intra-Japanese border effect with a unique east-west dimension, and reject possible explanations in terms of statistical artefacts (cf. Hillberry, 2002; Hillberry and Hummels, 2003, 2008).

Having established the existence of an intra-Japanese East-West border effect, the analysis in a second step aims to explain what causes the (negative) east-west bias in Japan's internal trade. In search for an explanation, a rich set of contemporaneous and historical explanatory variables, including (among others) measures for business, social and coethnic networks (cf. Combes, Lafourcade, and Mayer, 2005; Rauch and Trindade, 2002), as well as proxies for bilateral trust (cf. Guiso, Sapienza, and Zingales, 2009) and cultural proximity (cf. Lameli, Nitsch, Südekum, and Wolf, 2015), is taken into account. Thereby, two possible explanations for the intra-Japanese East-West border effect in terms of "history" versus "agglomeration" are identified. Ruling out history-based explanations, it is argued that post-war agglomeration trends characterised by a "Tôkyô-Ôsaka bipolar growth pattern" (cf. Fujita and Tabuchi, 1997) led to a persistent and self-reinforcing duality in Japan's social network structure, whose trade-enhancing effect today is more pronounced *within* rather than between the East and the West of Japan. The structure of Japan's contemporaneous business and social networks is thus most relevant to understand the east-west bias in intra-Japanese trade and responsible for the measured intra-Japanese East-West Border effect.

In order to identify the intra-Japanese East-West border effect, the analysis proceeds as follows: associating Japan's major agglomeration areas *Kantô* and *Kansai*, with the East and the West of Japan, the sample of 47 Japanese prefectures is divided into 23 East- and 24 West-Japanese prefectures.[1] Already from a visual inspection of Japan's internal trade integration matrix it becomes clear that average trade integration measured by the Head-Ries Index (cf. Head and Ries, 2001) is more than five to six times as high within the East or the West than between both country parts. Simple gravity regressions, which additionally account for the trade-inhibiting effect of bilateral transportation cost, confirm this pattern: including an East-West "border" dummy into a gravity equation with exporter- and importer-specific fixed effects, results in a robust, statistically significant, and economically meaningful intra-Japanese East-West border effect, which is associated with a reduction of 23.1% to 51.3% in east-west trade. Although this trade reduction may seem moderate compared to a drop in international trade of 80.8%, which Anderson and van Wincoop (2003) report for trade between Canadian provinces and U.S. states, it is substantial and much larger than the persistent reductions of 20.5% or 12.8% in contemporaneous intra-national trade across the former border between East- and West-Germany in Nitsch and Wolf (2013) or across the historical border between the Union and the Confederacy in Felbermayr and Gröschl (2014). The intra-Japanese East-West border effect represents an *ad valorem* tariff equivalent of about 13.4% to 43.4%, and although the average (real) consumption gains from a *hypothetical* elimination of the intra-Japanese East-West border effect would fall into a moderate range from 1.2% to 2.8%, there are substantial distributional consequences associated with such a *counterfactual* scenario: as trade would be diverted away from the periphery and from large trading hubs, prefectures like Hokkaidô, Okinawa, Tôkyô or Ôsaka would lose, while prefectures that are located in close distance to the intra-Japanese East-West "border" would benefit.[2]

The paper's results are robust to employing alternative methodologies (in particular a PPML-model, cf. Santos Silva and Tenreyro, 2006, 2010), measuring trade flows either in quantities or in values (cf. Combes, Lafourcade, and Mayer, 2005; Nitsch and Wolf, 2013), or drawing on sectoral rather than on aggregate bilateral trade data (cf. Chen, 2004). The intra-Japanese East-West border effect can be identified across all waves (2000, 2005, 2010) of the National Commodity Flow Survey (NCFS), and yearly data from the Japanese Commodity Flow Statis-

[1] The Kantô regions includes Japan's capital Tôkyô as well as Japan's largest harbour Yokohama. The population in 2010 amounted to 42.6 million people. The Kansai region includes Japans second largest citiy Ôsaka, the former capital Kyôto, and Japan's second largest harbour Kobe. The population in 2010 amounted to 22.7 million people.

[2] The importance of market access for regional development is highlighted by Redding and Sturm (2008), who exploit the division of Germany after the Second World War and the subsequent reunification of East- and West-Germany in 1990 as natural experiments to show that the loss (restoration) of market access led to a deceleration (acceleration) of city growth in western border regions.

tic (CFS) suggests that there is a moderate increase in the size of the intra-Japanese East-West border effect over the decade from 2000 to 2012. East-West border effects tend to be stronger and more robust in secondary sectors (e.g. machinery, chemicals or manufacturing) than in primary sectors (e.g. agriculture, forest or minerals). However, when distinguishing between homogeneous and differentiated products (cf. Rauch, 1999) in order to account for the role of local preferences and limited trust, no systematic correlation between the share of differentiated products and the size of the intra-Japanese East-West border effect can be identified. Finally, to account for a (possible) east-west heterogeneity in Japan's infrastructure networks, up to four transportation modes (by road, rail, sea and air) are distinguished. In order to address the notorious mismeasurement of bilateral transportation cost, information on unit transportation cost (per ton and kilometre) provided by the National Commodity Flow Survey (NCFS) is used to compute the exact bilateral trade cost, accounting for all distance-related (i.e. gas, tolls, etc.) and time-related (i.e. salaries, insurance, etc.) expenditures. Thereby, it makes little difference, whether per unit transportation cost are multiplied by greater-circle distance, real-road distance (cf. Ozimek and Miles, 2011) or a population-weighted average over bilateral distances measured at a highly disaggregated sub-prefecture level (cf. Mayer and Zignago, 2011). Throughout, the outcomes of all these sensitivity checks not only robustly confirm the existence of a unique intra-Japanese East-West border effect but also support an "agglomeration"- rather than a "history"-based explanation.

This paper contributes to a growing literature, which argues that observed trade reductions along existing or defunct political borders can be explained through the spatial heterogeneity in the trade-enhancing effect of business and social networks (cf. Combes, Lafourcade, and Mayer, 2005; Garmendia, Llano, Minondo, and Requena, 2012). Thereby, it challenges the view that the boundaries of network structures inevitably have to coincide with the geography of political and/or administrative borders. Moreover, by linking the structure of Japan's contemporaneous social networks to post-war agglomeration trends characterised by a "Tôkyô-Ôsaka bipolar growth pattern" (cf. Fujita and Tabuchi, 1997), this paper complements existing studies in which inter- and intra-national border effects are explained through the regional clustering of production activities at the industry level. Chen (2004) finds that the trade-reducing effect of international borders is magnified in industries, which are associated with a low Ellison-Glaeser agglomeration index (cf. Ellison and Glaeser, 1997), and argues that if firms are not bound to certain location (e.g. through agglomeration forces), they will choose their location to minimise cross-border trade cost, which lowers cross-border trade and gives rise to an endogenous border effect. Using highly disaggregated data on intra-US shipments, Hillberry and Hummels (2008) argue that the intra-national home bias at the state level is an artefact of geographic aggregation, that can be explained by trade in specialised intermediates between intermediate input and final output producers, who co-locate their production sites to save on transportation cost.

By proposing an (endogenous) agglomeration-based explanation for the presence of discontinuous, geographic barriers to intra-national trade, this paper also contributes to a literature that aims to identify the boundaries of regional sub-economies. Existing labour market studies thereby usually draw on the notion of local labour markets (cf. Manning and Petrongolo, 2011; Enrico, 2011), which are identified in terms of "travel-to-work areas" (cf. Ball, 1980) or "commuting zones" (cf. Tolbert and Sizer, 1996; Autor and Dorn, 2013; Autor, Dorn, and Hanson, 2013). On the contrary, agglomeration studies in spirit of Ellison and Glaeser (1997) propose cluster detection methods based on unusually high densities of industrial establishments in a spatially coherent subset of regions (cf. Mori and Smith, 2014, 2015). In Hsu, Mori, and Smith (2014) a partition of the US economy into a certain number of economic regions is achieved by associating a given set of large cities with their respective economic hinterlands. The association of cities with their hinterlands thereby is based on a hierarchical ordering of big cities' import shares in the respective hinterland regions, such that the expansion of economic regions is determined by the central city's export potential and by the trade-reducing effect of bilateral distance. By utilising a gravity approach to identify regional sub-economies based on the intensity of inter- vs. intra-regional trade, this paper offers a synthesis between the border-effect literature and the agglomeration literature outlined above.

The paper is structured as follows: Data, theory and implementation are covered in Section 2. Section 3 identifies and explores the intra-Japanese East-West border effect. The sensitivity analysis follows in Section 4. Section 5 finally offers an explanation for the intra-Japanese East-West border effect. A final discussion in Section 6 concludes the paper.

2 Setup

Subsection 2.1 introduces the National Commodity Flow Survey (NCFS) as main data source. Theory and implementation are covered in the Subsections 2.2 and 2.3, respectively.

2.1 Data

Data on intra-Japanese trade flows are obtained from the National Commodity Flow Survey (NCFS) [*Zenkoku Kamotsu Jun Ryûdô Chôsa*] compiled by the Ministry of Land, Infrastructure, Tourism and Transport (MLIT). The NCFS reports trade flows (measured in metric tons) between *and* within all 47 Japanese prefectures at a five-year base since 1970. Bilateral commodity flows thereby are inferred from two separate surveys: a one-year survey (1YS) with information on aggregated commodity flows per year, and a complementing three-day survey (3DS), which provides comparable information for the shorter time span of three days at more detailed levels of disaggregation.[3] Figure 10 in the Appendix summarizes the structure of the raw data, which is publicly available for the years 2000, 2005, and 2010. Exploiting this rich data structure, three data sets at different levels of aggregation can be constructed. The resulting data sets (at the lowest level of aggregation) comprise $46,389$ observations ($=47$ exporters $\times$ 47 importers $\times$ 7 sectors $\times$ 3 years), $450,636$ observations (47 exporters $\times$ 47 importers $\times$ 68 sub-sectors $\times$ 3 years), and $185,556$ observations ($=47$ exporters $\times$ 47 importers $\times$ 7 sectors $\times$ 4 transport modes $\times$ 3 years), respectively. The NCFS moreover holds detailed information on prefecture-pair-specific unit transport costs (per metric ton and kilometre). By exploiting this valuable information, it is possible to compute the actual bilateral transport cost as the product of (greater-circle) distance between the capitals of any prefecture pair times the unit transport costs (per metric ton and kilometre) of connecting both cities.[4] As a result, *exact* trade costs account for both distance-related (i.e. gas, tolls, etc.) and time-related (i.e. salaries, insurance, etc.) transport cost.

If necessary, the NCFS is complemented by data from the Commodity Flow Statistic (CFS) [*Kamotsu Chiiki Ryûdô Chôsa*], which also is reported by the Ministry of Land, Infrastructure, Tourism and Transport (MLIT). The CFS provides information on the intra-Japanese transport volume at a yearly basis form 2000 to 2012. Commodity flows are disaggregated by industry and transport mode such that two data sets with 689,208 observations (= 47 exporters $\times$ 47 importers $\times$ 8 sectors $\times$ 3 transport modes $\times$ 13 years) and 918,944 observations (= 47 exporters $\times$ 47 importers $\times$ 32 industries $\times$ 13 years) can be constructed. Figure 11 in the Appendix illustrates the structure of the raw data.

To economise on space, a more detailed discussion of the data is delegated to the Appendix. Detailed summary statistics can be found in Table 6, which also contains a list of all other data sources used in this study.

2.2 Theory

To account for the rich structure of the NCFS and the CFS, a multi-sector version of an – otherwise standard – Armington model (cf. Arkolakis, Costinot, and Rodriguez-Clare, 2012;

[3] Both surveys cover the same sample of $21,349$ ($21,045$; $25,349$) representative Japanese firms for 2010 (2005; 2000), which corresponds to a response rate of 34% (31%; 38%) for 2010 (2005; 2000).

[4] Following the literature (cf. Anderson and van Wincoop, 2003; Baier and Bergstrand, 2009), intra-prefecture distance is approximated by a quarter of the distance to the closest neighbouring prefecture. In Subsection 4.2 alternative, more flexible distance specifications are considered.

Costinot and Rodriguez-Clare, 2015) is adopted. In each prefecture $i, j = 1, \ldots, n$ a representative household aims to maximise aggregate consumption

$$C_j = \prod_{s=1}^{S} C_{j,s}^{\beta_{j,s}} \quad \text{with} \quad \beta_{j,s} > 0 \quad \text{and} \quad \sum_{s=1}^{s} \beta_{j,s} = 1. \tag{1}$$

Thereby, total consumption of sector s' varieties in prefecture j takes the form:

$$C_{j,s} = \left[\sum_{i=1}^{n} (\psi_{ij} C_{ij,s})^{(\sigma_s - 1)/\sigma_s} \right]^{\sigma_s/(\sigma_s - 1)}. \tag{2}$$

with $\sigma_s > 1$ denoting the elasticity of substitution between different varieties within the same sector s, and $\psi_{ij} > 0$ being an exogenous preference parameter. As in the single-sector Armington model (cf. Anderson, 1979; Anderson and van Wincoop, 2003), there is a sole producer for each variety such that $C_{ij,s}$ denotes prefecture j's consumption of prefecture i's sector s variety. Solving for the optimal level of demand $C_{ij,s}$ yields

$$C_{ij,s} = \left(\frac{\psi_{ij} P_{ij,s}}{P_{j,s}} \right)^{-\sigma_s} \frac{\beta_{j,s} E_j}{P_{j,s}}, \tag{3}$$

in which

$$P_{j,s} \equiv \left[\sum_{i=1}^{n} (\psi_{ij} P_{ij,s})^{1-\sigma_s} \right]^{1/(1-\sigma_s)} \tag{4}$$

is prefecture j's ideal price index for sector s, $P_{ij,s}$ refers to the price of prefecture i's sector s variety in prefecture j, and $\beta_{j,s} E_j$ denotes prefectures j's total expenditure on goods from sector s. In order to sell one unit of sector s' variety in prefecture j, firms from prefecture i must ship $\tau_{ij,s} \geq 1$ units, with $\tau_{ii,s} = 1$. For there to be no arbitrage opportunities, the price of sector s' variety produced in i and sold to j must be equal to $P_{ij,s} = \tau_{ij,s} P_{ii,s} = \tau_{ij,s} w_i = \tau_{ij,s} Y_i / L_i$. Thereby, perfect competition implies $P_{ii,s} = w_i$, while $w_i = Y_i / L_i$ follows from full employment, with Y_i as prefecture i's aggregate income and L_i as prefecture i's total labour endowment. Combining $P_{ij,s} = \tau_{ij,s} Y_i / L_i$ with Eqs. (3) and (4), it is possible to derive the sector-level volume $C_{ij,s}$ *and* value $X_{ij,s}$ of bilateral trade from prefecture i to prefecture j as:

$$\begin{aligned} C_{ij,s} &= \frac{(\tau_{ij,s} Y_i)^{-\sigma_s} (L_i / \psi_{ij})^{\sigma_s}}{\sum_{l=1}^{n} (\tau_{lj,s} Y_l)^{1-\sigma_s} (L_l / \psi_{lj})^{\sigma_s - 1}} \beta_{j,s} E_j, \\ X_{ij,s} &= \frac{(\tau_{ij,s} Y_i)^{1-\sigma_s} (L_i / \psi_{ij})^{\sigma_s - 1}}{\sum_{l=1}^{n} (\tau_{lj,s} Y_l)^{1-\sigma_s} (L_l / \psi_{lj})^{\sigma_s - 1}} \beta_{j,s} E_j. \end{aligned} \tag{5}$$

Exploiting the fact that for $\sigma_s = \sigma$ and $\tau_{ij,s} = \tau_{ij}$ the multi-sector Armington model is isomorphic to a (standard) single-sector Armington model, two analogous gravity equations for aggregate bilateral trade flows can be obtained from aggregating up Eq. (5)

$$\begin{aligned} C_{ij} &= \sum_{s=1}^{S} C_{ij,s} = \frac{(\tau_{ij} Y_i)^{-\sigma} (L_i/\psi_{ij})^{\sigma}}{\sum_{l=1}^{n} (\tau_{lj} Y_l)^{1-\sigma} (L_l/\psi_{lj})^{\sigma-1}} E_j, \\ X_{ij} &= \sum_{s=1}^{S} X_{ij,s} = \frac{(\tau_{ij} Y_i)^{1-\sigma} (L_i/\psi_{ij})^{\sigma-1}}{\sum_{l=1}^{n} (\tau_{lj} Y_l)^{1-\sigma} (L_l/\psi_{lj})^{\sigma-1}} E_j. \end{aligned} \tag{6}$$

In the following Eq. (6) is adapted as baseline specification. Eq. (5) serves as theoretical foundation whenever the analysis requires a more disaggregated view on sector-level bilateral trade flows.

2.3 Implementation

In the literature on intra-national trade two different approaches to utilise shipment data measured in quantities (rather than in values) exist.[5] Combes, Lafourcade, and Mayer (2005) use a monopolistic competition framework à la Dixit-Stiglitz-Krugman (cf. Dixit and Stiglitz, 1977; Krugman, 1980) to derive a demand function, which allows to estimate the intra-national trade volume (measured in metric tons) consistently for France. Alternatively, Nitsch and Wolf (2013) aggregate up industry-level trade volumes for Germany, using unit-values from the German foreign trade statistic as time-varying weights to obtain intra-national trade flows measured in values.[6] In the following, *both* approaches are used to consistently estimate intra-Japanese trade in quantities *and* values based on Eqs. (5) and (6).

Bilateral resistance $\tau_{ij,s} \cdot \psi_{ij}$ is specified as follows:

$$\tau_{ij,s} \cdot \psi_{ij} = \text{Trans}_{ij,s}^{\delta_{1s}} \cdot e^{\delta_2 \text{Bord}_{ij} + \delta_3 \text{Adj}_{ij} + \delta_4 \text{Pref}_{ij} + \delta_5 \text{Reg}_{ij} + \delta_6 \text{Sea}_{ij}}. \tag{7}$$

Thereby, Bord_{ij} is a binary indicator variable, which takes a value of $\text{Bord}_{ij} = 0$ if both prefectures in the pair $i \times j$ either belong to East- or West-Japan and a value of $\text{Bord}_{ij} = 1$ if one prefecture is located in the East while the other prefecture is located in the West of Japan. The parameter δ_2 consequently captures one plus the tariff equivalent of trading across a (hypothetical) intra-Japanese East-West border (which will be specified in more detail below). Bilateral transport costs are captured by $\ln \text{Trans}_{ij,s}$, and Adj_{ij} is a binary indicator variable, taking

[5] The US commodity flow survey (cf. Wolf, 2000; Hillberry, 2002; Hillberry and Hummels, 2003; Millimet and Osang, 2007; Yilmazkuday, 2012; Coughlin and Novy, 2013; Felbermayr and Gröschl, 2014) provides information on both the volume and the value of intra-national trade. Poncet (2003, 2005) uses provincial input-output (IO) tables to derive intra-national trade flows for China. For the case of Japan comparable IO tables only exist at the aggregated level of the 9 main regions (cf. Okubo, 2004), but not at the more disaggregated level of the 47 prefectures covered by the NCFS and CFS.

[6] Requena and Llano (2010) apply a similar strategy to their Spanish data, using unit-prices derived from detailed industry-level surveys as weights for the aggregation.

a value of $\text{Adj}_{ij} = 1$ if prefectures i and j share a common border and a value of $\text{Adj}_{ij} = 0$ otherwise. Finally, the indicator variables Pref_{ij}, Reg_{ij}, and Sea_{ij} account for all trade flows across prefectural, regional, or sea borders, thereby controlling for the intra-national home bias and the existence of additional administrative and geographic borders inside Japan.

Two major issues concerning the use of shipment data have been identified in the existing literature (cf. Combes, Lafourcade, and Mayer, 2005; Nitsch and Wolf, 2013). First, a certain fraction of shipments enter or leave Japan via ports ($> 99\%$ in 2010) and hubs of air cargo ($< 1\%$ in 2010). Since Japan's external trade is channelled through these ports, intra-national shipments in general are biased towards coastal prefectures and in particular towards those hosting large port facilities (e.g. located in the bays of Tôkyô, Ôsaka, and Ise). To account for these and other unobservable demand or supply shifters in Eqs. (5) and (6), (sector-level) importer- and exporter-specific fixed effects are included in the empirical analysis. Second, single transactions often are reflected by multiple records in the shipment data due to the unloading and reloading of shipments at warehouses, ports, and railway freight terminals. Notably, Hillberry and Hummels (2003) show that the underlying hub and spoke distribution patterns translate into comparatively short distances for shipments that originate from wholesalers rather than from manufactures. In the empirical analysis, the over-representation of short-distance shipments (i.e. the intra-national home bias), is captured by additional fixed effects, which account for (short-distance) trade that does not cross intra-Japanese prefecture, region, or sea borders.

Following standard practice, Eq. (7) is substituted into Eq. (5) or (6), which subsequently are log-linearised and then estimated in an ordinary least squares (OLS) gravity regression with exporter- and importer-specific fixed effects (cf. Head and Mayer, 2015). However, to avoid potentially large biases of OLS estimates in the presence of heteroscedasticity and many zero observations (both relevant concerns at higher levels of disaggregation), Eqs. (5) and (6) are also estimated in their multiplicative forms, using the pseudo Poisson maximum-likelihood (PPML) estimator proposed by Santos Silva and Tenreyro (2006, 2010).

3 Results

Section 3 is structured as follows: Subsection 3.1 explores the National Commodity Flow Survey (NCFS), which then in Subsection 3.2 is used to identify a unique, spatial barrier to intra-Japanese trade. Subsection 3.3 finally explores how the intra-Japanese East-West border effect varies by year, industry or mode of transportation.

3.1 Exploring the National Commodity Flow Survey

To the best of my knowledge, this paper is the first to estimate the extent of intra-Japanese trade based on the National Commodity Flow Survey (NCFS). To assess the representativeness of the dataset, a standard gravity equation is estimated in varying specifications along the lines of Subsection 2.3. Thereby, different trade flow statistics (quantities vs. values), trade cost measures (distance vs. actual transport cost), and estimation techniques (OLS vs. PPML) are used.[7] Table 1 summarises the results for the baseline year 2010.

Table 1: *Exploring the National Commodity Flow Survey*

Dependent variable: Aggregated exports from prefecture i to prefecture j								
Year:	**2010**							
Survey:	**1YS**		**3DS**		**1YS**		**3DS**	
Unit:	**Quantities**		**Values**		**Quantities**		**Values**	
Model:	**OLS**	**PPML**	**OLS**	**PPML**	**OLS**	**PPML**	**OLS**	**PPML**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Coefficients:								
ln distance$_{ij}$	−1.2786***	−0.7625***	−1.1954***	−0.5614***				
	(.0465)	(.0614)	(.0611)	(.0920)				
ln transport cost$_{ij}$					−0.6761***	−0.6037***	−0.8685***	−0.3843***
					(.0425)	(.0512)	(.0471)	(.0642)
Adjacency$_{ij}$	0.4167***	0.5401***	0.5600**	0.7781***	1.1110***	0.9595***	1.1241***	1.1325***
	(.0893)	(.1042)	(.1126)	(.1578)	(.0874)	(.1235)	(.1044)	(.1703)
Prefecture border dummy$_{ij}$	−1.2813***	−1.4772***	−2.6314***	−2.8812***	−3.4264***	−2.5204***	−4.2655***	−3.7588***
	(.3112)	(.1645)	(.3910)	(.2751)	(.2374)	(.1283)	(.3141)	(.1878)
Region border dummy$_{ij}$	−0.1393	−0.3027**	−0.0527	−0.2924*	−0.8263***	−0.6788***	−0.5700***	−0.5559**
	(.0845)	(.1313)	(.1025)	(.1558)	(.0817)	(.1287)	(.0943)	(.1591)
Sea border dummy$_{ij}$	−0.3799***	−0.341***	−0.5476***	−0.5894***	−0.6231***	−0.3514***	−0.6712***	−0.6214***
	(.0896)	(.1016)	(.1168)	(.1236)	(.0885)	(.0995)	(.1086)	(.1264)
Fixed effects: 7								
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:								
Number of observations	2,207	2,209	2,199	2,209	2,207	2,209	2,199	2,209
(Pseudo) R^2	.8331	.9602	.7772	.9780	.8115	.9572	.7863	.9767

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

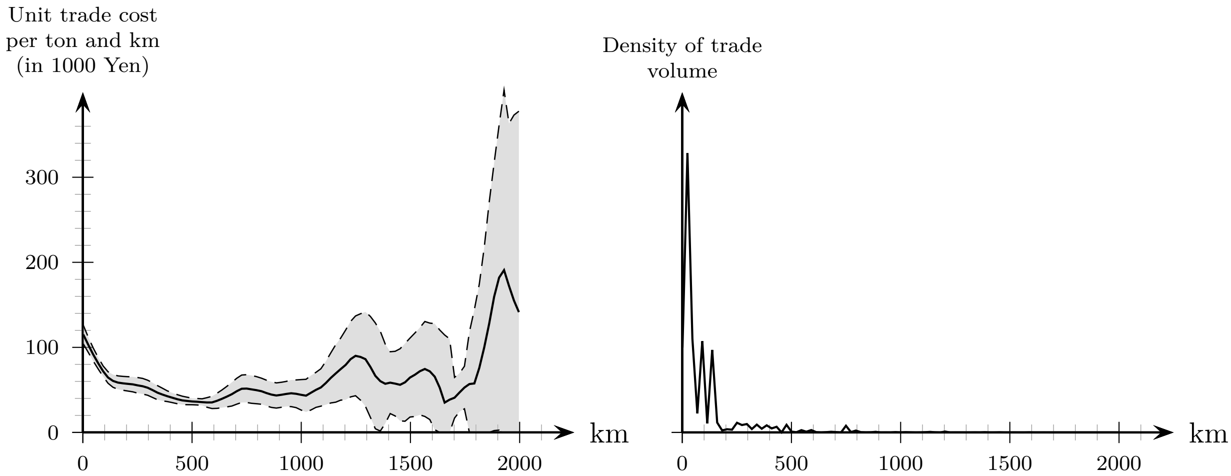
In the specifications (1) to (4) distance is chosen as a proxy for bilateral trade cost. The coefficients for distance and adjacency take values, which are comparable to the mean estimates reported in the meta-analysis by Head and Mayer (2015).[8] As usual, distance estimates under OLS are upward biased relative to PPML (cf. Santos Silva and Tenreyro, 2006; Head and Mayer, 2015). Finally, the estimates for the intra-national home bias are similar to those for the US (cf. Wolf, 2000; Millimet and Osang, 2007; Yilmazkuday, 2012). Specifications (5) to

[7] To compute the trade volume in values, trade flows are aggregated up from the industry level using unit-values from Japan's Foreign Trade Statistic as weights (cf. Nitsch and Wolf, 2013). For this purpose 6-digit HS-codes from the Japanese Foreign Trade Statistic are matched to the 68 (4-digit) industries reported in the National Commodity Flow Survey. All details regarding the matching are included in a Technical Supplement, which is available from the author upon request.

[8] Head and Mayer (2015) report typical gravity estimates, based on a comparison of 2,508 usable estimates from more than 150 published papers. Thereby the mean estimates for distance and adjacency in a structural gravity setting take values of −1.14 and 0.52, respectively. See also Disdier and Head (2008).

(8) repeat the analysis using actual transportation cost instead of the unweighted distance as a proxy for bilateral trade cost. As a striking result, proxies for short-distance trade (e.g. between neighbouring prefectures) deliver estimates of larger (absolute) size. At the same time, the trade reducing effect of actual transport costs seems to be smaller than the effect of unweighted distance. To understand these differences, Figure 1a explores the link between per unit transportation cost and (unweighted) distance.[9]

Figure 1: *Unit Trade Cost and Trade Volumes over Distance*



(a) *Unit Trade Cost in 2010* **(b)** *Trade Volume in 2010*

As evident from Figure 1a, unit trade costs fall substantially within the first 500 kilometres, which according to Figure 1b account for more than 95% of the intra-Japanese trade volume in 2010.[10] The standard procedure of using unweighted distance as a proxy for bilateral trade cost ignores the decline of per unit transportation costs over increasing distances. As a consequence, the implied reduction in short-distance trade is misattributed to other short-distance-trade proxies, which mitigates the trade-enhancing effect among neighbouring prefectures as well as within single prefectures, regions or islands.

Taking stock, the National Commodity Flow Survey (NCFS) generates estimates which are comparable to typical results from the gravity literature. Thereby, it is possible to avoid the notorious measurement error, usually resulting from the use of unweighted distance as a proxy for bilateral trade cost.

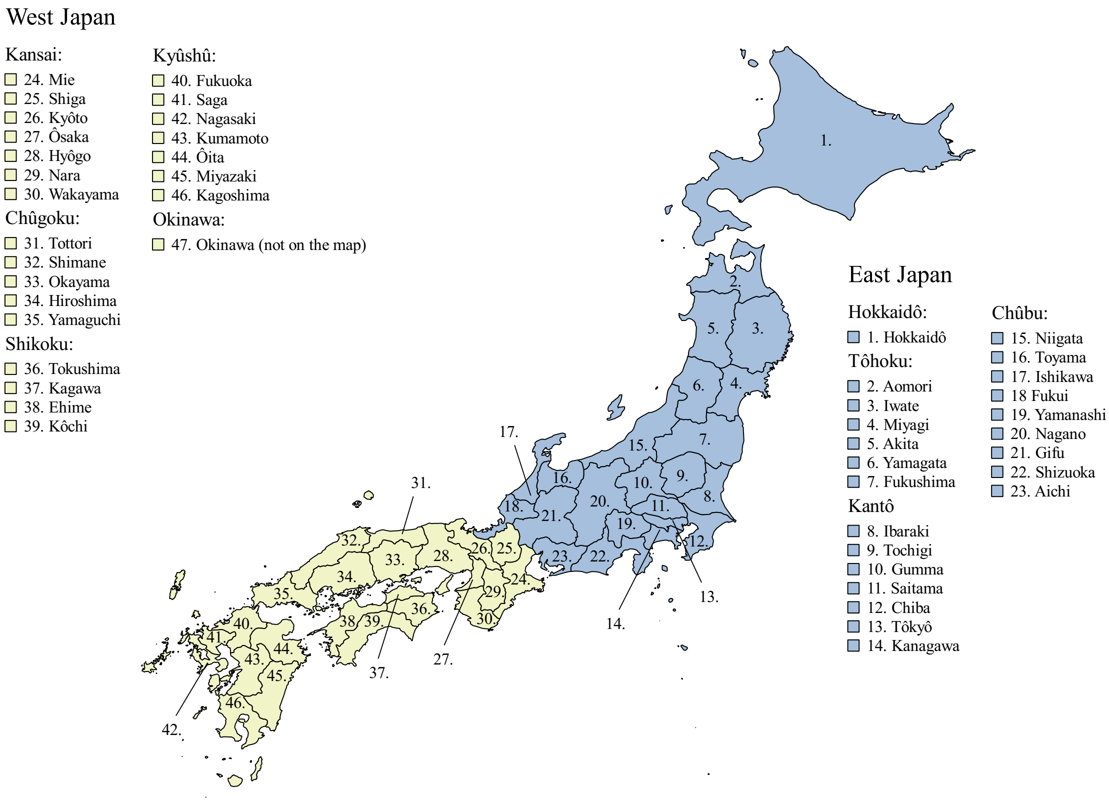
[9]Figure 1a uses an (Epanechnikov) kernel regression estimator to provide a non-parametric estimate of the relationship between the distance of shipments and the respective per unit transpotation cost in 2010. As in Hillberry and Hummels (2008) $n = 100$ points are computed, allowing the estimator to calculate and employ the optimal bandwidth. The solid line in Figure 1a refers to the estimate, dashed lines indicate the 99%-confidence interval. Figure 1b presents an (Epanechnikov) kernel density (with optimal bandwidth) of the 2010 trade volume (measured in quantities).

[10]Further evidence in favour of long-haul economies in the Japanese transportation sector comes from Yoko, Mun, Yoshihiko, and Sung (2012), who use the 2005 wave of the NCFS to structurally estimate a cost function for (on-road) transportation services.

3.2 Identifying the Intra-Japanese East-West Border Effect

The NCFS covers 47 Japanese prefectures grouped in 9 administrative regions. Except for the Prefecture Okinawa all prefectures are depicted in Figure 2, which presents a division into two blocks with 23 East- and 24 West-Japanese prefectures, arranged around Japan's two major agglomeration areas *Kantô* and *Kansai*.[11] Interestingly, the terms *Kantô* (関東) and *Kansai* (関西) thereby literally refer to two areas in the east (東) and west (西) of a barrier (関), and it will be shown that this east-west barrier matters in a crucial way for the contemporaneous pattern of intra-national trade in Japan.[12]

Figure 2: *Regions and Prefectures of Japan*



To enable a first visual inspection of the intra-Japanese trade pattern, Table 2 reports measures of bilateral trade integration for all 47×47 Japanese prefecture pairs. Thereby, trade

[11]The Prefectures of Hokkaidô and Okinawa form two own regions. Both prefectures/regions differ from mainland Japan in various ways and have own historic, ethnic, and cultural backgrounds. The Ryûkyû Islands (today forming the Prefecture Okinawa) for the first time came under Japanese influence in 1609, official annexation followed in 1879. Hokkaidô's colonisation started gradually with a substantial acceleration of settlement efforts in the second half of the 19th century.

[12]According to Kodansha's Encyclopaedia of Japan (1999a,b,c), the distinction between Kantô and Kansai can be traced back to the 10th century, when checkpoints – *Sekisho* (関所) in Japanese – where established to inspect travellers between both regions.

integration is measured by the Head-Ries Index (HRI) (cf. Head and Ries, 2001)

$$\hat{\phi}_{ij} = \hat{\phi}_{ij} = \sqrt{\frac{C_{ij}C_{ji}}{C_{ii}C_{jj}}} \in [0, 1] \quad \text{with} \quad \phi_{ij} \equiv \tau_{ij}^{-\sigma}, \tag{8}$$

which exploits the Independence of Irrelevant Alternatives (IIA) property (cf. Anderson, De-Palma, and Thisse, 1992) of gravity equation (6) to evaluate the overall level of bilateral trade integration between any two prefectures under the assumptions of symmetry in bilateral trade cost ($\tau_{ij} = \tau_{ji}$) and frictionless intra-prefectural trade ($\tau_{ii} = \tau_{jj} = 1$).[13] Note that by con-

Table 2: *Bilateral Trade Integration Between Japanese Prefecture*

	1. Hokkaidô	2. Aomori	3. Iwate	4. Miyagi	5. Akita	6. Yamagata	7. Fukushima	8. Ibaraki	9. Tochig	10. Gumma	11. Saitama	12. Chiba	13. Tôkyô	14. Kanagawa	15. Niigata	16. Toyama	17. Ishikawa	18. Fukui	19. Yamanashi	20. Nagano	21. Gifu	22. Shizuoka	23. Aichi
1. Hokkaidô	1	.03	0	.02	.01	0	0	.01	0	.01	.01	.05	.02	.03	.01	.01	0	0	0	0	0	.01	.01
2. Aomori	.03	1	.03	.03	.02	.01	.01	.02	.01	0	.01	.01	.02	.01	0	0	0	0	0	0	0	0	0
3. Iwate	0	.03	1	.07	.02	.01	.01	.01	.01	0	.01	.01	.05	.01	0	0	0	0	0	0	0	0	0
4. Miyagi	.02	.03	.07	1	.02	.07	.07	.02	.01	.01	.02	.02	.03	.02	.01	.01	0	0	0	0	0	.01	0
5. Akita	.01	.02	.02	.02	1	.02	.01	.01	0	0	.01	0	.01	.01	.01	0	0	0	0	0	0	0	0
6. Yamagata	0	.01	.01	.07	.02	1	.02	.01	.01	.01	.01	.01	.01	.01	.03	0	0	0	0	0	0	0	0
7. Fukushima	0	.01	.01	.07	.01	.02	1	.04	.04	.02	.04	.02	.03	.03	.01	0	0	0	.01	.01	.01	.01	0
8. Ibaraki	.01	.02	.01	.02	.01	.01	.04	1	.09	.05	.07	.10	.09	.04	.01	0	0	0	0	.01	.01	.02	.02
9. Tochig	0	.01	.01	.01	0	.01	.04	.09	1	.13	.09	.08	.09	.05	.01	0	0	0	0	.01	0	.01	.01
10. Gumma	.01	0	0	.01	0	.01	.02	.05	.13	1	.14	.05	.06	.04	.02	.01	0	0	.01	.02	.01	.02	.02
11. Saitama	.01	.01	.01	.02	.01	.01	.04	.07	.09	.14	1	.08	.27	.07	.03	.01	0	0	.01	.02	.01	.03	.02
12. Chiba	.05	.01	.01	.02	0	.01	.02	.10	.08	.05	.08	1	.15	.10	.02	.01	0	0	.01	.01	.01	.02	.05
13. Tôkyô	.02	.02	.05	.03	.01	.01	.03	.09	.09	.06	.27	.15	1	.20	.03	.01	.01	0	.02	.03	.01	.04	.02
14. Kanagawa	.03	.01	.01	.02	.01	.01	.03	.04	.05	.04	.07	.10	.20	1	.02	.01	0	0	.02	.01	.01	.06	.02
15. Niigata	.01	0	0	.01	.01	.03	.01	.01	.01	.02	.03	.02	.03	.02	1	.02	.01	.02	0	.01	0	.01	.01
16. Toyama	.01	0	0	.01	0	0	0	0	0	.01	.01	.01	.01	.01	.02	1	.09	.03	0	.01	.01	.01	.02
17. Ishikawa	0	0	0	0	0	0	0	0	0	0	0	0	.01	0	.01	.09	1	.05	0	0	.01	0	.01
18. Fukui	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.02	.03	.05	1	0	0	.01	.01	.01
19. Yamanashi	0	0	0	0	0	0	.01	0	0	.01	.01	.01	.02	.02	0	0	0	0	1	.04	0	.04	0
20. Nagano	0	0	0	0	0	0	.01	.01	.01	.02	.02	.01	.03	.01	.01	.01	0	0	.04	1	.01	.01	.01
21. Gifu	0	0	0	0	0	0	.01	.01	0	.01	.01	.01	.01	.01	0	.01	.01	.01	0	.01	1	.01	.21
22. Shizuoka	.01	0	0	.01	0	0	.01	.02	.01	.02	.03	.02	.04	.06	.01	.01	0	.01	.04	.01	.01	1	.09
23. Aichi	.01	0	0	0	0	0	0	.02	.01	.02	.02	.05	.02	.02	.01	.02	.01	.01	0	.01	.21	.09	1
24. Mie	0	0	0	0	0	0	0	.01	.01	.01	.01	.02	.01	.02	0	.01	0	.01	0	.01	.05	.03	.22
25. Shiga	0	0	0	0	0	0	0	.01	0	.01	.01	.01	.01	.01	0	.01	.01	.02	0	.01	.03	.01	.04
26. Kyôto	0	0	0	0	0	0	0	0	0	0	.01	0	.01	.01	0	0	0	.01	0	0	.01	.01	.01
27. Ôsaka	.01	.01	0	.01	0	.01	.01	.01	.01	.01	.02	.02	.03	.02	.02	.02	.01	.02	0	.01	.02	.02	.04
28. Hyôgo	0	0	0	0	0	0	0	.01	.01	.01	.01	.02	.02	.01	.01	.01	.01	.02	0	0	.01	.01	.04
29. Nara	0	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	.01	0	0	0	.01	.01
30. Wakayama	0	0	0	0	0	0	0	.01	0	0	0	0	0	.01	0	0	0	0	0	0	.01	0	.01
31. Tottori	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32. Shimane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33. Okayama	0	0	0	0	0	0	0	.01	0	0	.01	.01	.01	.01	0	.01	0	0	0	0	.01	.01	.02
34. Hiroshima	0	0	0	0	0	0	0	.01	0	0	.01	.01	.01	.01	0	0	0	0	0	0	.01	.01	.01
35. Yamaguchi	0	0	0	0	0	0	0	.01	0	0	0	.01	0	0	.01	0	0	.01	0	0	0	0	.01
36. Tokushima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.01
37. Kagawa	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0
38. Ehime	0	0	0	0	0	0	0	.01	0	0	.01	.01	.01	.01	0	0	0	0	0	0	0	0	.01
39. Kôchi	0	0	0	0	0	0	0	0	0	0	0	.01	.01	0	0	0	0	0	0	0	0	0	0
40. Fukuoka	0	0	0	.01	0	0	0	.01	.01	0	.01	.01	.01	.01	.01	0	0	.01	0	0	.01	.01	.03
41. Saga	0	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	0	0	0	0	0	0
42. Nagasaki	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43. Kumamoto	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44. Ôita	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	.02
45. Miyazaki	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46. Kagoshima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47. Okinawa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	24. Mie	25. Shiga	26. Kyôto	27. Ôsaka	28. Hyôgo	29. Nara	30. Wakayama	31. Tottori	32. Shimane	33. Okayama	34. Hiroshima	35. Yamaguchi	36. Tokushima	37. Kagawa	38. Ehime	39. Kôchi	40. Fukuoka	41. Saga	42. Nagasaki	43. Kumamoto	44. Ôita	45. Miyazaki	46. Kagoshima	47. Okinawa
1. Hokkaidô	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Aomori	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Iwate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Miyagi	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	0	0	0
5. Akita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Yamagata	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7. Fukushima	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8. Ibaraki	.01	.01	0	.01	.01	0	.01	0	0	.01	.01	.01	0	0	.01	0	.01	0	0	0	0	0	0	0
9. Tochig	.01	0	0	.01	.01	0	0	0	0	0	0	0	0	0	0	0	.01	0	0	0	0	0	0	0
10. Gumma	.01	.01	0	.01	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11. Saitama	.01	.01	.01	.02	.01	0	0	0	0	.01	.01	0	0	0	.01	0	.01	0	0	0	0	0	0	0
12. Chiba	.02	.01	0	.02	.02	0	0	0	0	.01	.01	.01	0	.01	.01	.01	.01	0	0	0	.01	0	0	0
13. Tôkyô	.01	.01	.01	.03	.02	.01	0	0	0	.01	.01	0	0	0	.01	.01	.01	.01	0	0	0	0	0	0
14. Kanagawa	.02	.01	.01	.02	.01	0	.01	0	0	.01	.01	0	0	0	.01	0	.01	0	0	0	0	0	0	0
15. Niigata	0	0	0	.02	.01	0	0	0	0	0	0	.01	0	0	0	0	.01	0	0	0	0	0	0	0
16. Toyama	.01	.01	0	.02	.01	0	0	0	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17. Ishikawa	0	.01	0	.01	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18. Fukui	.01	.02	.01	.02	.02	.01	0	0	0	0	0	.01	0	0	0	0	.01	0	0	0	0	0	0	0
19. Yamanashi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20. Nagano	.01	.01	0	.01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21. Gifu	.05	.03	.01	.02	.01	0	.01	0	0	.01	.01	0	0	0	0	0	.01	0	0	0	0	0	0	0
22. Shizuoka	.03	.01	.01	.02	.01	.01	0	0	0	.01	.01	0	0	0	0	0	.01	0	0	0	0	0	0	0
23. Aichi	.22	.04	.01	.04	.04	.01	.01	0	0	.02	.01	.01	.01	0	.01	0	.03	0	0	0	.02	0	0	0
24. Mie	1	.04	.01	.05	.03	.01	.01	0	0	.02	.01	.01	0	.01	.01	0	0	0	0	0	0	0	0	0
25. Shiga	.04	1	.06	.07	.04	.01	.02	0	0	.01	.01	0	.01	0	.01	0	.01	.01	0	0	0	0	0	0
26. Kyôto	.01	.06	1	.10	.05	.03	.01	0	0	.01	.01	0	.01	0	.01	0	.01	.01	0	0	0	0	0	0
27. Ôsaka	.05	.07	.10	1	.23	.10	.11	.02	.01	.05	.06	.02	.02	.04	.03	.02	.04	.01	.01	.01	.01	.01	.01	0
28. Hyôgo	.03	.04	.05	.23	1	.03	.05	.02	.03	.07	.04	.03	.04	.05	.03	.01	.02	.01	0	0	.02	0	.01	0
29. Nara	.01	.01	.03	.10	.03	1	.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30. Wakayama	.01	.02	.01	.11	.05	.03	1	0	0	.01	.01	0	.01	.02	.01	.02	0	0	0	0	0	.01	0	0
31. Tottori	0	0	0	.02	.02	0	0	1	.05	.03	.01	.01	0	0	0	0	0	0	0	0	0	0	0	0
32. Shimane	0	0	0	.01	.03	0	0	.05	1	.02	.06	.02	0	0	0	0	0	0	0	0	0	0	0	0
33. Okayama	.02	.01	.01	.05	.07	0	.01	.03	.02	1	.14	.02	.01	.03	.02	0	.01	0	0	0	.01	0	0	0
34. Hiroshima	.01	.01	.01	.06	.04	0	.01	.01	.06	.14	1	.12	.02	.06	.06	.01	.03	.01	.01	.01	.02	.01	0	0
35. Yamaguchi	.01	0	0	.02	.03	0	0	.01	.02	.02	.12	1	0	.01	.05	0	.07	.02	.01	.02	.05	.01	.01	0
36. Tokushima	0	.01	.01	.02	.04	0	.01	0	0	.01	.02	0	1	.07	.02	.01	0	0	0	0	.01	0	0	0
37. Kagawa	.01	0	0	.04	.05	0	.02	0	0	.03	.06	.01	.07	1	.05	.02	.02	0	0	0	.01	0	0	0
38. Ehime	.01	.01	.01	.03	.03	0	.01	0	0	.02	.06	.05	.02	.05	1	.02	.02	0	0	0	.02	.01	.01	0
39. Kôchi	0	0	0	.02	.01	0	.02	0	0	0	.01	0	.01	.02	.02	1	.01	0	0	0	0	0	0	0
40. Fukuoka	0	.01	.01	.04	.02	0	0	0	0	.01	.03	.07	0	.02	.02	.01	1	.14	.06	.07	.06	.04	.03	.02
41. Saga	0	.01	.01	.01	.01	0	0	0	0	0	.01	.02	0	0	0	0	.14	1	.14	.02	.03	.02	.01	0
42. Nagasaki	0	0	0	.01	0	0	0	0	0	0	.01	.01	0	0	0	0	.06	.14	1	.01	.02	0	.01	0
43. Kumamoto	0	0	0	.01	0	0	0	0	0	0	.01	.02	0	0	0	0	.07	.02	.01	1	.03	.02	.02	0
44. Ôita	0	0	0	.01	.02	0	0	0	0	.01	.02	.05	.01	.01	.02	0	.06	.03	.02	.03	1	.04	.03	0
45. Miyazaki	0	0	0	.01	0	0	.01	0	0	0	.01	.01	0	0	.01	0	.04	.02	0	.02	.04	1	.09	0
46. Kagoshima	0	0	0	.01	.01	0	0	0	0	0	0	.01	0	0	.01	0	.03	.01	.01	.02	.03	.09	1	.03
47. Okinawa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.02	0	0	0	0	0	.03	1

Scale: 0 .05 .10 .15 .20 .25 .30

struction the bilateral-trade-integration matrix in Table 2 is symmetric and entries at the main diagonal take a value of one due to $\hat{\phi}_{ii} = 1$.[14] The ordering of prefectures, starting with 1. Hokkaidô in the far northeast (upper-left corner) and ending with 47. Okinawa in the extreme southwest (lower-right corner), is the same as in Figure 2. Geography hence shines through in Table 2 and entries with longer (horizontal or vertical) distances to the main diagonal usu-

[13] See Head and Mayer (2015) for a more detailed discussion and further applications.

[14] Note, that in Table 2 zeros are (vastly) overreported due to the rounding of index numbers with a value below 0.5%. Indeed, the one-year survey (1YS) for 2010 features only 2 zero-trade-flows out of an overall number of $47 \times 47 = 2,209$ trade flows.

ally refer to trade integration between prefectures which are also geographically more distant. Exploiting this structure, it is possible to dissect Table 2 into four quadrants. Thereby the upper-left and the lower-right quadrants in Table 2 capture intra-East and intra-West trade, respectively, while the symmetric, off-diagonal quadrants refer to trade between the East and the West. When comparing trade integration across the quadrants in Table 2, a surprisingly stark east-west pattern in Japan's intra-national trade is revealed: prefecture pairs within the East and the West are on average five to six times as well integrated as prefecture pairs featuring one prefecture from the East and another prefecture from the West of Japan.

Of course, this finding is anything but a surprise. Prefectures from the East and the West are on average separated by larger distances than prefectures which both originate from the same country part. As a consequence, east-west trade should be (relatively) costlier and therefore also less intense. The relevant question, thus, is not whether there is (comparatively) less east-west trade, but rather to what extent this pattern persists, once bilateral trade cost are taken into account. If the lack of east-west trade in Table 2 can be fully explained through higher bilateral east-west transportation cost, no systematic geographic variation should be left in the residuals ($C_{ij} - \widehat{C}_{ij}$ or $X_{ij} - \widehat{X}_{ij}$, respectively) from Table 1. Table 3 plots the share of east-east, west-west, east-west and west-east prefecture pairs for which the actual trade flow C_{ij} or X_{ij} is underestimated by $\widehat{C}_{ij}$ or $\widehat{X}_{ij}$, respectively. According to Table 3, a gravity model that

Table 3: *The Share of Prefecture Pairs with Underestimated Trade Flows*

Specification	East-East	West-West	East-West	West-East	All
(1)	50.85%	56.42%	45.65%	45.83%	49.75%
(3)	52.93%	54.61%	48.01%	48.01%	50.09%
(5)	61.81%	61.11%	32.07%	35.51%	47.62%
(7)	58.41%	58.33%	42.39%	41.30%	50.11%

Residuals are computed based on the specifications (1), (3), (5) and (7) in Table 1.

explicitly takes into account bilateral trade cost systematically underestimates (overestimates) *actual* bilateral trade flows within (between) the East and the West. Notably, the east-west bias is most pronounced in the *preferred* Specifications (5) and (7), which account for per unit transportation costs that are falling over longer distances (cf. Section 3.1).

To assess in a next step the *average* impact of the division into East- and West-Japan on trade between rather than within both blocks on a more throughout basis, Eqs. (5) and (6) are re-estimated, taking into account the East-West border dummy introduced in Subsection 2.3. Table 4 presents the benchmark results for 2010. Thereby, in Columns (1) and (2) aggregate trade flows from the one-year survey (1YS) measured in metric tons are used for the estimation.

Under OLS, cross-border trade is 51.3% ($e^{-0.719} - 1$) smaller than trade within both blocks. This reduction may seem small compared to a drop of 80.8% that Anderson and van Wincoop (2003) report for trade between Canada provinces and U.S. states.[15] However, the drop in intra-Japanese East-West trade is substantial and much larger than the persistent reductions of 20.5% or 12.8% in contemporaneous intra-national trade across the former border between the GDR (East-Germany) and the FRG (West-Germany) in Nitsch and Wolf (2013) or across the historical border between the Union and the Confederacy during the American Secession in Felbermayr and Gröschl (2014).[16]

Table 4: *Baseline East-West Border Effect*

Dependent variable: Exports from prefecture i to prefecture j							
Year:	**2010**						
Survey:	**1YS**		**3DS**				
Data:	**Aggregated**		**Aggregated**				**Sectoral**
Unit:	**Quantities**		**Quantities**		**Values**		**Quantities**
Model:	**OLS-FE**	**PPML-FE**	**OLS-FE**	**PPML-FE**	**OLS-FE**	**PPML-FE**	**PPML-FE**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Coefficients:							
East-West border dummy$_{ij}$	-0.7188^{***}	-0.3956^{***}	-0.5395^{***}	-0.3601^{***}	-0.5661^{***}	-0.2631^{*}	-0.3255^{***}
	(.0487)	(.1130)	(.0542)	(.1173)	(.0619)	(.1392)	(.0498)
ln transport cost$_{ij}$	-0.5238^{***}	-0.5494^{***}	-0.9521^{***}	-0.5607^{***}	-0.7487^{***}	-0.3476^{***}	-0.6162^{***}
	(.0426)	(.0599)	(.0451)	(.0671)	(.0495)	(.0760)	(.0652)
Adjacency$_{ij}$	1.0743^{***}	0.9449^{***}	0.9790^{***}	1.0404^{***}	1.0952^{***}	1.1127^{***}	1.0236^{***}
	(.0895)	(.1302)	(.0938)	(.1484)	(.1059)	(.1670)	(.1483)
Prefecture border dummy$_{ij}$	-3.6356^{***}	-2.5786^{***}	-3.0865^{***}	-2.6566^{***}	-4.4296^{***}	-3.7919^{***}	-2.6565^{***}
	(.2396)	(.1248)	(.2664)	(.1617)	(.3154)	(.1879)	(.4265)
Region border dummy$_{ij}$	-0.5619^{***}	-0.5330^{***}	-0.4389^{***}	-0.3574^{**}	-0.3615^{***}	-0.4687^{***}	-0.4978^{***}
	(.0846)	(.1244)	(.0862)	(.1393)	(.0981)	(.1582)	(.0618)
Sea border dummy$_{ij}$	-0.5937^{***}	-0.3590^{***}	-0.4950^{***}	-0.4128^{***}	-0.6490^{***}	-0.6127^{***}	-0.5512^{***}
	(.0856)	(.0972)	(.0715)	(.0732)	(.1079)	(.1265)	(.1083)
Fixed effects:							
Exporter (i)	✓	✓	✓	✓	✓	✓	✗
Importer (j)	✓	✓	✓	✓	✓	✓	✗
Exporter × Sector ($i \times s$)	✗	✗	✗	✗	✗	✗	✓
Importer × Sector ($j \times s$)	✗	✗	✗	✗	✗	✗	✓
Summary statistics:							
Number of observations	2,207	2,209	2,199	2,209	2,199	2,209	109,104
(Pseudo) R^2	.8287	.9367	.8914	.9494	.7944	.9766	.8839

Robust standard errors (in Specification (7) clustered at the industry level); significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In Columns (3) to (7) disaggregated industry-level trade flows from the three-day survey (3DS) are used. Across all specifications, the East-West border effect has the expected sign, a comparable magnitude, and is highly significant. Whether industry-level trade flows in Columns (3)-(4) or (5)-(6) thereby are aggregated up in terms of quantities (cf. Combes, Lafourcade, and Mayer, 2005) or values (cf. Nitsch and Wolf, 2013) does not make a big difference for the

[15] See Table 2 in Anderson and van Wincoop (2003), OLS in 1993: $e^{-1.65} - 1$.

[16] See Table 1a in Nitsch and Wolf (2013), pooled OLS in 2004: $e^{-0.229} - 1$, as well as Table 2 in Felbermayr and Gröschl (2014), OLS in 1993: $e^{-0.137} - 1$.

estimation results. Finally, to ensure that results do not depend on the mode of aggregation, Column (7) presents an estimate for the East-West border effect at the level of 68 two-digit sectors (cf. Chen, 2004; Anderson and Yotov, 2010). This practice has the advantage that all price terms in the sector-level gravity equations from Eq. (5) can be fully absorbed through exporter×sector- and importer×sector-specific fixed effects, which in addition control for varying transport cost across different industries (cf. Chen and Novy, 2011).[17] Taking into account a considerable amount of zeros in bilateral trade flows at the disaggregated industry-level, PPML is the preferred estimation technique. The obtained estimate closely resembles the PPML estimates for aggregate trade flows in the columns (4) and (6) and implies a reduction in East-West trade of 27.8% ($e^{-0.326} - 1$).

Computing the tariff equivalent of the intra-Japanese East-West border effect, requires knowledge of the trade cost elasticity $\sigma - 1$, which, according to Hertel, Hummels, Ivanic, and Keeney (2007), can be estimated directly from gravity equation (5), given that the NCFS provides detailed information on bilateral trade cost (per ton and kilometre).[18] Following the approach of Hertel, Hummels, Ivanic, and Keeney (2007), Eq. (7) is re-specified as follows: to approximate for $\tau_{ij,s}$ one plus the *ad valorum* freight rate $\tau_{ij,s} = 1 + \text{Freight}_{ij,s}$ is used, while ψ_{ij} is assumed to have the following function form:

$$\psi_{ij} = \text{Dist}_{ij}^{\mu_1} \, e^{\mu_2 \text{Bord}_{ij} + \mu_3 \text{Adj}_{ij} + \mu_4 \text{Pref}_{ij} + \mu_5 \text{Reg}_{ij} + \mu_6 \text{Sea}_{ij}}, \tag{9}$$

with Dist_{ij} denoting bilateral (greater circle) distance and the remaining variables being defined as in Eq. (7). To obtain an estimate for $\sigma_s - 1$, the terms for $\tau_{ij,s}$ and ψ_{ij} are substituted into $X_{ij,s}$ from Eq. (5), which subsequently is log-linearised and then estimated in an OLS gravity regression with sector×exporter- and sector×importer-specific fixed effects. Table 7 in the Appendix presents the results for the years 2000, 2005, and 2010. Depending on the sector, σ_s varies from 2.03 for “manufacturing” in 2010 to 4.79 for “miscellaneous products” in 2005, which is in line with the findings of Yilmazkuday (2012), who computes elasticities of substitution for trade within the US that range from 1.61 to 5.99 with an average value of 3.01. Pooling over all sectors implies an average trade cost elasticity of about $\sigma - 1 \approx 1.56$, which is a somewhat smaller value than the mean or the preferred estimate of 3.19 or 4.51 that Head and Mayer

[17] Anderson and Yotov (2010) estimate a structural gravity equation at the sector-level and argue that this practice reduces the aggregation bias. For a more detailed discussion of the aggregation bias in structural gravity equations see Anderson and van Wincoop (2004).

[18] Eaton and Kortum (2002) offer multiple ways to estimate the trade cost elasticity from a gravity model akin to Eq. (6) when information on bilateral trade costs is not available. A refinement of Eaton and Kortum’s preferred method is provided by Simonovska and Waugh (2014). Hillberry and Hummels (2013) review the literature.

(2015) report in their meta study.[19] Finally, applying a trade cost elasticity of 1.56, 3.19, or 4.51 to the corresponding point estimate for the intra-Japanese East-West border effect from Specification (5) in Table 4, implies a tariff equivalent of 43.4%, 19.0%, or 13.4%, respectively.

Following Arkolakis, Costinot, and Rodriguez-Clare (2012), it is moreover possible to quantify how the distribution of prefecture-level real consumption is shaped through the intra-Japanese East-West border effect.[20] Thereby, changes in prefecture-level real consumption $\widehat{C}_j$ in response to a certain (intra-national) trade shock

$$\widehat{C}_j = \hat{\lambda}_{jj}^{\frac{1}{1-\sigma}} \qquad \text{with} \qquad \lambda_{jj} \equiv \frac{X_{jj}}{\sum_l X_{lj,s}}, \tag{10}$$

are proportional to changes in the respective prefecture's domestic expenditure share λ_{jj}.[21]

While in Figure 3a the prefecture-level gains in per capita consumption from intra-Japanese trade are plotted, Figure 3b illustrates how these consumption gains would change in a *counterfactual* equilibrium without the intra-Japanese East-West border effect.[22] Depending on the applied trade cost elasticity (1.56 vs. 3.19 or 4.51), the average consumption gains from inter-prefectural trade in Japan range from 25.1% to 7.9%. The *counterfactual* increase in the economy-wide real consumption level associated with a *hypothetical* elimination of the intra-Japanese East-West border effect would amount to 2.8%, 1.7%, or 1.2%, respectively. Although these *average* changes seem modest, there are substantial distributional consequences associated with the counterfactual experiment from Figure 3b: as one might expect, prefectures close to (and in particular in the west of) the intra-Japanese East-West border would benefit from a removal of this "border". However, such a removal at the same time would divert inter-prefectural trade away from the periphery (i.e. Hokkaidô or Okinawa) and from large cities (e.g. Tôkyô, Yokohama, Ôsaka, Kobe, Fukuoka, and Nagasaki), which according to Figure 2 stand out as disproportionally well-integrated trading hubs.

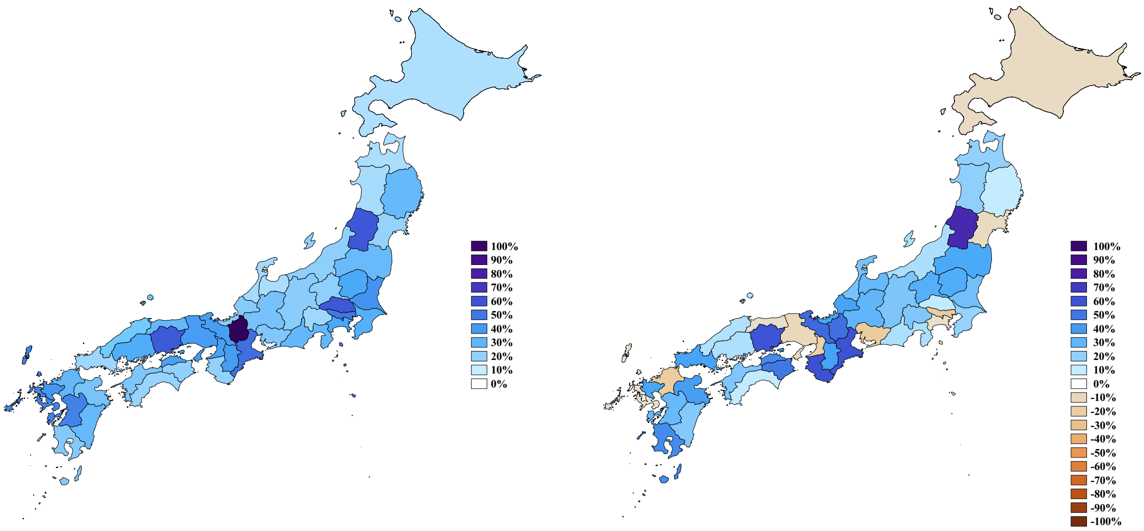
[19] Data on bilateral transport cost in the NCFS are only available at the aggregate level of seven major sectors, which might explain why the estimated elasticity of substitution is comparatively small. Notably, Hummels (1999) shows that estimates for the trade cost elasticity, which are obtained from data on international freight rates, tend to be larger if the analysis is conducted at a lower level of disaggregation. The trade cost elasticities for manufacturing products (SITC categories 5 - 9) equal 5.79, 6.26, 7.04, and 8.26 if estimated at the one-, two-, three-, and four-digit level, respectively.

[20] Note that it is always possible to quantify the *counterfactual* consumption change associated with a *hypothetical* elimination of the intra-Japanese East-West border effect. However, it is less clear to what extent a change in prefecture-level consumption directly translates into a welfare change. If the intra-Japanese East-West border effect results from *real* trade barriers, which for example have been shaped by some historic event (cf. Nitsch and Wolf, 2013; Felbermayr and Gröschl, 2014), consumption losses from trade frictions are tantamount to welfare losses. On the contrary, when the intra-Japanese East-West border effect reflects the geography of local preferences, consumption and welfare effects *may* fall apart, which renders (quantitative) welfare prediction problematic.

[21] As common in the literature (cf. Costinot and Rodriguez-Clare, 2015), the exact hat notation $\hat{v} \equiv v'/v$ is used to denote percentage changes.

[22] Both figures assume a trade cost elasticity of 1.56. Outcomes for alternative trade cost elasticity of 3.19 or 4.51 (cf. Head and Mayer, 2015) are reported in the appendix.

Figure 3: *Per Capita Consumption and the Intra-Japanese East-West Border Effect*



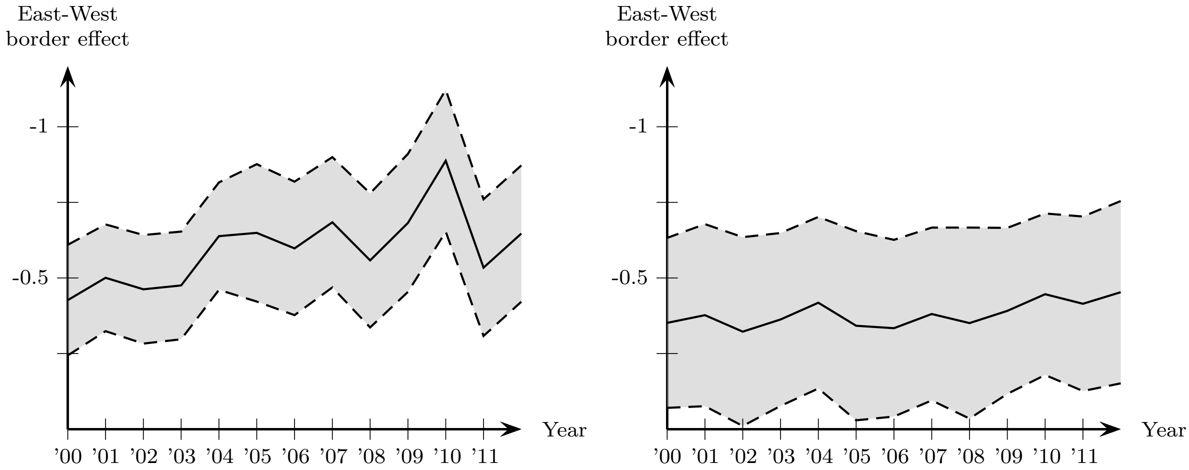
(a) *Consumption Gains from Trade* **(b)** *Counterfactual Analysis*

In summary, the intra-Japanese East-West border effect has a strong and significant impact on the pattern of inter-prefectural trade in Japan. A hypothetical elimination of the intra-Japanese East-West border effect is associated with economically meaningful consumption gains that are unequally distributed between border regions, on the one hand, and the (extreme) periphery as well as large trading hubs on the other hand.

3.3 Exploring the Intra-Japanese East-West Border Effect

Table 9 in the Appendix summarises border effect estimates obtained from the 2010, 2005, and 2000 wave of the NCFS (suppressing the other coefficients from Table 4). Thereby, the Specifications (1) to (7) in Table 9 are the same as in Table 4. The East-West border effect is always negative and in all but one specification highly significant. The implied trade reduction ranges from 61.4% to 27.6% with the median East-West border effect causing a trade reduction of about 42.3%. To track the evolution of the intra-Japanese East-West border effect more closely year by year over the decade from 2000 to 2012, the Commodity Flow Statistic (CFS) is used as an alternative data source. Following Nitsch and Wolf (2013), the baseline specification from Table 4 is re-estimated in a pooled sample, allowing the error terms to be correlated within prefecture pairs and controlling for the complete set of time-varying importer- and exporter-specific fixed effects. Figures 4a and 4b plot the parameter estimates together with the 99%-confidence interval for the intra-Japanese East-West border effect from 2000 to 2012 obtained under pooled OLS and PPML, respectively.[23] The intra-Japanese East-West border effect in

Figure 4: *The East-West Border Effect from 2000-2012*



(a) *Pooled OLS* **(b)** *PPML*

both figures is significantly below zero over the entire sample period. Moreover, comparing the border effects at the beginning and at the end of the sample period reveals an increase in the border effect, which is statistically significant at a 1% (5%) level in Figure 4a (Figure 4b). Together, these findings not only confirm the previous result from Table 9, but also suggest that the intra-Japanese East-West border effect has increased slightly over time.

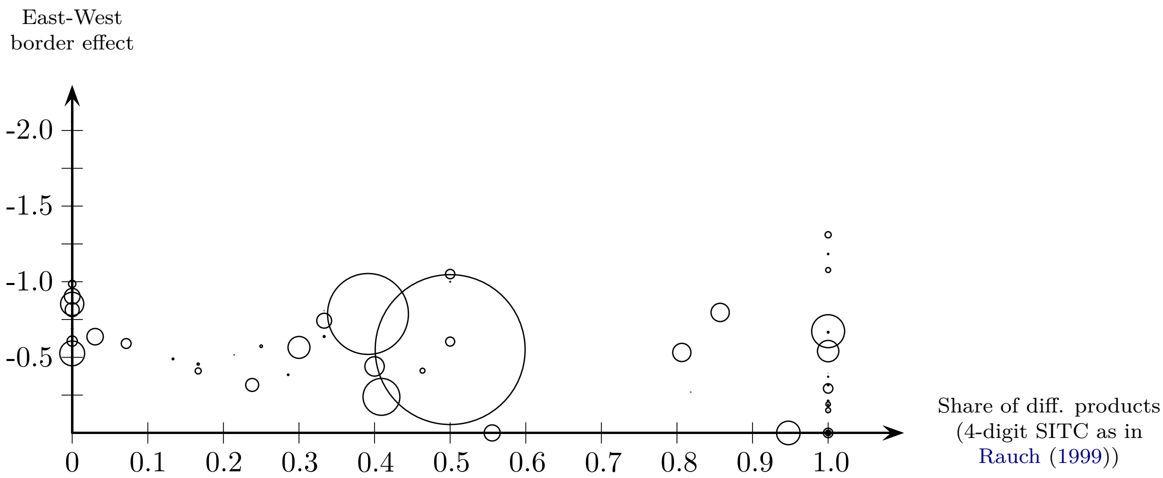
Table 10 in the Appendix uses the 2010, 2005, and 2000 wave of the NCFS (1YS) to identify the intra-Japanese East-West border effect separately for seven major sectors (suppressing again the other coefficients from Table 4). The East-West border effect in all but one specification has the expected negative sign and is highly significant across all industries belonging to the economy's secondary sector.[24] Based on the more disaggregated three-day survey (3DS), Figure 5 presents estimates for 64 industry-level border effects, which are plotted against the share of differentiated products in the respective industry, following the conservative classification in Rauch (1999).[25] To maximise the number of available observations, industry-level border effects are estimated in a pooled sample, including the 2010, 2005, and 2000 wave of the NCFS.

[23]The complete set of estimates from both regressions is reported in a Technical Supplement, which is available from the author upon request.

[24]When comparing the East-West border effect across sectors s caution is warranted. Estimated border effects in Table 10 refer to the product of the trade cost elasticity $\sigma_s - 1$ and the cost-increasing effect of the intra-Japanese East-West border δ_{1s}. Table 7 from the Appendix suggest that sectoral trade cost elasticities in 2010 vary from 1.03 for manufacturing to 2.81 for forest. Moreover, it seems likely that the East-West trade pattern for industries belonging to the economy's primary sector (i.e. agriculture, forest, & mining) to a large extent is dictated by differences in comparative advantage, that are not included in the simple model from Section 2.

[25]To obtain the share of differentiated products in a given industry, the (updated) Rauch-classification based on 4-digit SITC (Rev. 2) codes is matched to the NCFS industry classification. A Technical Supplement, which is available from the author upon request, presents a detailed concordance table and reports the complete set of industry-level estimates for the intra-Japanese East-West border effect together with the respective share of differentiated products according to the conservative/liberal classification in Rauch (1999).

Figure 5: *The East-West Border Effect for Differentiated versus Non-differentiated goods*

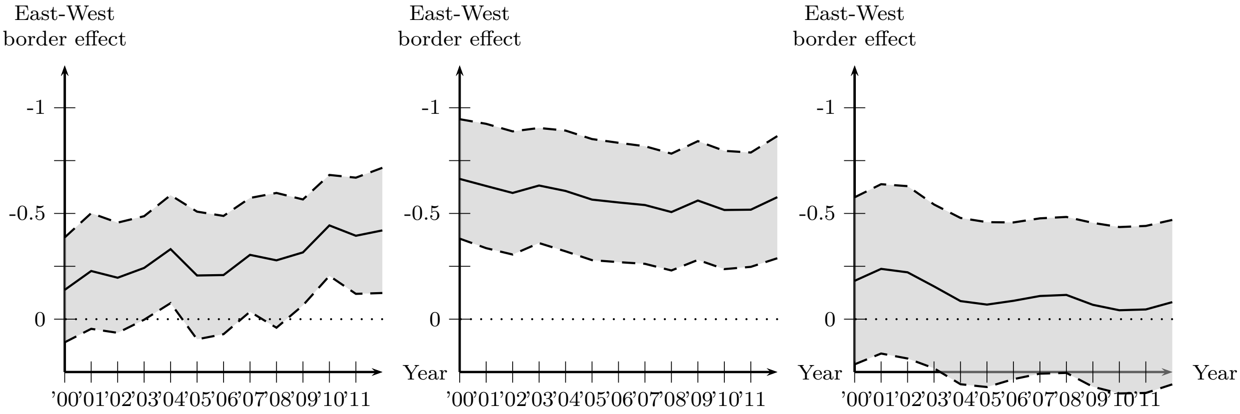


Taking into account a considerable amount of zero (industry-level) trade flows, PPML is used as preferred estimation technique. The complete set of time-varying importer- and exporter-specific fixed effects is taken into account and error terms are allowed to be correlated within prefecture pairs. If limited trust among market participants or strong preferences for local goods are the cause behind the intra-Japanese East-West trade pattern, one would not expect to find a significant border effect for standardized (homogeneous) products, whose quality is easy to verify and for which idiosyncratic demand shocks have little bearing. Figure 5 rejects these explanations: the obtained border effects in most industries are (significantly) negative and do not seem to be (negatively) correlated with the share of differentiated products.[26]

Table 11 in the Appendix reports estimates for the intra-Japanese East-West border effect that result from the 2010, 2005, and 2000 waves of the NCFS (3DS), disaggregated by seven major sectors (cf. Table 10) *and* four modes of transportation (i.e. by rail, road, sea and air). Exploiting this variation, Specification (1) of Table 11 includes exporter- and importer-specific fixed effects that also vary by sector *and* by mode of transportation. Throughout all waves of the NCFS the estimated intra-Japanese East-West border effect has the expected negative sign and is highly significant, which rules out explanations based on a combination of sector-level comparative advantage and prefecture-specific infrastructure. When estimated separately by mode of transportation, negative and significant border effects can be identified for shipments that are transported either by sea or by road. Figure 6, which uses yearly CFS data from 2000 to 2012, confirms this picture: for shipments that are transported by rail an

[26]Observations in Figure 5 are weighted by the industry-level trade volume. Insignificant East-West border effects are treated as zeros.

Figure 6: *The East-West Border Effect by Transportation Mode from 2000-2012 (PPML)*



(a) *Road* **(b)** *Sea* **(c)** *Rail*

intra-Japanese East-West border effect does not seem to exist.[27] To explain the absence of an intra-Japanese East-West border effect for railway-based shipments the historical east-west expansion of Japan's railway network has to be taken into account. Thereby the Tôkaidô Main line, which was completed in 1889 as Japan's first long-distance railway line, connecting Tôkyô and Kôbe, is a case in point. By the early 1950's, the Tôkaidô Main line had become Japan's main artery for railway-based transportation: although accounting only for 3 percent of Japanese National Railways' (JNR's) total railway network, the Tôkaidô Main line carried 24 percent of its passengers and 23 percent of its freight (cf. Smith, 2003). The absence of a (negative) intra-Japanese East-West border effect in Specification (2) of Table 11 thus appears to be perfectly in line with a (positive) east-west bias in Japan's railway infrastructure.

To sum up, the intra-Japanese East-West border effect can be observed consistently over time and has increased slightly over the decade from 2000 to 2012. Moreover, there is no evidence in favour of explanations for the intra-Japanese East-West border effect that are based on local preferences, limited trust or Japan's railway infrastructure.

4 Sensitivity Analysis

To ensure that the intra-Japanese East-West border effect does not result from statistical artefacts, Section 4 offers a wide range of sensitivity checks: in Subsection 4.1, several millions of placebo regressions are performed to verify the unique east-west dimension of the intra-Japanese

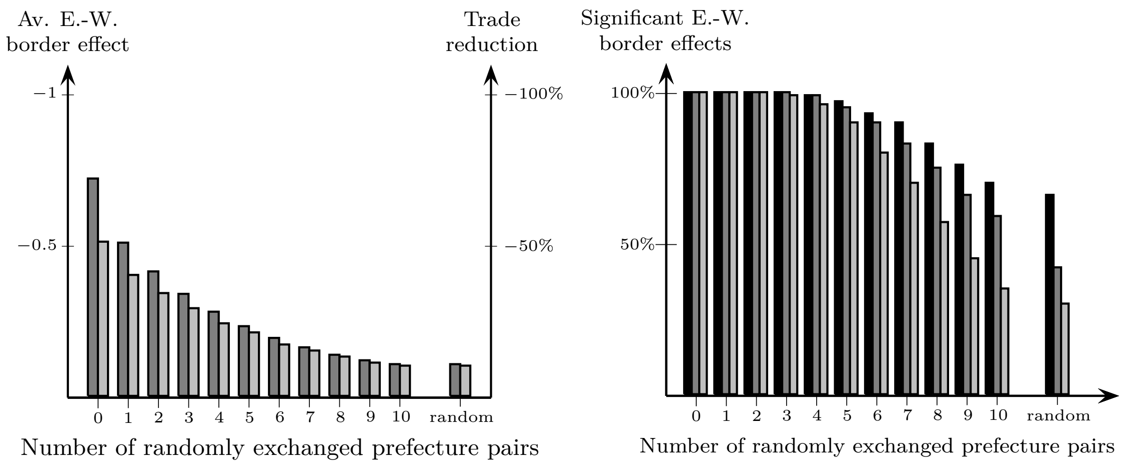
[27] Estimates in Figure 6 are obtained from a pooled sample covering the decade from 2000 to 2012. Following Nitsch and Wolf (2013), all regressions include the complete set of time-varying importer- and exporter-specific fixed effects and allow error terms to be correlated within prefecture pairs. Disaggregating bilateral trade flows by mode of transportation results in a considerable number of zero trade flows, such that PPML is used as preferred estimation technique. Figures 6a, 6b, and 6c plot the obtained parameter estimates for the intra-Japanese East-West border effect together with the corresponding 99%-confidence intervals. The complete set of estimates from all three regressions is reported in a Technical Supplement, which is available from the author upon request.

border effect. Subsection 4.2 allows for alternative and more flexible specifications of bilateral transportation cost.

4.1 Placebo Regressions

To what extent does trade across the intra-Japanese East-West border from Figure 2 differ from trade across any other *hypothetical* borders inside Japan? To answer this question, a million placebo regressions based on Specification (1) in Table 4 are performed in a first step.[28] Thereby, each of these placebo regressions randomly assigns the 47 Japanese prefectures either to a hypothetical "East" or to a hypothetical "West". Surprisingly often there is a border effect, which at a 1% significance level is negative and significant in 33.9% of all cases. However, the trade-reducing effect of these hypothetical borders on average is rather small (10% compared to 51.3% in the benchmark case). The largest border effect out of a million placebo regressions implies a trade reduction of 36.6%, which is still one third smaller than the baseline result of 51.3%. Reassuringly, equality between the border effect in the benchmark scenario and the border effects resulting from the placebo regressions *always* can be rejected at a 1% level of significance.

Figure 7: *The Average East-West Border Effect in a Million Placebo Regressions*



(a) *Average Size of the East-West Border Effect* **(b)** *Share of Significant East-West Border Effects*

In a second step, both prefecture blocks (i.e. the hypothetical "East" and the hypothetical "West") are conditioned to be of similar size. Starting out from the allocation in Figure 2, prefectures in up to 10 randomly chosen East-West prefecture pairs are intentionally misallocated

[28] After all there exist 2^{47} possible ways of counting Japan's 47 prefectures either to a hypothetical "East" or to a hypothetical"West". Covering all these possible allocations in single placebo regressions would be computationally infeasible. Hence, following Felbermayr and Gröschl (2014), a million randomly chosen placebo regressions are performed.

between the "East" and the "West". Thereby, for each specification with 1 to 10 exchanged east-west prefecture pairs again a *million* placebo regressions are performed. As evident from Figure 7, the average size of the East-West border effect falls together with the share of placebos, from which a significant border effect results as more and more east-west prefecture pairs are "misallocated".[29] Provided the number of exchanged east-west prefecture pairs is sufficiently high, the outcome resembles an allocation, in which all prefectures are randomly allocated across the hypothetical "East" and "West".

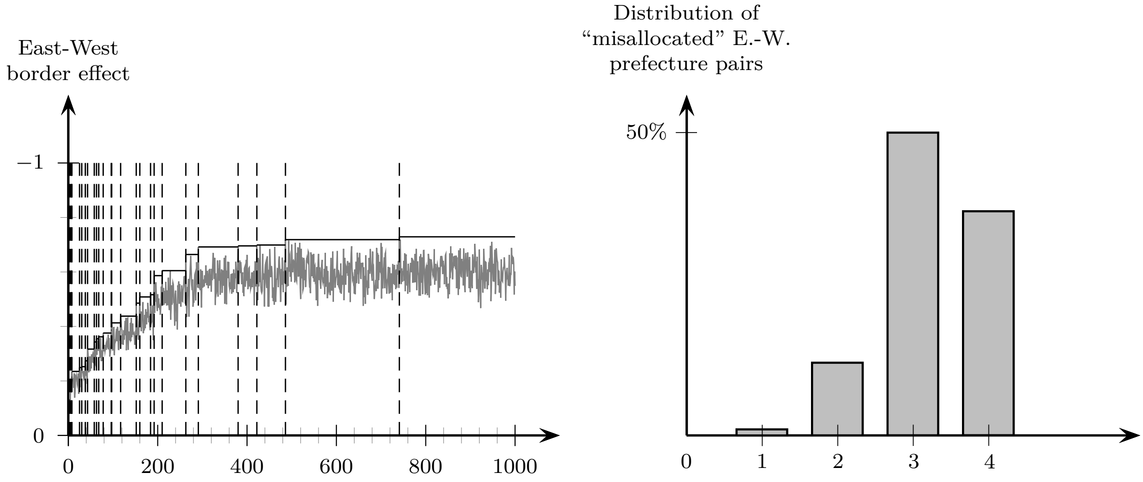
In a final third step, a simple heuristic is constructed to search for the *maximum* intra-Japanese border effect. Thereby, the search algorithm starts from a random baseline allocation of prefectures into two similarly sized prefecture blocks. Then, in each iteration step one randomly chosen prefecture from each block is experimentally assigned to the respective other block. If one of the newly obtained allocations generates an intra-Japanese border effect, which is larger than the border effect in the baseline allocation, the algorithm stops and adopts this allocation as the new baseline allocation before continuing its search for the *maximum* intra-Japanese border effect. Overall, the algorithm is performed 100 times with 10,000 iteration steps in each run. As evident from Figure 8a, which plots the typical first 1,000 iteration steps, the algorithm converges fast to a level that is comparable to the East-West border effect identified in Column (1) of Table 4.[30] Interestingly, the maximum intra-Japanese border effect detected in 100 runs is only slightly larger in absolute size and implies a trade reduction of 52.9% ($e^{-0.752}-1$) instead of 51.9%, resulting from the baseline regression in Specification (1) of Table 4. The allocations of prefectures preferred by the algorithm are very similar to the allocation imposed in Figure 2: The median number of "misallocated" prefecture pairs is three. Overall, the number of "misallocated" east-west prefecture pairs does not exceed four (cf. Figure 8b).

To account for the possibility that there might exist *further* spatial trade barriers above and beyond the intra-Japanese East-West barrier identified in Subsection 3.2, two additional, *hypothetical* "borders" within the East and the West are randomly introduced into another million of placebo regressions. For this purpose, the East and the West are again subdivided into two blocks of fixed size (12 + 11 eastern and 12 + 12 western prefectures). For each placebo regression prefectures within the East and the West are then randomly allocated to both blocks. In 32.3% (29.1%) of all cases there is a significant intra-East (intra-West) border

[29] Figure 7a plots the mean estimate (dark gray) together with the implied trade reduction in percent (light gray). Figure 7b differentiates between the usual 1%, (black), 5% (dark gray), and 10% (light gray) significance levels.

[30] Dashed lines in Figure 8a indicate the adoption of a *new* baseline allocation of prefectures. The benchmark for the *maximum* border effect at each iteration step thereby is given by the upper envelope over all estimated border effects up to this point.

Figure 8: *In Search for the Maximum Intra-Japanese Border Effect*



(a) *A Simple Heuristic* **(b)** *"Misallocated" East-West Prefecture Pairs*

effect. However, usually these effects (mean point estimate of -0.1106 and -0.1118, respectively) are small compared to the intra-Japanese East-West border effect, which, although slightly reduced in size (with a mean point estimate of -0.5804), is highly significant throughout *all* placebo regressions.

In further robustness checks several plausible prefecture allocations are investigated as alternatives to the allocation in Figure 2. To check the sensitivity of results with respect to the allocation of border prefectures, Japan's central *Chûbu* region with its 9 prefectures (located in-between the *Kantô* and *Kansai* area) is divided between the East and the West.[31] For *all* $2^9 = 512$ possible splits of the *Chûbu* region a negative and highly significant East-West border effect exists, which is in only 32% of all cases statistically different from the baseline estimate in Column (1) of Table 4. Moreover, the East-West border effect is also robust against a complete exclusion of the *Chûbu* region from the sample. Similarly, when dropping potential outliers such as *Okinawa* or *Hokkaidô*, the baseline result from Subsection 3.2 is not affected.

To sum up, several million placebo regressions not only confirm the intra-Japanese border effect's *unique* east-west dimension, but also show that the intra-Japanese East-West border effect is unchallenged in terms of its economic importance. Along no other spatial dimension trade reductions of comparable magnitude can be identified, and there is no evidence in support of alternative and/or additional spatial trade barriers that can be linked to systematic geographic borderlines.

[31] Interestingly, the name *Chûbu* (中部) literally translates into "middle" *chû* (中) and "part" *bu* (部).

4.2 Alternative Specification – Bilateral Transportation Cost

Table 12 in the Appendix accounts for the possibility that the intra-Japanese East-West border effect identified in Subsection 3.2 results from the mismeasurement of bilateral transportation cost (cf. Head and Mayer, 2002; Hillberry and Hummels, 2008). In the benchmark specifications (cf. Columns (1) and (2) of Table 12) inter-prefectural distance is measured by the greater-circle distance between prefecture capitals, while intra-prefectural distance is approximated by one fourth of the distance to the closest neighbouring prefecture. Given that 85.0% of all intra-Japanese shipments in 2010 were transported on the road, real-road distance inferred from Google Maps (cf. Ozimek and Miles, 2011) is used in Specifications (3) and (4) as an alternative distance measure. In Specifications (5) and (6) Japan's unique Grid Square Statistic is employed to compute *consistently* inter- *and* intra-prefectural distances as population-weighted averages over bilateral distances between 374,674 squared cells of 1km^2 size (cf. Mayer and Zignago, 2011; Yotov, 2012).[32] Alternatively, bilateral transportation costs in Specification (7) are measured by real travel time (cf. Ozimek and Miles, 2011). Finally, to allow for more flexibility in the measurement of bilateral distances, Specification (8) introduces distance intervals as in Eaton and Kortum (2002). Following Felbermayr and Gröschl (2014), five distance intervals (in kilometres) are introduced to cover the ranges [0,250), [250,500), [500,1000), [1000,2000), and [2000,max], which are implemented in Specification (8) through a set of four dummy variables (using the range [0,250] as reference category).

For all specifications of Table 12 a negative and highly significant intra-Japanese East-West border effect exists. However, two observations are noteworthy: First, irrespective of how bilateral distances are measured, the intra-Japanese East-West border effect tends to be larger when unit transport cost (per metric ton and kilometre) are used as distance weights (cf. Specifications (1),(3), and (5) vs. (2), (4), and (6), respectively). As argued in Subsection 3.1, per unit transport costs decline over longer distances (see Figure 1). Thus, if the heterogeneity in unit transport cost is ignored, the impact of distance on bilateral trade is underestimated (overestimated) over short (long) distances, and the implied trade reduction over short distances is misattributed to other proxies for short-distance trade (e.g. proxies for trade within the East or the West). As a consequence, the trade-inhibiting effect of the Intra-Japanese East-West border is underestimated relative to a specification which accounts for transportation fixed cost (see also Table 3). Secondly, the intra-Japanese East-West border effect is smaller in magnitude (although still highly significant) if distance is weighted by Japan's highly disaggregated

[32] Following Mayer and Zignago (2011) and Yotov (2012), bilateral distance between prefecture i and j is computed as $\text{dist}_{ij} = \sum_{\hat{\imath}\in i} \text{pop}_{\hat{\imath}}/\text{pop}_i \sum_{\hat{\jmath}\in j} \text{pop}_{\hat{\jmath}}/\text{pop}_j \text{dist}_{\hat{\imath}\hat{\jmath}}$, with $\text{pop}_{\hat{\imath}}$ and $\text{pop}_{\hat{\jmath}}$ referring to the population at location $\hat{\imath}$ and $\hat{\jmath}$ in 2010, and $\text{dist}_{\hat{\imath}\hat{\jmath}}$ denoting greater-circle distance between location $\hat{\imath}$ and $\hat{\jmath}$.

population distribution (cf. Sepecification (5) and (6) of Table 12). This observation is in line with the finding of Hillberry and Hummels (2008), who show that the home bias in intra-US trade disappears once shipments are tracked at a highly disaggregated ZIP-code level.

Together these findings suggest that there is no evidence supporting an explanation of the intra-Japanese East-West border effect in terms of misspecified bilateral transportation cost.

5 Explaining the Intra-Japanese East-West Border Effect

In order to explain the intra-Japanese East-West border effect, Subsection 5.1 gradually introduces a wide range of contemporaneous and historical controls into the baseline regression from Table 4. Subsection 5.2 then isolates those explanatory variables, which display a *significant* variation along the east-west dimension. To explore the relationship between these variables and the border effect, the analysis follows Chen (2004) and introduces the intra-Japanese East-West border dummy together with an interaction term between the border dummy and the explanatory variable of interest.

5.1 In Search for Explanations

This section examines to what extent the intra-Japanese East-West border effect is biased by observable characteristics at the prefecture-pair level. To this end, a large number of contemporaneous and historical determinants from the empirical trade literature are sequentially introduced into the baseline regression from Subsection 3.2. As a point of reference, Specification (1) in Table 13 (from the Appendix) presents the benchmark result including geographic trade costs variables only.

Business networks: Specification (2) in addition controls for the role of business networks. Following Combes, Lafourcade, and Mayer (2005), Japan's 2009 *Economic Census* [*Keizai Sensasu*] is used to compute the total number of bilateral headquarter-plant links between any two prefectures. By construction, the resulting business-network variable is symmetric, suggesting that headquarter-plant links are equally important for prefecture-level exports and imports. In line with the findings of Combes, Lafourcade, and Mayer (2005) and Garmendia, Llano, Minondo, and Requena (2012), the network coefficient in Column (2) is not only positive and significant, but also associated with an reduced (although still significant) intra-Japanese East-West border effect.

Social networks: To account for the role of social networks resulting from internal migration (cf. Helliwell, 1997; Head and Ries, 1998; Millimet and Osang, 2007), inter- *and* intra-prefectural migration flows from the 2010 *Report on Internal Migration in Japan* [*Jûmin Kihon*

Daichô Jinkô Idô Hôkoku] are aggregated up over the five-year interval from 2005 to 2009.[33] As suggested by the literature, migration has a positive and highly significant impact on bilateral trade. Accounting for the social network effect from internal migration moreover mitigates the intra-Japanese East-West border effect, which in Column (3) of Table 13 becomes statistically indistinguishable from zero.

Alternatively, Specifications (4) and (5) control for social networks resulting from individual commuting and travel patterns. Thereby the total number of inter- *and* intra-prefectural commuters (excluding students) is derived from the 2010 *Population Census* [*Kokusei Chôsa*]. Information on the accumulated flows of road-, rail-, and air-travel passengers over the five-year interval from 2005 to 2009 are obtained from the 2010 *Passenger Flow Survey* [*Ryokyaku Chiiki Ryûdô Chôsa*]. Network effects in Specifications (4) and (5) resemble those of internal migration in Specification (3) and have a similar (although less intense) impact on the intra-Japanese East-West border effect.[34]

Coethnic networks: To control for the role of coethnic networks in intra-Japanese trade, the geographic distribution of ethnic Chinese and Koreans from Japan's 2010 *Population Census* [*Kokusei Chôsa*] is taken into account.[35] Thereby, the strength of a coethnic network is approximated by the product of the respective minority's prefectural population shares (cf. Rauch and Trindade, 2002). Accounting for coethnic networks does not affect the intra-Japanese East-West border effect, and *unobserved* fractionalisation (cf. Felbermayr, Jung, and Toubal, 2010) may explain the somewhat counterintuitive trade-inhibiting effect of ethnic Korean networks in Specifications (6) and (9).[36]

Religious networks: Data from the 2010 *Religion Yearbook* [*Shûkyô Nenkan*] is used to capture networks originating from Japan's three major religions (Shintoism, Buddhism, and Christianity). For each prefecture the share of supporters of a given religion in the respective

[33] Due to data limitations, the majority of existing studies (see Genc, Gheasi, Nijkamp, and Poot, 2012, for a recent meta-analysis) uses migration stocks instead of accumulated migration flows to proxy for migration networks. As a consequence the trade-creating effects of temporary stays due to return or onward migration are ignored.

[34] When accounting for the complete set of controls in Specification (9), only the trade-enhancing effect of air-travel networks survives, which is in line with the finding of Cristea (2011), who shows that the demand for business-class air travel is directly related to the volume of U.S. state-level exports in differentiated products.

[35] As Japan's two major ethnic minorities, Chinese and Koreans accounted for 27.9% and 25.7% of all non-natives in 2010. While most of today's ethnic Koreans are the descendants of Koreans that stayed in Japan after World War II, Chinese immigration is a more recent phenomenon. Results remain unchanged if coethnic networks among the much smaller groups of immigrants from the Philippines, Thailand, Indonesia, Vietnam, the United Kingdom, the United States, Brazil or Peru are additionally taken into account.

[36] The Japanese Population Census does not distinguish between North- and South-Koreans, as most Koreans arrived in Japan prior to the outbreak of the Korean war (1950-1953) that led to the division of Korea. Nevertheless, most Koreans sympathise either with the North or the South and are organised in the General Association of Korean Residents in Japan [*Chongryon*] or in the Korean Residents Union in Japan [*Mindan*], respectively (cf. Ryang and Lie, 2009).

prefecture's total number of supporters is computed.[37] However, including the product of prefectures' religion shares as a measure for religious networks in Specification (7) of Table 13 does not impact on the East-West bias in intra-Japanese trade.

Trust: To control for the trade-inhibiting effect of limited trust (cf. Guiso, Sapienza, and Zingales, 2009), data on individual trust levels from the 2010 wave of the Japanese General Social Survey (JGSS) are used to compute the prefectural population share of people who state that they trust other people.[38] Bilateral trust, approximated by the product of prefectural trust shares, has the expected positive impact on intra-Japanese trade (cf. Guiso, Sapienza, and Zingales, 2009). However, in line with the results from Subsection 3.3, the intra-Japanese East-West border effect cannot be explained by an east-west heterogeneity in the trade-creating effect of bilateral trust.

History: Recently, several authors (cf. Head, Mayer, and Ries, 2010; Nitsch and Wolf, 2013; Felbermayr and Gröschl, 2014) have highlighted the long shadow of history for inter- and intra-national trade. Thereby, Felbermayr and Gröschl (2014) argue that the American Civil War led to a manifestation of long-lasting cultural differences, which continue to shape the pattern of trade between the former Union and Confederacy up to this day. To identify an internal conflict of comparable importance in Japan's history, one has to go back to the end of the *Sengoku* period (15th/16th century), which literally translates into "the period of warring states". In 1600, Japan's (re-)unification under Oda Nobunaga, Toyotomi Hideyoshi, and Tokugawa Ieyasu climaxed in the battle of Sekigahara, in which Tokugawa Ieyasu, supported by the majority of eastern feudal lords, succeed over a coalition of mainly western feudal lords. This victory not only formed the basis for the subsequent rule of the Tokugawa dynasty (1603-1868), but also led to a distinction between *fudai* and *tozama* feudal lords (*daimyo*), depending on whether the respective vassal at Sekigahara was on the winning or losing side. To consolidate their power base the first five Tokugawa rulers (*shoguns*) between 1601 and 1705 confiscated and redistributed one half of the country's total taxable land base (cf. Hall, 1991, pp. 150-53). The henceforth stable distribution of land holdings that emerged from this process towards the end of the 17th

[37] While in existing studies (cf. Lewer and Van den Berg, 2007a,b) the number of supporters reporting adherence to a certain religion usually is put into relation to the overall population of the respective region or country, this approach would be misleading in the case of Japan, where a substantial part of the population feels attached to more than one religion. According to the *Religion Yearbook*, in 2010, there were 106.5 million people in Japan reporting adherence to Shintoism, 89.7 million people reporting adherence to Buddhism, and 2.1 million people declaring an affinity to Christianity. Together, these numbers exceed Japan's total population of 127.5 millions in 2010 by 55%.

[38] Respondents were asked: "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?" The answers to the trust question then were coded as 1 (almost always trust), 2 (usually trust), 3 (usually can't be too careful) and 4 (almost always can't be too careful). At the prefecture-level the share of respondents that have trust in other people consequently is computed as the number of respondents in categories 1 and 2 relative to the number of respondents in all four categories, taking into account the internal weights reported by the 2010 wave of the JGSS.

century was characterised by a clear core-versus-periphery pattern: while most of the loyal *fudai daimyo* were rewarded by strategically important domains in central Japan, most of the *tozama daimyo* were pushed to Japan's north-eastern and south-western periphery. To capture the geographic dimension of this political division, which endured throughout the 18th century and finally also featured prominently in the Tokugawa shogunate's decline, administrative data from the *Summary of han governments* [*Hansei ichiran*] is used, which was compiled by the new Meiji government soon after it came to power in 1868. Building up on the work of Beasley (1960), all major feudal domains (*han*) with an annual yield of more than 50,000 *koku* of rice (1 *koku* $\approx$ 5 bushels) are identified as either a *fudai* or *tozama* domain.[39] Using the same concordance list as in Davis and Weinstein (2002) to match Japan's 68 historical provinces to the present 47 Japanese prefectures, it is possible to reconstruct a historical border between former *fudai* and *tozama* landholdings. The resulting *fudai*-versus-*tozama* border is characterised by a clear core-versus-periphery pattern and differs substantially from the East-West "border" in Figure 2. Reassuringly, the historical *fudai*-versus-*tozama* border in Specification (9) of Table 13 affects neither today's cross-border trade nor does it explain the intra-Japanese East-West border effect.

Thus, while there is little evidence in favour of an explanation for the intra-Japanese East-West border effect in terms of defunct political borders originating from the structure of feudal landholdings in pre-modern Japan, it is of course possible that other (unobserved) historical shocks have the potential to explain the (contemporaneous) east-west bias in intra-Japanese trade. To account for such explanations a comprehensive measure of *past* economic and political interactions between Japanese prefectures is required. In order to meet this challenge, Falck, Heblich, Lameli, and Südekum (2012) propose a measure of cultural proximity, which can be constructed from the geographic variation in historical dialect data. The proposed cultural proximity index thereby builds on the idea that similarities in prefectures' dialectical imprints are the outcome of an evolutionary process shaped by past interactions between the respective prefectures. For Japan, data on the geographic variation of historical dialects exists in form of the Linguistic Atlas of Japan (LAJ) [*Nihon Gengo Chizu*]. Based on a survey conducted by the National Language Research Institute between 1957 and 1964, the LAJ covers 285 prototypical language characteristics from 2400 locations all over Japan that were reported by male informants, who were born not later than in 1903.[40] For each Japanese prefecture, a characteristic set of *dominant* realisations for 240 uniquely identifiable language characteristics exists, such

[39] As in Beasley (1960) the term *fudai* subsumes direct branch houses of the Tokugawa family (*sanke*, *sakyô*, and *kamon*).

[40] More detailed information on the sampling of locations and informants are reported in Tokugawa and Masanobu (1966).

that it is possible to compute a simple index of cultural proximity as the percentage overlap in identical realisations at the prefecture-pair level.[41] Although in today's Japan, which *de jure* and *de facto* is a single-language country, dialects no longer represent an actual hurdle to communication, the modern use of dialects still contributes in an integral way to cultural identities at the sub-national level. By exploiting the strong correlation between modern and historical dialect patterns, it is hence possible to proxy contemporaneous cultural differences across Japanese prefectures through historical dialect similarity. Importantly, the historical geography of dialect similarity thereby is far from random. For the case of Germany Falck, Heblich, Lameli, and Südekum (2012) show that historical dialect patterns can be linked to past geographic, political or religious borders as well as to distinct events of historical mass migrations. Similar anecdotal evidence exists for Japan: Using a Geographical Information Systems (GIS) to match the spatial distribution of negative suffixes to Japan's surface topography, Onishi (2011) shows that the resulting borderline between the East (using -*nai*) and the West (using -*n* as well as its variants -*sen*, -*hen*, and -*hin*) is exactly predicted by a natural pattern of long valleys and high mountain chains in the Japanese Alps. For another example, consider Table 14 (in the Appendix), which plots Japan's cultural proximity matrix. Focussing on the prefectures of Hokkaidô and Okinawa, it is easily verified that both prefectures are language enclaves located in Japan's extreme periphery. Due to its isolated location and its unique history Okinawa's dialect differs substantially from the dialects of mainland Japan (with a maximum overlap of just about 15%). For Hokkaidô, which is similarly isolated, the overlap in dialectical imprints with its direct neighbouring prefectures (e.g. Aomori with 32% overlap and Iwate with 39% overlap) is limited as well. However, Hokkaidô's dialect at the same time displays a close resemblance to the dialects of more distant prefectures from central Honshu (e.g. Tôkyô or Nagano, each with an remarkable overlap of 64%). What is the reason for this striking difference? Unlike Okinawa, Hokkaidô during the second half of the 19th century became the target of systematic colonisation efforts, which not only were associated with an internal mass migration towards Hokkaidô but also with a subsequent acculturation towards central Japan.[42] Both examples highlight how historical interactions between Japanese prefectures are preserved within the respective prefectures' dialectical imprints. Cultural proximity, approximated by historical dialect similarity, therefore represents a comprehensive measure for past interactions at the prefecture-pair level and serves as a natural control for (alternative)

[41] Following Falck, Heblich, Lameli, and Südekum (2012) the cultural proximity index for prefecture pair $i \times j$ equals $CP_{ij} \equiv \sum_{c=1}^{240} I_{ijc} / \sum_{c=1}^{240} I_{iic} \in [0,1]$, in which I_{ijc} is an indicator variable, taking the value one if both prefectures share the same dominant realisation for the language characteristic $c = 1, \ldots, 240$ and zero otherwise.

[42] Over the turn of the century the population of Hokkaidô soared. Thereby, the massive increase in population was largely due to immigration, which raised the number of inhabitants from 150,000 in 1870 to almost 2.5 million in 1930 (cf. UNFPA, 1981).

history-based explanations of the intra-Japanese East-West border effect. When included into Specification (8) of Table 13, cultural proximity is not only associated with increased bilateral trade (cf. Felbermayr and Toubal, 2010; Lameli, Nitsch, Südekum, and Wolf, 2015), but also with a mitigated (although still significant) East-West border effect.

Summing up the results from Table 13, two potential explanations for the intra-Japanese East-West border effect can be identified: On the one hand, the intra-Japanese East-West border effect (at least partly) can be explained by the structure of business and social networks (Combes, Lafourcade, and Mayer, 2005), which are likely outcomes of post-war agglomeration trends, associated with a massive concentration of economic activity in Japan's major metropolitan areas (cf. Fujita and Tabuchi, 1997). On the other hand, it cannot be ruled out that unobserved historical shocks gave rise to cultural differences across Japanese prefectures, which still matter today (cf. Felbermayr and Gröschl, 2014; Lameli, Nitsch, Südekum, and Wolf, 2015).

5.2 History versus Agglomeration

To sort out whether the intra-Japanese East-West border effect can be explained through history or agglomeration, Table 5 (suppressing the other controls from Table 4) includes the East-West border dummy together with an interaction term between the border dummy and the explanatory variable of interest (cf. Chen, 2004). Thereby, the sign and significance of the coefficient on the interaction term indicates whether the intra-Japanese East-West border is up- or downward biased through the geographic heterogeneity of the respective variable.

Is there any evidence that the East-West border effect can be explained by the structure of intra-Japanese business networks? Column (2) of Table 5 reports the results with the business network variable. The negative and significant coefficient on the interaction term with the East-West border dummy shows that the trade enhancing-effect of business networks is stronger within the East and the West than across the east-west dimension. Evaluating the intra-Japanese East-West border effect at the 75% versus the 25% percentile of the headquarter-plant-link distribution implies a reduction of the (absolute) border effect from $-0.4960 = -0.1034 - (0.0721 \times 5.4424)$ to $-0.2937 = -0.1034 - (0.0721 \times 2.6391)$, which corresponds to an increase in cross-border trade by 13.7 percentage points. The intra-Japanese East-West border effect therefore (at least partly) can be explained by the structure of Japanese business network, which tends to be stronger within rather than between the East and the West. Specification (3) of Table 5 suggests that the trade-enhancing effect of social networks is characterised by the same east-west heterogeneity. Even though migration networks generally foster trade, they do less so

Table 5: *Explaining the Intra-Japanese East-West Border Effect*

Dependent variable: Exports in tons from prefecture i to prefecture j					
Year:	**2010**				
Survey:	**1YS**				
Unit:	**Quantities**				
Model:	**OLS-FE**				
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
East-West border dummy$_{ij}$	-0.7188^{***}	-0.1034	0.6043^{**}	-1.4651^{***}	-0.2990
	(.0487)	(.1229)	(.2431)	(.1713)	(.4065)
ln number of headquarter-plant links$_{ij}$		0.7780^{***}			0.3837^{***}
		(.0446)			(.0709)
ln number of headquarter-plant links$_{ij}$ × East-West border dummy$_{ij}$		-0.0721^{***}			-0.0702
		(.0243)			(.0632)
ln agg. migration flows (2005-2009)$_{ij}$			0.9898^{***}		0.5142^{***}
			(.0429)		(.0802)
ln agg. migration flows (2005-2009)$_{ij}$ × East-West border dummy$_{ij}$			-0.0834^{***}		-0.0063
			(.0281)		(.0779)
Cultural proximity$_{ij}$				4.3630^{***}	1.8940^{***}
				(.3409)	(.3881)
Cultural proximity$_{ij}$ × East-West border dummy$_{ij}$				2.7277^{***}	1.4569^{***}
				(.4046)	(.4198)
Fixed effects:					
Exporter (i)	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓
Summary statistics:					
Number of observations	2,207	2,207	2,207	2,207	2,207
R^2	.8287	.8641	.8678	.8486	.8759

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

across the east-west dimension. Again, comparing the 75% and 25% percentile of aggregated bilateral migration flows suggests a decline in the magnitude of intra-Japanese East-West border effect from $-0.1666 = 0.6043 - (0.0834 \times 9.2432)$ to $0.0416 = 0.6043 - (0.0834 \times 6.7475)$, which is equivalent to an increase in cross-border trade by 19.6 percentage points. The *dual* structure of Japan's business and social networks thus offers a intuitive explanation for the observed intra-Japanese East-West border effect.

Are the network effects along the east-west dimension reinforced or even predetermined by cultural differences between the East and the West of Japan? Column (4) of Table 5 answers this question by including an interaction term of the East-West border effect with the cultural proximity index from Subsection 5.1. Thereby, the positive and significant coefficient on the interaction term suggests that the trade-creating effect of cultural proximity is stronger between rather than within both country parts. Table 14 from the Appendix confirms this result: Instead of the familiar east-west pattern from Table 2 a clear core-versus-periphery pattern can be identified. The index of cultural proximity, which within the core (prefectures with the numbers 7 to 40) usually ranges between 0.4 an 0.7, drops down to values somewhere around 0.2 or 0.3 once prefecture pairings between the core and the periphery are considered. Finally, comparing the 25% and 75% percentile of the cultural proximity index implies intra-Japanese East-West border effects of $-0.6582 = -1.4651 + (2.7277 \times 0.2958)$ and $-0.1013 =$

$-1.4651+(2.7277\times0.5000)$, respectively. An equivalent improvement in the cultural ties between Japanese prefecture therefore would be associated with a (relative) increase in East-West trade by 38.6 percentage points. Taking stock, there is no evidence that the intra-Japanese border effect results from cultural differences between East- and West-Japan. Indeed, the true size of the intra-Japanese border effect is to some extent concealed by the strong cultural ties between Japan's central prefectures.

Together, the results from Table 5 offer clear support for an explanation of the intra-Japanese East-West border effect in terms of business and social networks rather than in terms of cultural differences. As a robustness check, Column (5) includes all interactions in a single regression. While sign and significance for the interaction term with the cultural proximity index are preserved, the interaction terms for the network variables turn insignificant, probably due to a multicollinearity issue. The significance of the interaction term with either network variable is restored once the respective other network variable is dropped from the regression.

5.3 Agglomeration and the Intra-Japanese East-West Border Effect

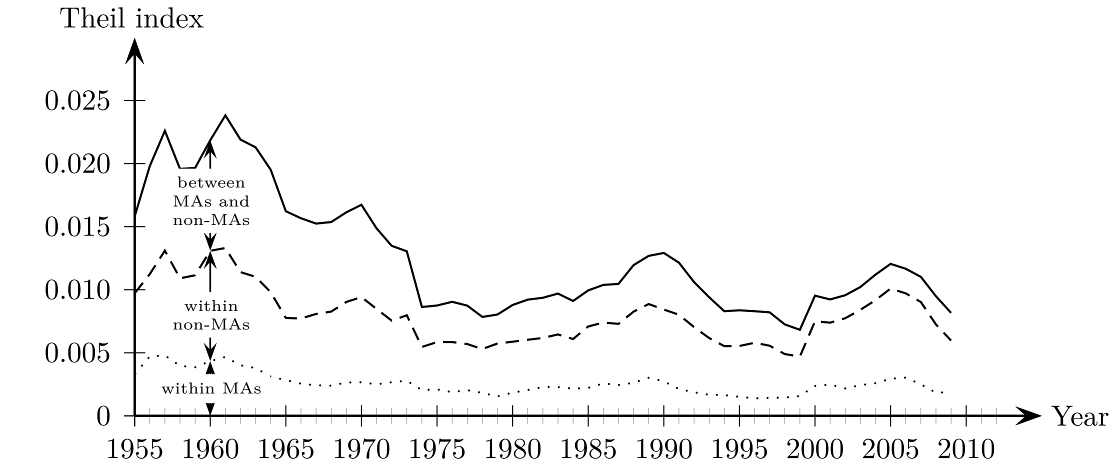
Of course, network formation itself is an endogenous process, which ultimately raises the question why business and social networks are more integrated *within* rather than *between* the East and the West of Japan. Fujita and Tabuchi (1997) offer a simple answer to this question in terms of what they call the "Tôkyô-Ôsaka bipolar growth pattern": During Japan's post-war recovery period, large metropolitan areas (MAs) such as Tôkyô or Ôsaka grew at much higher rates than non-MAs, which gave rise to a substantial MA-versus-non-MA income differential, triggering an unprecedented wave of rural-to-urban migration (cf. Tabuchi, 1988).[43] Between 1955 and 1970, both MAs thereby *predominantly* drew migrants from the surrounding prefectures, which led to the establishment of an eastern migration network mainly centred around the Tôkyô MA and a western network disproportionally clustered around the Ôsaka MA.[44] Due to their *persistent* and *self-reinforcing* nature (cf. Carrington, Detragiache, and Vishwanath, 1996), both migration networks not only outlived the (initialising) Tôkyô-Ôsaka migration boom (1955-1970), but also became increasingly important for the pattern of intra-Japanese east-west trade.

Extending the analysis of Fujita and Tabuchi (1997) and Fujita, Mori, Henderson, and Kanemoto (2004), Figure 9 depicts the Theil decomposition of inter-prefectural per capita income differentials (cf. Subfigure 9a) together with the (net) migration figures (in thousands)

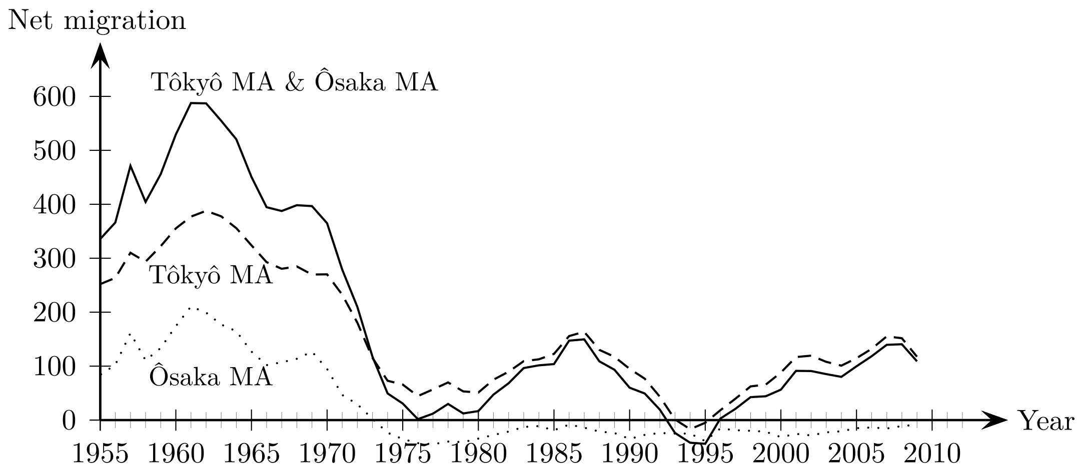
[43] Evidence on how agglomeration affects the location decision of firms and workers is summarised in Head and Mayer (2004).

[44] Following Fujita and Tabuchi (1997), the Tokyo MA comprises the prefectures: Tôkyô, Kanagawa, Saitama and Chiba. The prefectures of Ôsaka, Hyôgo, Kyôto and Nara form the Ôsaka MA.

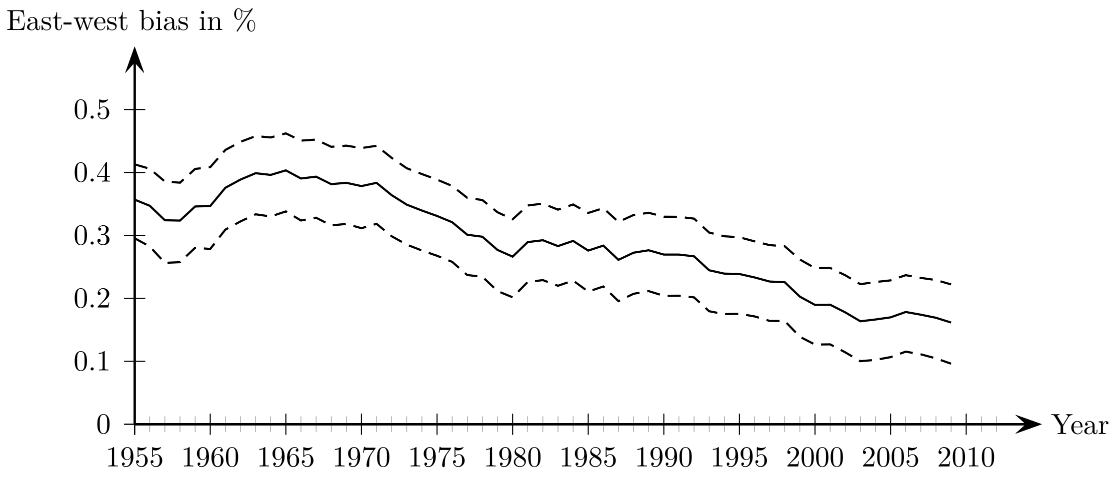
Figure 9: *The pattern of Intra-Japanese Migration from 1955 to 2009*



(a) *Theil Decomposition for the Inter-prefectural per Capita Income Differential*



(b) *Net Migration to Tôkyô and Ôsaka Metropolitan Areas*



(c) *The East-West Bias in the Intra-Japanese Migration Network* for the MAs of Tôkyô and Ôsaka (cf. Subfigure 9b).[45] According to Figure 9, Japan's post-war recovery period from 1955 to 1970 was associated with a substantial MA-versus-non-MA (per capita) income differential, which dropped sharply after 1970 and has stayed constant (at a low level) since then. Using Sim's test of causality, Tabuchi (1988) shows that the massive (net) migration to the MAs of Tôkyô and Ôsaka between 1955 and 1970 occurred in response to the inter-prefectural income differentials presented in Subfigure 9a. Between 1970 and 1975, (net) migration from non-MAs to MAs dropped dramatically, leading to a persistent population drain for the Ôsaka MA and moderately fluctuating (net) immigration for the Tôkyô MA after 1975. To see how post-war Japan's bipolar agglomeration process has shaped the intra-Japanese migration network consider the following gravity equation

$$\ln(M_{ijt}/L_{it}) = D_{it} + D_{jt} + \alpha_{1t}\ln(\text{Dist}_{ijt}) + \alpha_{2t}\ln(\text{Bord}_{ijt}) + \varepsilon_{ijt}, \tag{11}$$

which relates the rate of emigration M_{ijt}/L_{it} from prefecture i to prefecture j at time t to a set of monadic source and destination fixed effects, D_{it} and D_{jt}, to bilateral distance Dist_{ijt} as a proxy of bilateral migration cost, and to ε_{ijt} as the standard error term.[46] Thereby, the source- and destination-specific fixed effects capture all prefecture-specific impact variables, such as ongoing wages, prices, and amenities (cf. Roback, 1982; McDuff, 2011). The indicator variable $\text{Bord}_{ijt} \in \{0, 1\}$ takes a value of one if migration occurs along the east-west dimension and zero otherwise. The parameter α_{2t} hence quantifies to what extent the intra-Japanese migration network at time t exhibits a (negative) east-west bias. Focussing on the percentage reduction $(1 - e^{\alpha_{2t}})$ in migration between rather than within the East and the West, Subfigure 9c suggests that the increasingly dual structure of post-war Japan's internal migration network between 1955 and 1970 can be linked to the "Tôkyô-Ôsaka bipolar growth pattern" (cf. Fujita and Tabuchi, 1997). However, unlike the Tôkyô-Ôsaka migration boom, which effectively ended in 1975, the east-west bias in Japan's internal migration network exhibits an astonishing persistence.

To account for the impact of *present* and *past* migration networks on the pattern of intra-Japanese trade in 2000, 2005, and 2010, the Tables 15, 16, and 17 (from the Appendix) regresses the contemporaneous trade volume on bilateral migration stocks (aggregated over five-year intervals from 1955 to 2009). In addition to the baseline controls from Table 4, an interaction

[45] Inter-prefectural inequality in Subfigure 9a is computed based on prefecture-level per capita income data from 1955 to 2010 (evaluated at prices from the base year 2000), which are published by the Economic and Social Research Institute (ESRI); see also Barro and Sala-I-Martin (1992) and Fujita and Tabuchi (1997). Inter- and intra-prefectural migration stocks, underlying the Subfigures 9b and 9c are drawn from the Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC). Migration data on Okinawa is not available before 1975. Dashed lines in Subfigure 9c indicate the 99% confidence interval.

[46] Following Anderson (2011), gravity equation (11) can be derived from a simple discrete location choice model with random utility (cf. Anderson, DePalma, and Thisse, 1992).

term between the network variable and the East-West border dummy is included to control for geographic heterogeneity in the trade-creating effect of migration networks. As in Table 5, *present* migration networks are found to have a trade-creating effect that is stronger *within* rather than *between* the East and the West. Interestingly, the (negative) east-west bias in the effect of (present) migration networks becomes more important over time, which not only is in line with the results from Subsection 3.3, but also compatible with a self-reinforcing, dual network structure. When accounting for *past* migration networks, the coefficients on the interaction terms with the East-West border dummy are small and insignificant for networks from the 1950s, 1960s, and 1970s, but become *gradually* larger and more significant when migration networks from the 1980s, 1990s, and 2000s are taken into account. Together, both findings suggest that the (negative) east-west bias in the trade-creating effect of migration networks gets stronger over time, which may be interpreted as evidence in favour of an evolving network structure, centred around an eastern and a western cluster that emerged from post-war Japan's "Tôkyô-Ôsaka bipolar growth pattern" (cf. Fujita and Tabuchi, 1997).

6 Conclusion

This paper identifies an intra-Japanese East-West border effect in the absence of an intra-Japanese East-West border and argues that discrete barriers to trade may – but not necessarily have to – coincide in their geography with the shape of present or past political borders. For the case of Japan, the reduction of 23.1% to 51.3% in intra-Japanese east-west trade relative to trade within both country parts, can be explained by the dual structure of contemporaneous business and social networks, which disproportionally foster trade within rather than between the East and the West. Thereby, Japan's dual network structure can interpreted as the natural outcome of post-war agglomeration processes, characterised by a "Tôkyô-Ôsaka bipolar growth pattern" (cf. Fujita and Tabuchi, 1997).

While it is well beyond the scope of this paper to explore the various ways in which the dual structure of Japan's business and social networks not only affects the pattern of internal trade, but also the Japanese economy as a whole, there are several observations that are compatible with the observed intra-Japanese East-West "border" effect. In the aftermath of the Great East Japan Earthquake, The Economist (2011) raised concerns with regard to fragility of the Japanese link in global supply chains. Analysing the impact of the Great East Japan Earthquake on the network of Japanese suppliers, Saito (2012) observes that the extent to which Japan's firms actually were affected differed substantially according to their location in the East or the West of Japan. Accounting only for major supply links and allowing for up to two intermediary firms, the faction of (potentially) affected firms amounts to 54% in Tôhoku and 30% in Hokkaidô, but only to 14% – 17% in the rest of Japan, which is compatible with a *dual* (business) network structure that fenced West-Japanese firms against negative spillovers from the East.

Focussing on inter- rather than intra-national trade, Eaton and Kortum (2002) find that Japan, despite its relative remoteness, belonged to one of the most open economies in their sample. Following the argumentation of Wolf (2009), who uses historical intra-German trade data from 1885 to 1933 to show that external disintegration over this period led to a deeper internal trade integration among German regions, Japan's outstanding openness might thus as well be interpreted as a sign for lacking internal trade integration due to the east-west bias in intra-Japanese trade.

Finally, it should be noted that clustered network structures are not a Japan-specific singularity. Whether the specific geography of intra-national trade flows in other settings can be linked to (potentially) more complex multi-polar network structures, and to what extent these structures represent a challenge to economic integration within and between countries is left for future research.

References

Anderson, J. E. (1979): "A Theoretical Foundation for the Gravity Equation," *American Economic Review*, 69(1), 106–16.

Anderson, J. E. (2011): "The Gravity Model," *Annual Review of Economics*, 3(1), 133–60.

Anderson, J. E., and E. van Wincoop (2003): "Gravity with Gravitas: A Solution to the Border Puzzle," *American Economic Review*, 93(1), 170–92.

——— (2004): "Trade Costs," *Journal of Economic Literature*, 42(3), 691–751.

Anderson, J. E., and Y. V. Yotov (2010): "The Changing Incidence of Geography," *American Economic Review*, 100(5), 2157–86.

Anderson, S. P., A. DePalma, and J.-F. Thisse (1992): *Discrete Choice Theory of Product Differentiation*. MIT Pr., Cambridge, Mass. [u.a.].

Arkolakis, C., A. Costinot, and A. Rodriguez-Clare (2012): "New Trade Models, Same Old Gains?," *American Economic Review*, 102(1), 94–130.

Autor, D. H., and D. Dorn (2013): "The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market," *American Economic Review*, 103(5), 1553–97.

Autor, D. H., D. Dorn, and G. H. Hanson (2013): "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review*, 103(6), 2121–68.

Baier, S. L., and J. H. Bergstrand (2009): "Bonus vetus OLS: A Simple Method for Approximating International Trade-cost Effects Using the Gravity Equation," *Journal of International Economics*, 77(1), 77–85.

Ball, R. (1980): "The Use and Definition of Travel-to-Work Areas in Great Britain: Some Problems," *Regional Studies*, 14(2), 125–139.

Barro, R. T., and X. Sala-I-Martin (1992): "Regional Growth and Migration: A Japan-United States Comparison," *Journal of the Japanese and International Economies*, 6(4), 312 – 46.

Beasley, W. G. (1960): "Feudal Revenue in Japan at the Time of the Meiji Restoration," *The Journal of Asian Studies*, 19(3), pp. 255–72.

Carrington, W. J., E. Detragiache, and T. Vishwanath (1996): "Migration with Endogenous Moving Costs," *American Economic Review*, 86(4), 909–30.

Chen, N. (2004): "Intra-national versus International Trade in the European Union: Why Do National Borders Matter?," *Journal of International Economics*, 63(1), 93–118.

Chen, N., and D. Novy (2011): "Gravity, Trade Integration, and Heterogeneity across Industries," *Journal of International Economics*, 85(2), 206–21.

Combes, P.-P., M. Lafourcade, and T. Mayer (2005): "The Trade-creating Effects of Business and Social Networks: Evidence from France," *Journal of International Economics*, 66(1), 1–29.

Costinot, A., and A. Rodriguez-Clare (2015): "Chapter 4 - Trade Theory with Numbers: Quantifying the Consequences of Globalization," in *Handbook of International Economics*, ed. by K. R. Elhanan Helpman, and G. Gopinath, vol. 4 of *Handbook of International Economics*, pp. 197 – 261. Elsevier.

Coughlin, C. C., and D. Novy (2013): "Is the International Border Effect Larger than the Domestic Border Effect? Evidence from US Trade," *CESifo Economic Studies*, 59(2), 249–76.

Cristea, A. D. (2011): "Buyer-seller Relationships in International Trade: Evidence from U.S. States' Exports and Business-Class Travel," *Journal of International Economics*, 84(2), 207–20.

Davis, D. R., and D. E. Weinstein (2002): "Bones, Bombs, and Break Points: The Geography of Economic Activity," *American Economic Review*, 92(5), 1269–1289.

Disdier, A.-C., and K. Head (2008): "The Puzzling Persistence of the Distance Effect on Bilateral Trade," *The Review of Economics and Statistics*, 90(1), 37–48.

Dixit, A. K., and J. E. Stiglitz (1977): "Monopolistic Competition and Optimum Product Diversity," *American Economic Review*, 67(3), 297–308.

Eaton, J., and S. Kortum (2002): "Technology, Geography, and Trade," *Econometrica*, 70(5), 1741–79.

Ellison, G., and E. L. Glaeser (1997): "Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach," *Journal of Political Economy*, 105(5), 889–927.

Enrico, M. (2011): "Chapter 14 - Local Labor Markets*," vol. 4, Part B of *Handbook of Labor Economics*, pp. 1237–313. Elsevier.

Falck, O., S. Heblich, A. Lameli, and J. Südekum (2012): "Dialects, Cultural Identity, and Economic Exchange," *Journal of Urban Economics*, 72(2), 225–39.

Felbermayr, G., and J. Gröschl (2014): "Within U.S. Trade and the Long Shadow of the American Secession," *Economic Inquiry*, 52(1), 382–404.

Felbermayr, G. J., B. Jung, and F. Toubal (2010): "Ethnic Networks, Information, and International Trade: Revisiting the Evidence," *Annales d'Economie et de Statistique*, (97-98), 41–70.

Felbermayr, G. J., and F. Toubal (2010): "Cultural Proximity and Trade," *European Economic Review*, 54(2), 279–93.

Fujita, M., T. Mori, J. V. Henderson, and Y. Kanemoto (2004): "Chapter 65 Spatial Distribution of Economic Activities in Japan and China," in *Cities and Geography*, ed. by J. V. Henderson, and J.-F. Thisse, vol. 4 of *Handbook of Regional and Urban Economics*, pp. 2911 – 77. Elsevier.

Fujita, M., and T. Tabuchi (1997): "Regional Growth in Postwar Japan," *Regional Science and Urban Economics*, 27(6), 643–70.

Garmendia, A., C. Llano, A. Minondo, and F. Requena (2012): "Networks and the Disappearance of the Intranational Home Bias," *Economics Letters*, 116(2), 178–82.

Genc, M., M. Gheasi, P. Nijkamp, and J. Poot (2012): "The Impact of Immigration on International Trade: A Meta-analysis," in *Migration Impact Assessment New Horizons*, ed. by M. S. Peter Nijkamp, Jacques Poot, pp. 301–37. Edward Elgar Publishing, Inc., Cheltenham, UK.

Guiso, L., P. Sapienza, and L. Zingales (2009): "Cultural Biases in Economic Exchange?," *The Quarterly Journal of Economics*, 124(3), 1095–131.

Hall, J. W. (1991): *The Cambridge History of Japan. 4. Early Modern Japan.* Cambridge: Cambridge Univ. Press, Cambridge.

Head, K., and T. Mayer (2000): "Non-Europe: The Magnitude and Causes of Market Fragmentation in the EU," *Review of World Economics (Weltwirtschaftliches Archiv)*, 136(2), 284–314.

——— (2002): "Illusory Border Effects: Distance Mismeasurement Inflates Estimates of Home Bias in Trade," Working Papers 2002-01, CEPII research center.

——— (2004): "Chapter 59 The Empirics of Agglomeration and Trade," in *Cities and Geography*, ed. by J. V. Henderson, and J.-F. Thisse, vol. 4 of *Handbook of Regional and Urban Economics*, pp. 2609 – 69. Elsevier.

——— (2015): "Chapter 3 - Gravity Equations: Workhorse, Toolkit, and Cookbook," in *Handbook of International Economics*, ed. by K. R. Elhanan Helpman, and G. Gopinath, vol. 4 of *Handbook of International Economics*, pp. 131–95. Elsevier.

Head, K., T. Mayer, and J. Ries (2010): "The Erosion of Colonial Trade Linkages after Independence," *Journal of International Economics*, 81(1), 1–14.

Head, K., and J. Ries (1998): "Immigration and Trade Creation: Econometric Evidence from Canada," *Canadian Journal of Economics*, 31(1), 47–62.

——— (2001): "Increasing Returns versus National Product Differentiation as an Explanation for the Pattern of U.S.-Canada Trade," *The American Economic Review*, 91(4), pp. 858–76.

Helliwell, J. F. (1997): "National Borders, Trade and Migration," *Pacific Economic Review*, 2(3), 165–85.

Hertel, T., D. Hummels, M. Ivanic, and R. Keeney (2007): "How Confident Can We Be of CGE-based Assessments of Free Trade Agreements?," *Economic Modelling*, 24(4), 611–35.

Hillberry, R., and D. Hummels (2003): "Intranational Home Bias: Some Explanations," *The Review of Economics and Statistics*, 85(4), 1089–1092.

——— (2008): "Trade Responses to Geographic Frictions: A Decomposition Using Micro-data," *European Economic Review*, 52(3), 527–50.

——— (2013): "Chapter 18 - Trade Elasticity Parameters for a Computable General Equilibrium Model," in *Handbook of Computable General Equilibrium Modeling*, ed. by P. B. Dixon, and D. W. Jorgenson, vol. 1 of *Handbook of Computable General Equilibrium Modeling*, pp. 1213–269. Elsevier.

Hillberry, R. H. (1999): "Explaining the 'Border Effect': What Can We Learn from Disaggregated Commodity Flow Data?," Indiana University Graduate Student Economics Working Paper Series 9802, Indiana University.

——— (2002): "Aggregation Bias, Compositional Change, and the Border Effect," *Canadian Journal of Economics*, 35(3), 517–30.

Hsu, W.-T., T. Mori, and T. E. Smith (2014): "Spatial Patterns and Size Distributions of Cities," KIER Working Papers 882, Kyoto University, Institute of Economic Research.

Hummels, D. (1999): "Toward a Geography of Trade Costs," GTAP Working Papers 1162, Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University.

Kodansha's Encyclopaedia of Japan (1999a): "Kansai Region," in Kodansha's Encyclopaedia of Japan (CD-Rom), Kodansha International: Tokyo.

——— (1999b): "Kanto Region," Kodansha International: Tokyo.

——— (1999c): "Sekisho," Kodansha International: Tokyo.

Krugman, P. (1980): "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review*, 70(5), 950–59.

Lameli, A., V. Nitsch, J. Südekum, and N. Wolf (2015): "Same Same But Different: Dialects and Trade," *German Economic Review*, forthcoming.

Lewer, J. J., and H. Van den Berg (2007a): "Estimating the Institutional and Network Effects of Religious Cultures on International Trade," *Kyklos*, 60(2), 255–77.

——— (2007b): "Religion and International Trade: Does the Sharing of a Religious Culture Facilitate the Formation of Trade Networks?," *American Journal of Economics and Sociology*, 66(4), 765–94.

Manning, A., and B. Petrongolo (2011): "How local are labor markets? Evidence from a spatial job search model," CEPR Discussion Papers 8686, C.E.P.R. Discussion Papers.

Mayer, T., and S. Zignago (2011): "Notes on CEPII's Distances Measures: The GeoDist Database," Working Papers 2011-25, CEPII research center.

McCallum, J. (1995): "National Borders Matter: Canada-U.S. Regional Trade Patterns," *American Economic Review*, 85(3), 615–23.

McDuff, D. (2011): "Demand Substitution across US Cities: Observable Similarity and Home Price Correlation," *Journal of Urban Economics*, 70(1), 1–14.

Millimet, D. L., and T. Osang (2007): "Do State Borders Matter for U.S. Intranational Trade? The Role of History and Internal Migration," *Canadian Journal of Economics*, 40(1), 93–126.

Mori, T., and T. E. Smith (2014): "A Probabilistic Modeling Approach to the Detection of Industrial Agglomerations," *Journal of Economic Geography*, 14(3), 547–88.

——— (2015): "On the Spatial Scale of Industrial Agglomerations," *Journal of Urban Economics*, forthcoming.

Nitsch, V., and N. Wolf (2013): "Tear Down this Wall: On the Persistence of Borders in Trade," *Canadian Journal of Economics*, 46(1), 154–79.

Okubo, T. (2004): "The Border Effect in the Japanese Market: A Gravity Model Analysis," *Journal of the Japanese and International Economies*, 18(1), 1–11.

Onishi, T. (2011): "Mapping the Japanese Language," in *Language Mapping Part II: Maps*, ed. by R. K. Lameli, Alfred, and S. R. (Ed.). De Gruyter Mouton, Berlin, Boston.

Ozimek, A., and D. Miles (2011): "Stata Utilities for Geocoding and Generating Travel Time and Travel Distance Information," *Stata Journal*, 11(1), 106–19.

Poncet, S. (2003): "Measuring Chinese Domestic and International Integration," *China Economic Review*, 14(1), 1 – 21.

——— (2005): "A Fragmented China: Measure and Determinants of Chinese Domestic Market Disintegration," *Review of International Economics*, 13(3), 409–30.

Rauch, J. E. (1999): "Networks versus Markets in International Trade," *Journal of International Economics*, 48(1), 7–35.

Rauch, J. E., and V. Trindade (2002): "Ethnic Chinese Networks In International Trade," *The Review of Economics and Statistics*, 84(1), 116–30.

Redding, S. J., and D. M. Sturm (2008): "The Costs of Remoteness: Evidence from German Division and Reunification," *American Economic Review*, 98(5), 1766–97.

Requena, F., and C. Llano (2010): "The Border Effects in Spain: An Industry-level Analysis," *Empirica*, 37(4), 455–76.

Roback, J. (1982): "Wages, Rents, and the Quality of Life," *Journal of Political Economy*, 90(6), 1257–78.

Ryang, S., and J. Lie (2009): *Diaspora without Homeland: Being Korean in Japan*. University of California Press Berkeley.

Saito, Y. (2012): "The Impact of the Great East Japan Earthquake on Companies in the Non-affected Areas: Structure of the Inter-company Network of Supply Chains and its Implication," Discussion Papers 12020, Research Institute of Economy, Trade and Industry (RIETI).

Santos Silva, J., and S. Tenreyro (2006): "The Log of Gravity," *The Review of Economics and Statistics*, 88(4), 641–58.

——— (2010): "On the Existence of the Maximum Likelihood Estimates in Poisson Regression," *Economics Letters*, 107(2), 310–12.

Simonovska, I., and M. E. Waugh (2014): "The Elasticity of Trade: Estimates and Evidence," *Journal of International Economics*, 92(1), 34–50.

Smith, R. A. (2003): "The Japanese Shinkansen: Catalyst for the Renaissance of Rail," *The Journal of Transport History*, 24(2), 222–37.

Tabuchi, T. (1988): "Interregional Income Differentials and Migration: Their Interrelationships," *Regional Studies*, 22(1), 1–10.

The Economist (2011): "Broken Links," May 31st.

Tokugawa, M., and K. Masanobu (1966): *Introduction to the Linguistic Atlas of Japan*. The National Language Research Institute, Tokyo.

Tolbert, C. M., and M. Sizer (1996): "U.S. Commuting Zones and Labor Market Areas: A 1990 Update," Economic Research Service Staff Paper 9614, U.S. Department of Agriculture.

UNFPA (1981): *Planned Population Distribution for Development: Hokkaido Experience.* United Nations Fund for Population Activities, New York.

Wei, S.-J. (1996): "Intra-National versus International Trade: How Stubborn are Nations in Global Integration?," NBER Working Papers 5531, National Bureau of Economic Research, Inc.

Wolf, H. C. (2000): "Intranational Home Bias in Trade," *The Review of Economics and Statistics*, 82(4), pp. 555–63.

Wolf, N. (2009): "Was Germany Ever United? Evidence from Intra- and International Trade, 1885-1933," *The Journal of Economic History*, 69(03), 846–81.

Yilmazkuday, H. (2012): "Understanding Interstate Trade Patterns," *Journal of International Economics*, 86(1), 158–66.

Yoko, K., S. Mun, N. Yoshihiko, and J. E. Sung (2012): "Determinants of Transport Costs for Inter-regional Trade," Discussion papers 12016, Research Institute of Economy, Trade and Industry (RIETI).

Yotov, Y. V. (2012): "A Simple Solution to the Distance Puzzle in International Trade," *Economics Letters*, 117(3), 794–98.

A Appendix

Figure 10: *The National Commodity Flow Survey (NCFS)*

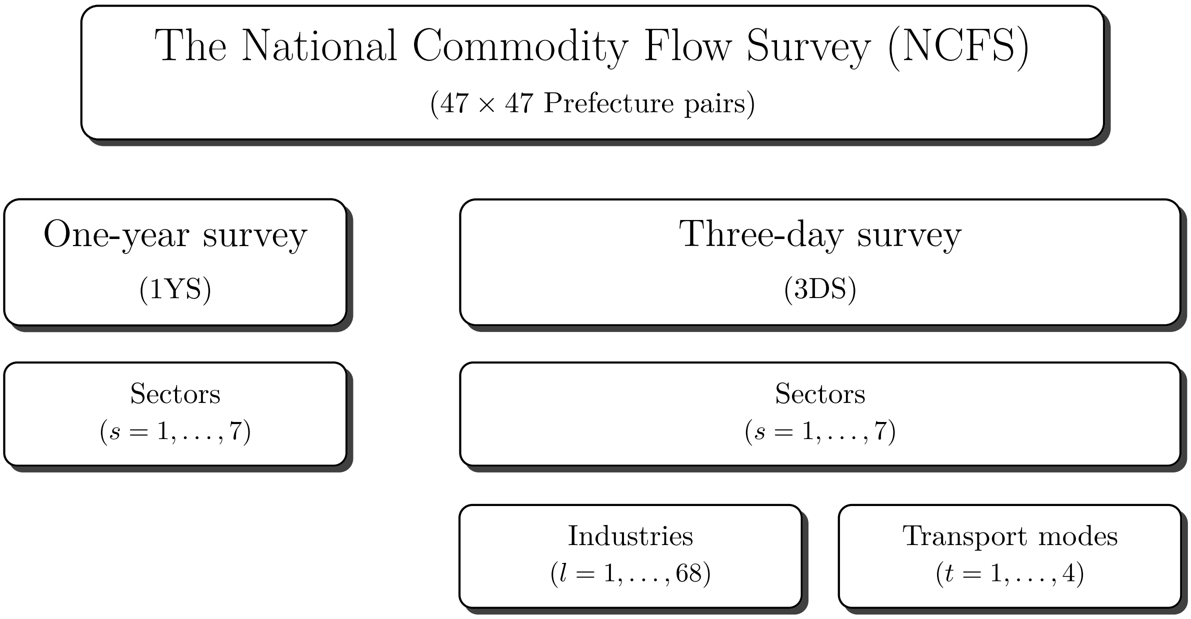


Figure 11: *The Commodity Flow Statistic (CFS)*

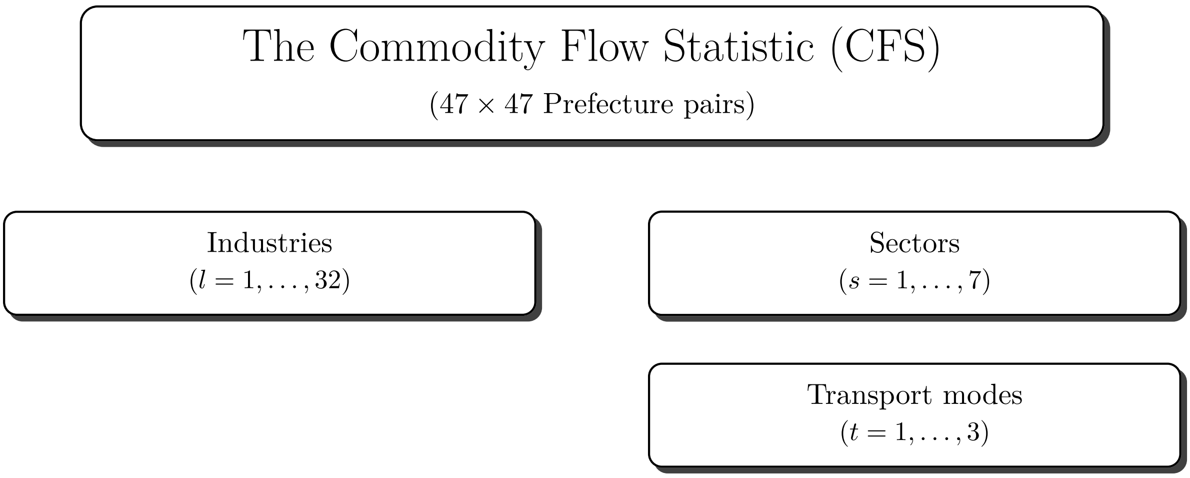


Table 6: *Summary Statistics and Data Sources*

Unit of observation: Pairs of prefectures ($i \times j$)				
Variable	**Year**	**Av.**	**S.D.**	**Data Source**
ln exports$_{ij}$ (1YS: disagg. by sector)	2000, 2005, 2010	11.4396	2.3297	
ln exports$_{ij}$ (3DS: disagg. by industry & transport mode)	2000, 2005, 2010	3.7796	3.1893	National Commodity Flow Survey; Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
ln transport cost$_{ij}$ (3DS: disagg. by transport mode)	2000, 2005, 2010	9.0043	2.4351	
ln exports$_{ij}$ (disagg. by industry & transport mode)	2000-2012	10.2585	2.7236	Commodity Flow Statistic; Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
ln distance$_{ij}$	–	5.9114	0.9381	
Adjacency$_{ij}$	–	0.0806	0.2722	
Prefecture border dummy$_{ij}$	–	0.9787	0.1443	Own computation
Region border dummy$_{ij}$	–	0.8610	0.3459	
Sea border dummy$_{ij}$	–	0.4463	0.4972	
ln number of headquarter-plant links$_{ij}$	2009	4.1930	2.0767	Economic Census; Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC)
ln agg. migration flows$_{ij}$	2005-2009	8.0745	1.6952	Report on Internal Migration in Japan; Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC)
ln agg. migration stocks$_{ij}$	1955-2010	6.5879	1.8311	Historical Statistics of Japan; Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC)
ln commuting flows$_{ij}$	2010	4.1655	2.4721	Population Census; Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC)
ln agg. passenger flows by road$_{ij}$	2005-2009	1.7623	4.5714	
ln agg. passenger flows by rail$_{ij}$	2005-2009	10.4412	4.5798	Passenger Flow Survey; Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
ln agg. passenger flows by air$_{ij}$	2005-2009	1.0362	3.5157	
$\times$ Shinto share$_{ij}$	2010	1744.1770	840.5430	
$\times$ Buddhism share$_{ij}$	2010	1405.1470	457.0423	Religion Yearbook; Agency for Cultural Affairs of the Ministry of Education (MEXT)
$\times$ Christian share$_{ij}$	2010	25.3038	84.1938	
$\times$ Korean share$_{ij}$	2010	0.0472	0.0805	
$\times$ Chinese share$_{ij}$	2010	0.0847	0.0544	
$\times$ Philippine share$_{ij}$	2010	0.0095	0.0100	
$\times$ Thai share$_{ij}$	2010	0.0004	0.0008	
$\times$ Indonesian share$_{ij}$	2010	0.0002	0.0003	Population Census; Statistics Bureau of the Ministry of Internal Affairs and Communications (MIC)
$\times$ Vietnamese share$_{ij}$	2010	0.0003	0.0004	
$\times$ UK share$_{ij}$	2010	0.0000	0.0000	
$\times$ US share$_{ij}$	2010	0.0005	0.0009	
$\times$ Brazilian share$_{ij}$	2010	0.0131	0.0420	
$\times$ Peruvian share$_{ij}$	2010	0.0006	0.0022	
$\times$ Trust share$_{ij}$	2010	0.4510	0.0722	Japanese General Social Surveys (JGSS); JGGS Research Center
Fudai versus tozama dummy$_{ij}$	1968	0.4581	0.4983	Own Computation based on Beasley (1960)
Cultural proximity$_{ij}$	1957-1964	0.4110	0.1702	Linguistic Atlas of Japan (LAJ); National Institute for Japanese Language and Linguistics (NINJAL)

The operator $\times$ denotes the product of variables in prefecture i and prefecture j.

Table 7: *The Trade Cost Elasticity*

Dependent variable: Exports from prefecture i to prefecture j						
Survey:	**3DS**					
Data:	**Sectoral**					
Unit:	**Values**					
Model:	**OLS-FE**					
Year:	**2010**	**2005**	**2000**	**2010**	**2005**	**2000**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$1 - \sigma_s$						
Overall	-1.5615^{***}	-1.4899^{***}	-1.5607^{***}			
	(.0508)	(.0568)	(.0643)			
Agriculture				-2.1296^{***}	-1.9394^{***}	-1.7002^{***}
				(.0922)	(.1133)	(.1150)
Forest				-2.8135^{***}	-1.1806^{***}	-1.3821^{***}
				(.3628)	(.1074)	(.1780)
Minerals				-1.3001^{***}	-1.1882^{***}	-1.8177^{***}
				(.1500)	(.1286)	(.0870)
Machinery				-1.5805^{***}	-1.8136^{***}	-2.0229^{***}
				(.1081)	(.1607)	(.1592)
Chemicals				-1.9457^{***}	-1.7865^{***}	-1.3756^{***}
				(.1315)	(.2003)	(.1389)
Manufacturing				-1.0342^{***}	-1.1659^{***}	-1.3505^{***}
				(.05699)	(.06139)	(.07943)
Others				-1.9238^{***}	-3.7871^{***}	-2.4876^{***}
				(.2894)	(.3994)	(.4164)
East-West border dummy$_{ij}$	-0.1906^{***}	-0.2264^{***}	-0.2409^{***}	-0.1670^{***}	-0.1978^{***}	-0.2459^{***}
	(0.0488)	(0.0500)	(0.0465)	(0.0487)	(0.0494)	(0.0464)
ln distance$_{ij}$	-0.8035^{***}	-0.8798^{***}	-0.9033^{***}	-0.8056^{***}	-0.8652^{***}	-0.8840^{***}
	(0.0543)	(0.0522)	(0.0483)	(0.0534)	(0.0514)	(0.0478)
Adjacency$_{ij}$	0.7048^{***}	0.6515^{***}	0.6374^{***}	0.6865^{***}	0.6632^{***}	0.6344^{***}
	(0.0869)	(0.0842)	(0.0806)	(0.0857)	(0.0832)	(0.0800)
Prefecture border dummy$_{ij}$	-2.6488^{***}	-2.6281^{***}	-2.4630^{***}	-2.6104^{***}	-2.6693^{***}	-2.4744^{***}
	(0.2366)	(0.2509)	(0.2186)	(0.2329)	(0.2458)	(0.2189)
Region border dummy$_{ij}$	-0.2449^{***}	-0.2452^{***}	-0.1660^{**}	-0.2471^{***}	-0.2369^{***}	-0.1619^{**}
	(0.08083	(0.0759)	(0.0740)	(0.0799)	(0.0744)	(0.0733)
Sea border dummy$_{ij}$	-0.3253^{***}	-0.3738^{***}	-0.2093^{***}	-0.3025^{***}	-0.3536^{***}	-0.2142^{***}
	(0.0842)	(0.0815)	(0.0730)	(0.0827)	(0.0804)	(0.0730)
Fixed effects:						
Exporter × sector ($i \times s$)	✓	-✓	✓	✓	✓	✓
Importer × sector ($j \times s$)	✓	✓	✓	✓	✓	✓
Summary statistics:						
Number of observations	10,713	10,343	10,590	10,713	10,343	10,590
R^2	.7699	.7753	.7728	.7644	.7802	.7749

Robust standard errors clustered at the sector level; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: *Predicted Consumption Gains at the Prefecture Level*

	$\widehat{C}_j^A$			$\widehat{C}_j$		
ε	-1.56	-3.19	-4.51	-1.56	-3.19	-4.51
Hokkaidô	1.0467	1.0226	1.0159	0.9457	0.9730	0.9808
Aomori	1.0511	1.0247	1.0174	1.1008	1.0544	1.0401
Iwate	1.1901	1.0888	1.0620	1.0008	0.9893	0.9900
Miyagi	1.0944	1.0451	1.0317	0.9280	0.9635	0.9735
Akita	1.0573	1.0276	1.0194	1.1079	1.0533	1.0370
Yamagata	1.4880	1.2145	1.1474	1.6564	1.2973	1.2064
Fukushima	1.1845	1.0863	1.0603	1.2446	1.1250	1.0899
Ibaraki	1.3138	1.1428	1.0990	1.1657	1.0899	1.0653
Tochigi	1.2440	1.1127	1.0784	1.2343	1.1211	1.0870
Gunma	1.3130	1.1424	1.0988	1.2249	1.1096	1.0774
Saitama	1.4858	1.2137	1.1468	1.0031	1.0037	1.0030
Chiba	1.2216	1.1028	1.0717	1.0964	1.0814	1.0649
Tôkyô	1.3935	1.1762	1.1216	0.7727	0.8774	0.9095
Kanagawa	1.2493	1.1150	1.0800	0.9858	1.0102	1.0110
Niigata	1.1080	1.0514	1.0361	1.0513	1.0271	1.0197
Toyama	1.0518	1.0250	1.0176	1.1891	1.1037	1.0763
Ishikawa	1.0656	1.0315	1.0222	1.1537	1.0811	1.0594
Fukui	1.1220	1.0579	1.0406	1.2612	1.1300	1.0924
Yamanashi	1.0742	1.0356	1.0251	1.1382	1.0715	1.0516
Nagano	1.1185	1.0563	1.0395	1.1440	1.0778	1.0575
Gifu	1.1553	1.0731	1.0512	1.2008	1.1093	1.0810
Shizuoka	1.1933	1.0903	1.0630	1.0493	1.0279	1.0207
Aichi	1.1367	1.0647	1.0453	0.7377	0.8777	0.9158
Mie	1.4208	1.1874	1.1292	1.5030	1.2504	1.1742
Shiga	1.9575	1.3888	1.2615	1.4172	1.1845	1.1240
Kyôto	1.2793	1.1280	1.0889	1.4349	1.2235	1.1591
Ôsaka	1.2733	1.1254	1.0872	0.8207	0.9158	0.9415
Hyôgo	1.2908	1.1329	1.0923	0.9065	0.9600	0.9724
Nara	1.2851	1.1305	1.0906	1.2680	1.1306	1.0903
Wakayama	1.0992	1.0473	1.0333	1.5089	1.2577	1.1822
Tottori	1.1914	1.0894	1.0624	0.9711	0.9672	0.9724
Shimane	1.1255	1.0595	1.0417	1.0402	1.0117	1.0093
Okayama	1.4826	1.2124	1.1459	1.4996	1.2695	1.1944
Hiroshima	1.2352	1.1088	1.0758	1.0460	1.0231	1.0163
Yamaguchi	1.0784	1.0376	1.0264	1.2632	1.1594	1.1194
Tokushima	1.1033	1.0493	1.0346	1.3920	1.1977	1.1388
Kagawa	1.2731	1.1253	1.0871	1.3384	1.1665	1.1186
Ehime	1.1403	1.0663	1.0464	1.1413	1.0719	1.0517
Kôchi	1.0929	1.0444	1.0312	1.0043	0.9938	0.9921
Fukuoka	1.1973	1.0920	1.0643	0.7798	0.8913	0.9240
Saga	1.3014	1.1375	1.0954	1.2518	1.1147	1.0799
Nagasaki	1.3564	1.1608	1.1112	0.9940	0.9715	0.9742
Kumamoto	1.3625	1.1633	1.1129	1.1883	1.0807	1.0549
Ôita	1.1536	1.0724	1.0507	1.2777	1.1434	1.1033
Miyazaki	1.1908	1.0891	1.0623	1.1297	1.0571	1.0384
Kagoshima	1.1281	1.0607	1.0426	1.3338	1.1648	1.1124
Okinawa	1.0480	1.0232	1.0163	0.6583	0.7871	0.8349
Overall	1.2508	1.1139	1.0789	1.0279	1.0168	1.0123

Table 9: *The East-West Border Effect in 2000, 2005, and 2010*

Dependent variable: Exports from prefecture i to prefecture j							
Survey:	**1YS**		**3DS**				
Data:	**Aggregated**		**Aggregated**				**Sectoral**
Unit:	**Quantities**		**Quantities**		**Values**		**Quantities**
Model:	**OLS-FE**	**PPML-FE**	**OLS-FE**	**PPML-FE**	**OLS-FE**	**PPML-FE**	**PPML-FE**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Year: 2010							
East-West border dummy$_{ij}$	-0.7188^{***}	-0.3956^{***}	-0.5395^{***}	-0.3601^{***}	-0.5661^{***}	-0.2631^{*}	-0.3255^{***}
	(.0487)	(.1130)	(.0542)	(.1173)	(.0619)	(.1392)	(.0498)
Summary statistics:							
Number of observations	2,207	2,209	2,199	2,209	2,199	2,209	109,104
(Pseudo) R^2	.8287	.9367	.8914	.9494	.7944	.9766	.8839
Year: 2005							
East-West border dummy$_{ij}$	-0.6090^{***}	-0.4334^{***}	-0.5503^{***}	-0.4010^{***}	-0.6876^{***}	-0.2484	-0.4495^{***}
	(.0544)	(.0876)	(.0574)	(.1043)	(.0640)	(.1740)	(.1225)
Summary statistics:							
Number of observations	2,207	2,209	2,203	2,209	2,203	2,209	111,281
(Pseudo) R^2	.8206	.9313	.8373	.9382	.8091	.9611	.8815
Year: 2000							
East-West border dummy$_{ij}$	-0.8117^{***}	-0.5216^{***}	-0.9525^{***}	-0.5656^{***}	-0.7983^{***}	-0.4704^{***}	-0.5711^{***}
	(.0479)	(.0962)	(.0593)	(.1053)	(.0608)	(.1342)	(.0754)
Summary statistics:							
Number of observations	2,200	2,209	2,191	2,209	2,176	2,209	113,043
(Pseudo) R^2	.8116	.9369	.7807	.9589	.7843	.9599	.9249
Fixed effects:							
Exporter (i)	✓	✓	✓	✓	✓	✓	✗
Importer (j)	✓	✓	✓	✓	✓	✓	✗
Exporter × Sector ($i \times s$)	✗	✗	✗	✗	✗	✗	✓
Importer × Sector ($j \times s$)	✗	✗	✗	✗	✗	✗	✓

Robust standard errors (in Specification (7) clustered at the industry level); significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 10: *The East-West Border Effect Sector by Sector for 2000, 2005, & 2010*

Dependent variable: Exports in tons from prefecture i to prefecture j							
Survey:	**1YS**						
Unit:	**Quantities**						
Model:	**PPML-FE**						
Sector:	**Agriculture**	**Forest**	**Minerals**	**Machinery**	**Chemical**	**Manufact.**	**Others**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Year: 2010							
East-West border dummy$_{ij}$	-0.7704^{***}	-0.6547^{*}	-0.3341	-0.3132^{***}	-0.3825^{**}	-0.4143^{***}	-0.5248^{***}
	(.1528)	(.3819)	(.3815)	(.0954)	(.1796)	(.1021)	(.1299)
Summary statistics:							
Number of observations	2,209	2,162	2,209	2,209	2,209	2,209	2,209
Pseudo R^2	.9581	.9732	.9627	.9544	.9587	.9216	.7659
Year: 2005							
East-West border dummy$_{ij}$	-0.9571^{***}	-1.0140^{***}	-0.5832	-0.3146^{***}	-0.4963^{***}	-0.4860^{***}	-0.4452^{***}
	(.1412)	(.3154)	(.4238)	(.0833)	(.1317)	(.0831)	(.1003)
Summary statistics:							
Number of observations	2,209	2,209	2,209	2,209	2,209	2,209	2,209
Pseudo R^2	.9654	.8107	.9664	.9228	.9386	.8931	.9102
Year: 2000							
East-West border dummy$_{ij}$	-0.2811	0.4489^{*}	-0.9214^{***}	-0.3725^{***}	-0.4079^{***}	-0.3139^{***}	-0.3676^{***}
	(.1808)	(.2670)	(.2903)	(.0852)	(.1226)	(.0921)	(.0867)
Summary statistics:							
Number of observations	2,209	2,209	2,209	2,209	2,209	2,209	2,209
Pseudo R^2	.9228	.9357	.9824	0.9438	0.9610	0.9158	0.9003
Fixed effects:							
Exporter (i)	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓

Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11: *The East-West Border Effect by Transportation Mode for 2000, 2005, and 2010*

Dependent variable: Exports from prefecture i to prefecture j					
Survey:	**3DS**				
Data:	**Sectoral**				
Unit:	**Quantities**				
Model:	**PPML-FE**				
Transportation mode:	**all**	**rail**	**road**	**sea**	**air**
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Year: 2010					
East-West border dummy$_{ij}$	-0.4723^{***}	0.5982^{**}	-0.4260^{***}	-0.2946	0.1895
	(.0858)	(.2781)	(.0359)	(.3077)	(.3112)
Summary statistics:					
Number of observations	33,614	7,345	15,416	5,211	5,193
(Pseudo) R^2	.8941	.8046	.9188	.4413	.6045
Year: 2005					
East-West border dummy$_{ij}$	-0.5678^{***}	0.3009^{**}	-0.3548^{***}	-0.7837^{*}	-0.1737
	(.1653)	(.1307)	(.0972)	(.4079)	(.2284)
Summary statistics:					
Number of observations	34,241	7,497	15,463	5,456	5,825
(Pseudo) R^2	.9041	.8901	.9339	.4444	.4111
Year: 2000					
East-West border dummy$_{ij}$	-0.3169^{***}	-0.3869^{***}	-0.0939	-0.7596^{***}	-0.2338
	(.0457)	(.0357)	(.0907)	(.1960)	(.3395)
Summary statistics:					
Number of observations	36,250	7,775	15,463	6,064	6,948
(Pseudo) R^2	.9405	.6896	.9609	.5706	.6872
Fixed effects:					
Exporter×Sector ($i \times s$)	✗	✓	✓	✓	✓
Importer×Sector ($j \times s$)	✗	✓	✓	✓	✓
Exporter×Sector×Transport mode ($i \times s \times t$)	✓	✗	✗	✗	✗
Importer×Sector×Transport mode ($j \times s \times t$)	✓	✗	✗	✗	✗

Robust standard errors clustered at the industry level; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12: *Robustness Checks: Transportation Cost*

Dependent variable: Exports in tons from prefecture i to prefecture j								
Year:	**2010**							
Survey:	**1YS**							
Unit:	**Quantities**							
Model:	**OLS-FE**							
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
East-West border dummy$_{ij}$	-0.7188^{***}	-0.3313^{***}	-0.4329^{***}	-0.3178^{***}	-0.3942^{***}	-0.1818^{***}	-0.2942^{***}	-0.2832^{***}
	(.0487)	(.0557)	(.0514)	(.0529)	(.0527)	(.0548)	(.0532)	(.0571)
ln transport cost$_{ij}$	-0.5238^{***}		-0.5167^{***}		-0.5377^{***}			
	(.0426)		(.0294)		(.0303)			
ln distance$_{ij}$		-1.0827^{***}		-1.1818^{***}		-1.3508^{***}		
		(.0579)		(.0580)		(.0568)		
ln travel time$_{ij}$							-1.3796^{***}	
							(.0592)	
Within 250 - 500 km								-0.7817^{***}
								(.0580)
Within 500 - 1000 km								-1.5872^{***}
								(.0789)
Within 1000 - 2000 km								-2.6022^{***}
								(.1640)
More than 2000 km								-4.5850^{***}
								(.5950)
Adjacency$_{ij}$	1.0743^{***}	0.5182^{***}	0.7359^{***}	0.4511^{***}	0.7225^{***}	0.3566^{***}	0.4406^{***}	0.9784^{***}
	(.0895)	(.0897)	(.0844)	(.0878)	(.0842)	(.0861)	(.0854)	(.0856)
Prefecture border dummy$_{ij}$	-3.6356^{***}	-1.7584^{***}	-2.3636^{***}	-1.5071^{***}	-2.7631^{***}	-2.3030^{***}	-1.3230^{***}	-4.1700^{***}
	(.2396)	(.3148)	(.2661)	(.3081)	(.2419)	(.2455)	(.2919)	(.2222)
Region border dummy$_{ij}$	-0.5619^{***}	-0.1401	-0.2952^{***}	-0.09520	-0.3153^{***}	-0.1002	-0.04854	-0.5019^{***}
	(.0846)	(.0852)	(.0808)	(.0826)	(.0803)	(.0804)	(.0794)	(.0807)
Sea border dummy$_{ij}$	-0.5937^{***}	-0.4185^{***}	-0.4379^{***}	-0.4292^{***}	-0.3851^{***}	-0.2807^{***}	-0.3315^{***}	-0.2377^{***}
	(.0856)	(.0893)	(.0834)	(.0878)	(.0819)	(.0812)	(.0858)	(.0822)
Fixed effects:								
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:								
Number of observations	2,207	2,207	2,207	2,207	2,207	2,207	2,207	2,207
R^2	.8287	.8357	.8425	.8396	.8438	.8438	.8415	.8386

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 13: *In Search for Explanations of the Intra-Japanese East-West Border Effect*

Dependent variable: Exports in tons from prefecture i to prefecture j											
Year:	**2010**										
Survey:	**1YS**										
Unit:	**Quantities**										
Model:	**OLS-FE**										
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
East-West border dummy$_{ij}$	-0.7188^{***}	-0.3892^{***}	-0.0610	-0.3558^{***}	-0.4686^{***}	-0.7082^{***}	-0.7181^{***}	-0.7149^{***}	-0.7156^{***}	-0.4626^{***}	-0.0385
	(.0487)	(.0479)	(.0507)	(.0486)	(.0523)	(.0484)	(.0486)	(.0490)	(.0489)	(.0523)	(.0511)
Business networks:											
ln number of headquarter-plant links$_{ij}$		0.7312^{***}									0.2998^{***}
		(.0394)									(.0594)
Social networks:											
ln agg. migration flows (2005-2009)$_{ij}$			0.9323^{***}								0.4234^{***}
			(.0377)								(.0702)
ln commuting flows (2010)$_{ij}$				0.4613^{***}							0.1380^{***}
				(.0240)							(.0332)
ln agg. passenger flows by road (2005-2009)$_{ij}$					0.0254^{***}						-0.0106^{*}
					(.0066)						(.0061)
ln agg. passenger flows by rail (2005-2009)$_{ij}$					0.1056^{***}						0.0029
					(.0121)						(.0126)
ln agg. passenger flows by air (2005-2009)$_{ij}$					0.0474^{***}						0.0166^{**}
					(.0082)						(.0065)
Coethnic networks:											
× Korean share$_{ij}$						-2.3841^{***}					-1.4639^{***}
						(.3719)					(.3454)
× Chinese share$_{ij}$						-4.0124^{***}					0.3181
						(1.5153)					(1.3561)
Religious networks:											
× Shintoism share$_{ij}$							0.0001				-0.0001
							(.0002)				(.0001)
× Buddhism share$_{ij}$							-0.0004^{*}				-0.0001
							(.0002)				(.0002)
× Christian share$_{ij}$							0.0041				-0.0014
							(.0049)				(.0037)
Bilateral trust:											
× Trust share$_{ij}$								6.7061^{*}			-2.9383
								(4.0205)			(3.4190)
Historical controls:											
Fudai vs. tozama dummy$_{ij}$									0.0312		0.0135^{***}
									(.0439)		(.0412)
Cultural proximity$_{ij}$										4.9766^{***}	2.1379^{***}
										(.3436)	(.4234)
Geographic controls:											
ln transport cost$_{ij}$	-0.5238^{***}	-0.3564^{***}	-0.3086^{***}	-0.3884^{***}	-0.4346^{***}	-0.5229^{***}	-0.5240^{***}	-0.5237^{***}	-0.5240^{***}	-0.4337^{***}	-0.2724^{***}
	(.0426)	(.0385)	(.0399)	(.0411)	(.0408)	(.0429)	(.0428)	(.0426)	(.0426)	(.0402)	(.0375)
Adjacency$_{ij}$	1.0743^{***}	0.1264	0.06565	-0.3386^{***}	0.6878^{***}	1.1383^{***}	1.0662^{***}	1.0721^{***}	1.0731^{***}	0.5954^{***}	-0.3130^{***}
	(.0895)	(.0810)	(.0765)	(.1028)	(.0894)	(.0905)	(.0900)	(.0897)	(.0897)	(.0853)	(.0881)
Prefecture border dummy$_{ij}$	-3.6356^{***}	-1.0795^{***}	-1.2485^{***}	-0.7583^{***}	-2.2727^{***}	-3.7731^{***}	-3.6689^{***}	-3.5960^{***}	-3.6406^{***}	-1.3517^{***}	0.3108
	(.2396)	(.1985)	(.2004)	(.2385)	(.2514)	(.2290)	(.2400)	(.2408)	(.2399)	(.2695)	(.2334)
Region border dummy$_{ij}$	-0.5619^{***}	-0.0735	-0.0199	-0.0248	-0.4837^{***}	-0.6105^{***}	-0.5632^{***}	-0.5613^{***}	-0.5729^{***}	-0.1255	0.1903^{***}
	(.0846)	(.0711)	(.0669)	(.0779)	(.0778)	(.0860)	(.0846)	(.0848)	(.0865)	(.0798)	(.0690)
Sea border dummy$_{ij}$	-0.5937^{***}	-0.1460^{**}	-0.3273^{***}	-0.4372^{***}	-0.3576^{***}	-0.6161^{***}	-0.5949^{***}	-0.6001^{***}	-0.5950^{***}	-0.5090^{***}	-0.2252^{***}
	(.0856)	(.0741)	(.0780)	(.0784)	(.0870)	(.0854)	(.0858)	(.0857)	(.0858)	(.0787)	(.0754)
Fixed effects:											
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:											
Number of observations	2,207	2,207	2,207	2,207	2,207	2,207	2,207	2,207	2,207	2,207	2,207
R^2	.8287	.8634	.8673	.8535	.8411	.8317	.8292	.8289	.8287	.8443	.8773

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 14: *Cultural Proximity between Japanese Prefectures*

	1. Hokkaidô	2. Aomori	3. Iwate	4. Miyagi	5. Akita	6. Yamagata	7. Fukushima	8. Ibaraki	9. Tochig	10. Gumma	11. Saitama	12. Chiba	13. Tôkyô	14. Kanagawa	15. Niigata	16. Toyama	17. Ishikawa	18. Fukui	19. Yamanashi	20. Nagano	21. Gifu	22. Shizuoka	23. Aichi
1. Hokkaidô	1.0	.32	.39	.42	.33	.44	.56	.54	.64	.57	.63	.55	.64	.62	.54	.43	.46	.55	.62	.64	.53	.59	.53
2. Aomori	.32	1.0	.44	.37	.57	.39	.31	.30	.27	.22	.23	.23	.23	.23	.24	.23	.23	.20	.24	.25	.19	.21	.21
3. Iwate	.39	.44	1.0	.55	.56	.55	.43	.42	.33	.29	.30	.32	.29	.28	.33	.22	.22	.24	.31	.31	.23	.27	.24
4. Miyagi	.42	.37	.55	1.0	.43	.54	.51	.47	.42	.33	.35	.38	.35	.36	.34	.24	.25	.28	.37	.35	.26	.31	.27
5. Akita	.33	.57	.56	.43	1.0	.50	.34	.33	.28	.25	.26	.30	.24	.25	.26	.19	.19	.20	.27	.28	.20	.22	.21
6. Yamagata	.44	.39	.55	.54	.50	1.0	.49	.43	.39	.33	.37	.35	.35	.33	.36	.26	.27	.30	.35	.38	.28	.33	.28
7. Fukushima	.56	.31	.43	.51	.34	.49	1.0	.68	.69	.57	.62	.55	.60	.60	.52	.36	.39	.44	.55	.58	.44	.53	.45
8. Ibaraki	.54	.30	.42	.47	.33	.43	.68	1.0	.71	.57	.62	.54	.60	.59	.50	.33	.36	.43	.51	.54	.42	.50	.46
9. Tochigi	.64	.27	.33	.42	.28	.39	.69	.71	1.0	.72	.80	.65	.77	.72	.54	.40	.43	.49	.66	.67	.51	.64	.56
10. Gumma	.57	.22	.29	.33	.25	.33	.57	.57	.72	1.0	.77	.62	.70	.67	.57	.40	.42	.48	.65	.68	.54	.62	.57
11. Saitama	.63	.23	.30	.35	.26	.37	.62	.62	.80	.77	1.0	.68	.83	.76	.55	.43	.44	.53	.66	.68	.55	.66	.58
12. Chiba	.55	.23	.32	.38	.30	.35	.55	.54	.65	.62	.68	1.0	.68	.70	.51	.36	.38	.45	.60	.57	.46	.58	.53
13. Tôkyô	.64	.23	.29	.35	.24	.35	.60	.60	.77	.70	.83	.68	1.0	.85	.51	.45	.47	.53	.70	.67	.58	.71	.60
14. Kanagawa	.62	.23	.28	.36	.25	.33	.60	.59	.72	.67	.76	.70	.85	1.0	.50	.44	.45	.53	.70	.68	.56	.72	.59
15. Niigata	.54	.24	.33	.34	.26	.36	.52	.50	.54	.57	.55	.51	.51	.50	1.0	.46	.49	.48	.51	.56	.46	.50	.48
16. Toyama	.43	.23	.22	.24	.19	.26	.36	.33	.40	.40	.43	.36	.45	.44	.46	1.0	.80	.57	.44	.42	.49	.45	.41
17. Ishikawa	.46	.23	.22	.25	.19	.27	.39	.36	.43	.42	.44	.38	.47	.45	.49	.80	1.0	.64	.46	.43	.50	.45	.43
18. Fukui	.55	.20	.24	.28	.20	.30	.44	.43	.49	.48	.53	.45	.53	.53	.48	.57	.64	1.0	.51	.49	.56	.50	.48
19. Yamanashi	.62	.24	.31	.37	.27	.35	.55	.51	.66	.65	.66	.60	.70	.70	.51	.44	.46	.51	1.0	.70	.55	.69	.60
20. Nagano	.64	.25	.31	.35	.28	.38	.58	.54	.67	.68	.68	.57	.67	.68	.56	.42	.43	.49	.70	1.0	.56	.66	.57
21. Gifu	.53	.19	.23	.26	.20	.28	.44	.42	.51	.54	.55	.46	.58	.56	.46	.49	.50	.56	.55	.56	1.0	.60	.62
22. Shizuoka	.59	.21	.27	.31	.22	.33	.53	.50	.64	.62	.66	.58	.71	.72	.50	.45	.45	.50	.69	.66	.60	1.0	.68
23. Aichi	.53	.21	.24	.27	.21	.28	.45	.46	.56	.57	.58	.53	.60	.59	.48	.41	.43	.48	.60	.57	.62	.68	1.0
24. Mie	.55	.20	.25	.28	.21	.30	.43	.42	.50	.51	.51	.47	.52	.50	.49	.46	.53	.59	.52	.49	.58	.55	.57
25. Shiga	.54	.20	.25	.27	.20	.26	.43	.41	.48	.48	.49	.47	.55	.54	.43	.48	.55	.64	.53	.52	.57	.56	.50
26. Kyôto	.55	.21	.26	.29	.22	.27	.41	.39	.48	.47	.49	.45	.50	.50	.43	.43	.48	.61	.49	.48	.53	.53	.48
27. Ôsaka	.53	.19	.25	.25	.21	.27	.38	.36	.43	.44	.47	.41	.47	.45	.43	.45	.52	.60	.48	.46	.49	.48	.46
28. Hyôgo	.54	.20	.25	.29	.22	.28	.40	.38	.46	.44	.49	.43	.49	.47	.40	.43	.49	.60	.48	.46	.54	.48	.46
29. Nara	.46	.18	.21	.24	.19	.23	.35	.31	.40	.38	.40	.38	.43	.42	.38	.45	.53	.54	.40	.38	.47	.45	.44
30. Wakayama	.47	.18	.21	.23	.18	.23	.37	.37	.44	.41	.46	.42	.50	.48	.38	.46	.48	.57	.44	.41	.50	.50	.50
31. Tottori	.48	.20	.25	.27	.23	.28	.39	.35	.43	.45	.45	.40	.47	.45	.43	.38	.43	.47	.46	.46	.46	.46	.48
32. Shimane	.44	.21	.25	.25	.22	.25	.38	.35	.42	.43	.43	.42	.45	.44	.42	.33	.37	.42	.39	.42	.43	.44	.46
33. Okayama	.43	.19	.23	.26	.21	.25	.38	.35	.42	.44	.45	.45	.42	.45	.38	.36	.40	.47	.40	.42	.46	.40	.44
34. Hiroshima	.42	.16	.22	.24	.18	.24	.38	.34	.42	.42	.43	.39	.42	.41	.37	.34	.38	.41	.40	.40	.43	.43	.46
35. Yamaguchi	.39	.17	.21	.24	.19	.23	.36	.33	.39	.41	.42	.40	.40	.39	.39	.34	.39	.43	.38	.38	.41	.42	.43
36. Tokushima	.46	.19	.23	.25	.21	.26	.39	.36	.41	.40	.43	.40	.45	.45	.41	.41	.44	.45	.40	.44	.46	.49	.43
37. Kagawa	.47	.17	.20	.22	.19	.22	.34	.32	.38	.38	.41	.36	.42	.41	.43	.40	.45	.50	.39	.39	.46	.44	.45
38. Ehime	.48	.19	.24	.25	.20	.27	.40	.37	.43	.45	.45	.41	.43	.43	.42	.36	.41	.47	.40	.43	.45	.43	.45
39. Kôchi	.46	.17	.23	.25	.19	.25	.36	.35	.40	.38	.42	.38	.43	.43	.37	.32	.37	.45	.41	.42	.40	.42	.41
40. Fukuoka	.45	.16	.21	.26	.20	.24	.38	.38	.42	.45	.44	.43	.47	.46	.41	.37	.41	.45	.42	.43	.47	.47	.48
41. Saga	.28	.14	.18	.19	.18	.16	.23	.21	.28	.30	.28	.28	.29	.30	.29	.25	.26	.28	.26	.27	.27	.28	.28
42. Nagasaki	.35	.18	.22	.24	.21	.23	.30	.30	.34	.36	.36	.36	.34	.35	.36	.31	.33	.33	.32	.33	.33	.33	.35
43. Kumamoto	.33	.18	.20	.21	.21	.18	.28	.28	.32	.33	.34	.33	.33	.32	.34	.31	.34	.36	.30	.31	.33	.31	.33
44. Ôita	.33	.18	.22	.22	.20	.20	.27	.25	.30	.30	.31	.34	.32	.35	.31	.29	.33	.33	.29	.32	.31	.32	.35
45. Miyazaki	.28	.17	.21	.24	.21	.19	.26	.24	.30	.29	.30	.33	.32	.32	.28	.28	.30	.30	.25	.27	.29	.30	.32
46. Kagoshima	.21	.13	.16	.15	.16	.13	.18	.17	.18	.20	.20	.22	.22	.21	.23	.21	.23	.22	.20	.20	.21	.20	.20
47. Okinawa	.09	.07	.09	.07	.08	.06	.07	.08	.09	.08	.09	.10	.09	.09	.11	.08	.10	.08	.08	.08	.08	.08	.08

	24. Mie	25. Shiga	26. Kyôto	27. Ôsaka	28. Hyôgo	29. Nara	30. Wakayama	31. Tottori	32. Shimane	33. Okayama	34. Hiroshima	35. Yamaguchi	36. Tokushima	37. Kagawa	38. Ehime	39. Kôchi	40. Fukuoka	41. Saga	42. Nagasaki	43. Kumamoto	44. Ôita	45. Miyazaki	46. Kagoshima	47. Okinawa
1. Hokkaidô	.55	.54	.55	.53	.54	.46	.47	.48	.44	.43	.42	.39	.46	.47	.48	.46	.45	.28	.35	.33	.33	.28	.21	.09
2. Aomori	.20	.20	.21	.19	.20	.18	.18	.20	.21	.19	.16	.17	.19	.17	.19	.17	.16	.14	.18	.18	.18	.17	.13	.07
3. Iwate	.25	.25	.26	.25	.25	.21	.21	.25	.25	.23	.22	.21	.23	.20	.24	.23	.21	.18	.22	.20	.22	.21	.16	.09
4. Miyagi	.28	.27	.29	.25	.29	.24	.23	.27	.25	.26	.24	.24	.25	.22	.25	.25	.26	.19	.24	.21	.22	.24	.15	.07
5. Akita	.21	.20	.22	.21	.22	.19	.18	.23	.22	.21	.18	.19	.21	.19	.20	.19	.20	.18	.21	.21	.20	.21	.16	.08
6. Yamagata	.30	.26	.27	.27	.28	.23	.23	.28	.25	.25	.24	.23	.26	.22	.27	.25	.24	.16	.23	.18	.20	.19	.13	.06
7. Fukushima	.43	.43	.41	.38	.40	.35	.37	.39	.38	.38	.38	.36	.39	.34	.40	.36	.38	.23	.30	.28	.27	.26	.18	.07
8. Ibaraki	.42	.41	.39	.36	.38	.31	.37	.35	.35	.35	.34	.33	.36	.32	.37	.35	.38	.21	.30	.28	.25	.24	.17	.08
9. Tochigi	.50	.48	.48	.43	.46	.40	.44	.43	.42	.42	.42	.39	.41	.38	.43	.40	.42	.28	.34	.32	.30	.30	.18	.09
10. Gumma	.51	.48	.47	.44	.44	.38	.41	.45	.43	.44	.42	.41	.40	.38	.45	.38	.45	.30	.36	.33	.30	.29	.20	.08
11. Saitama	.51	.49	.49	.47	.49	.40	.46	.45	.43	.45	.43	.42	.43	.41	.45	.42	.44	.28	.36	.34	.31	.30	.20	.09
12. Chiba	.47	.47	.45	.41	.43	.38	.42	.40	.42	.45	.39	.40	.40	.36	.41	.38	.43	.28	.36	.33	.34	.33	.22	.10
13. Tôkyô	.52	.55	.50	.47	.49	.43	.50	.47	.45	.42	.42	.40	.45	.42	.43	.43	.47	.29	.34	.33	.32	.32	.22	.09
14. Kanagawa	.50	.54	.50	.45	.47	.42	.48	.45	.44	.45	.41	.39	.45	.41	.43	.43	.46	.30	.35	.32	.35	.32	.21	.09
15. Niigata	.49	.43	.43	.43	.40	.38	.38	.43	.42	.38	.37	.39	.41	.43	.42	.37	.41	.29	.36	.34	.31	.28	.23	.11
16. Toyama	.46	.48	.43	.45	.43	.45	.46	.38	.33	.36	.34	.34	.41	.40	.36	.32	.37	.25	.31	.31	.29	.28	.21	.08
17. Ishikawa	.53	.55	.48	.52	.49	.53	.48	.43	.37	.40	.38	.39	.44	.45	.41	.37	.41	.26	.33	.34	.33	.30	.23	.10
18. Fukui	.59	.64	.61	.60	.60	.54	.57	.47	.42	.47	.41	.43	.45	.50	.47	.45	.45	.28	.33	.36	.33	.30	.22	.08
19. Yamanashi	.52	.53	.49	.48	.48	.40	.44	.46	.39	.40	.40	.38	.40	.39	.40	.41	.42	.26	.32	.30	.29	.25	.20	.08
20. Nagano	.49	.52	.48	.46	.46	.38	.41	.46	.42	.42	.40	.38	.44	.39	.43	.42	.43	.27	.33	.31	.32	.27	.20	.08
21. Gifu	.58	.57	.53	.49	.54	.47	.50	.46	.43	.46	.43	.41	.46	.46	.45	.40	.47	.27	.33	.33	.31	.29	.21	.08
22. Shizuoka	.55	.56	.53	.48	.48	.45	.50	.46	.44	.40	.43	.42	.49	.44	.43	.42	.47	.28	.33	.31	.32	.30	.20	.08
23. Aichi	.57	.50	.48	.46	.46	.44	.50	.48	.46	.44	.46	.43	.43	.45	.45	.41	.48	.28	.35	.33	.35	.32	.20	.08
24. Mie	1.0	.67	.66	.67	.64	.68	.65	.50	.48	.52	.50	.48	.54	.55	.57	.50	.55	.32	.39	.39	.36	.33	.20	.10
25. Shiga	.67	1.0	.77	.71	.70	.70	.65	.49	.50	.50	.48	.47	.56	.55	.54	.49	.49	.28	.33	.33	.35	.30	.22	.09
26. Kyôto	.66	.77	1.0	.75	.77	.73	.67	.53	.55	.52	.52	.50	.61	.61	.56	.53	.51	.28	.36	.34	.39	.31	.20	.09
27. Ôsaka	.67	.71	.75	1.0	.77	.75	.65	.53	.49	.50	.52	.49	.57	.60	.56	.53	.49	.32	.37	.34	.37	.30	.22	.10
28. Hyôgo	.64	.70	.77	.77	1.0	.70	.63	.56	.54	.59	.55	.52	.59	.60	.57	.55	.53	.30	.37	.33	.36	.31	.22	.09
29. Nara	.68	.70	.73	.75	.70	1.0	.67	.46	.47	.46	.44	.44	.55	.59	.51	.49	.49	.30	.35	.35	.38	.32	.21	.12
30. Wakayama	.65	.65	.67	.65	.63	.67	1.0	.46	.48	.48	.50	.48	.54	.54	.52	.45	.49	.29	.35	.34	.35	.34	.20	.10
31. Tottori	.50	.49	.53	.53	.56	.46	.46	1.0	.68	.62	.61	.56	.49	.50	.53	.44	.48	.31	.37	.37	.41	.35	.26	.10
32. Shimane	.48	.50	.55	.49	.54	.47	.48	.68	1.0	.58	.66	.63	.52	.53	.57	.48	.53	.31	.39	.38	.44	.39	.25	.11
33. Okayama	.52	.50	.52	.50	.59	.46	.48	.62	.58	1.0	.64	.57	.49	.55	.55	.43	.50	.31	.38	.36	.40	.39	.24	.11
34. Hiroshima	.50	.48	.52	.52	.55	.44	.50	.61	.66	.64	1.0	.65	.50	.55	.60	.48	.53	.30	.38	.33	.40	.38	.23	.09
35. Yamaguchi	.48	.47	.50	.49	.52	.44	.48	.56	.63	.57	.65	1.0	.48	.50	.60	.49	.56	.31	.40	.40	.45	.43	.24	.10
36. Tokushima	.54	.56	.61	.57	.59	.55	.54	.49	.52	.49	.50	.48	1.0	.64	.62	.56	.48	.27	.39	.36	.43	.38	.24	.12
37. Kagawa	.55	.55	.61	.60	.60	.59	.54	.50	.53	.55	.55	.50	.64	1.0	.60	.50	.51	.30	.38	.38	.42	.38	.26	.13
38. Ehime	.57	.54	.56	.56	.57	.51	.52	.53	.57	.55	.60	.60	.62	.60	1.0	.66	.58	.35	.44	.42	.47	.43	.26	.13
39. Kôchi	.50	.49	.53	.53	.55	.49	.45	.44	.48	.43	.48	.49	.56	.50	.66	1.0	.48	.33	.38	.37	.40	.34	.24	.10
40. Fukuoka	.55	.49	.51	.49	.53	.49	.49	.48	.53	.50	.53	.56	.48	.51	.58	.48	1.0	.46	.55	.55	.53	.48	.31	.11
41. Saga	.32	.28	.28	.32	.30	.30	.29	.31	.31	.31	.30	.31	.27	.30	.35	.33	.46	1.0	.66	.58	.36	.38	.38	.13
42. Nagasaki	.39	.33	.36	.37	.37	.35	.35	.37	.39	.38	.38	.40	.39	.38	.44	.38	.55	.66	1.0	.67	.48	.50	.34	.13
43. Kumamoto	.39	.33	.34	.34	.33	.35	.34	.37	.38	.36	.33	.40	.36	.38	.42	.37	.55	.58	.67	1.0	.51	.57	.39	.15
44. Ôita	.36	.35	.39	.37	.36	.38	.35	.41	.44	.40	.40	.45	.43	.42	.47	.40	.53	.36	.48	.51	1.0	.60	.32	.15
45. Miyazaki	.33	.30	.31	.30	.31	.32	.34	.35	.39	.39	.38	.43	.38	.38	.43	.34	.48	.38	.50	.57	.60	1.0	.38	.13
46. Kagoshima	.20	.22	.20	.22	.22	.21	.20	.26	.25	.24	.23	.24	.24	.26	.26	.24	.31	.38	.34	.39	.32	.38	1.0	.13
47. Okinawa	.10	.09	.09	.10	.09	.12	.10	.10	.11	.11	.09	.10	.12	.13	.13	.10	.11	.13	.13	.15	.15	.13	.13	1.0

Scale: 0.0 .10 .20 .30 .40 .50 .60 .70 .80 .90 1.0

Table 15: *Agglomeration and the Intra-Japanese East-West Border Effect in 2000*

Dependent variable: Exports in tons from prefecture i to prefecture j									
Survey:	**1YS**								
Unit:	**Quantities**								
Model:	**OLS-FE**								
Year:	**2000**								
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
East-West border dummy$_{ij}$	-0.5053^{**}	-0.5756^{***}	-0.5632^{***}	-0.5066^{**}	-0.4444^{**}	-0.2237	-0.1572	-0.0934	0.0019
	(.2046)	(.2087)	(.2097)	(.2152)	(.2235)	(.2215)	(.2184)	(.2198)	(.2228)
ln agg. migration stocks (1955-1959)$_{ij}$	0.6357^{***}								
	(.0307)								
ln agg. migration stocks (1955-1959)$_{ij}$ × East-West border dummy$_{ij}$	0.0482^{*}								
	(.0252)								
ln agg. migration stocks (1960-1964)$_{ij}$		0.5469^{***}							
		(.0302)							
ln agg. migration stocks (1960-1964)$_{ij}$ × East-West border dummy$_{ij}$		0.0466^{*}							
		(.0241)							
ln agg. migration stocks (1965-1969)$_{ij}$			0.5742^{***}						
			(.0311)						
ln agg. migration stocks (1965-1969)$_{ij}$ × East-West border dummy$_{ij}$			0.0459^{*}						
			(.0236)						
ln agg. migration stocks (1970-1974)$_{ij}$				0.6279^{***}					
				(.0323)					
ln agg. migration stocks (1970-1974)$_{ij}$ × East-West border dummy$_{ij}$				0.0410^{*}					
				(.0239)					
ln agg. migration stocks (1975-1979)$_{ij}$					0.7274^{***}				
					(.0364)				
ln agg. migration stocks (1975-1979)$_{ij}$ × East-West border dummy$_{ij}$					0.0353				
					(.0251)				
ln agg. migration stocks (1980-1984)$_{ij}$						0.7838^{***}			
						(.0366)			
ln agg. migration stocks (1980-1984)$_{ij}$ × East-West border dummy$_{ij}$						0.0106			
						(.0251)			
ln agg. migration stocks (1985-1989)$_{ij}$							0.7682^{***}		
							(.0360)		
ln agg. migration stocks (1985-1989)$_{ij}$ × East-West border dummy$_{ij}$							-0.0013		
							(.0248)		
ln agg. migration stocks (1990-1994)$_{ij}$								0.7979^{***}	
								(.0363)	
ln agg. migration stocks (1990-1994)$_{ij}$ × East-West border dummy$_{ij}$								-0.0080	
								(.0250)	
ln agg. migration stocks (1995-1999)$_{ij}$									0.8876^{***}
									(.0375)
ln agg. migration stocks (1995-1999)$_{ij}$ × East-West border dummy$_{ij}$									-0.0143
									(.0254)
ln transportation cost$_{ij}$	-0.1395^{***}	-0.1687^{***}	-0.1657^{***}	-0.1624^{***}	-0.1528^{***}	-0.1393^{***}	-0.1437^{***}	-0.1372^{***}	-0.1250^{***}
	(.0247)	(.0252)	(.0249)	(.0246)	(.0249)	(.0246)	(.0246)	(.0243)	(.0239)
Adjacency$_{ij}$	0.4157^{***}	0.4966^{***}	0.4839^{***}	0.4519^{***}	0.3565^{***}	0.3017^{***}	0.3329^{***}	0.3247^{***}	0.2465^{***}
	(.0787)	(.0806)	(.0793)	(.0782)	(.0794)	(.0792)	(.0798)	(.0791)	(.0789)
Prefecture border dummy$_{ij}$	-1.8150^{***}	-2.1558^{***}	-2.0771^{***}	-1.8871^{***}	-1.5704^{***}	-1.4131^{***}	-1.4813^{***}	-1.3728^{***}	-1.0483^{***}
	(.2044)	(.2034)	(.1995)	(.1961)	(.2030)	(.2016)	(.1998)	(.1986)	(.2001)
Region border dummy$_{ij}$	-0.3515^{***}	-0.4407^{***}	-0.4256^{***}	-0.3984^{***}	-0.2566^{***}	-0.1971^{***}	-0.1977^{***}	-0.1547^{**}	-0.07791
	(.0689)	(.0695)	(.0686)	(.0679)	(.0684)	(.0682)	(.0692)	(.0689)	(.0685)
Sea border dummy$_{ij}$	-0.2741^{***}	-0.4486^{***}	-0.4583^{***}	-0.4504^{***}	-0.4553^{***}	-0.3864^{***}	-0.3707^{***}	-0.3824^{***}	-0.3353^{***}
	(.0729)	(.0729)	(.0722)	(.0724)	(.0749)	(.0749)	(.0747)	(.0743)	(.0736)
Fixed effects:									
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:									
Number of observations	2,116	2,116	2,116	2,116	2,200	2,200	2,200	2,200	2,200
R^2	.8605	.8557	.8578	.8598	.8491	.8514	.8502	.8518	.8547

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. For Okinawa no migration data available before 1975.

Table 16: *Agglomeration and the Intra-Japanese East-West Border Effect in 2005*

Dependent variable: Exports in tons from prefecture i to prefecture j										
Survey:	**1YS**									
Unit:	**Quantities**									
Model:	**OLS-FE**									
Year:	**2005**									
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
East-West border dummy$_{ij}$	-0.1083	-0.1613	-0.0885	-0.0049	0.2287	0.3916	0.4565*	0.4960**	0.5804**	0.5187**
	(.2155)	(.2247)	(.2262)	(.2307)	(.2405)	(.2407)	(.2409)	(.2432)	(.2476)	(.2493)
ln agg. migration stocks (1955-1959)$_{ij}$	0.6165***									
	(.0311)									
ln agg. migration stocks (1955-1959)$_{ij}$ × East-West border dummy$_{ij}$	0.0125									
	(.0263)									
ln agg. migration stocks (1960-1964)$_{ij}$		0.5482***								
		(.0318)								
ln agg. migration stocks (1960-1964)$_{ij}$ × East-West border dummy$_{ij}$		0.0126								
		(.0257)								
ln agg. migration stocks (1965-1969)$_{ij}$			0.5801***							
			(.0333)							
ln agg. migration stocks (1965-1969)$_{ij}$ × East-West border dummy$_{ij}$			0.0046							
			(.0251)							
ln agg. migration stocks (1970-1974)$_{ij}$				0.6278***						
				(.0349)						
ln agg. migration stocks (1970-1974)$_{ij}$ × East-West border dummy$_{ij}$				-0.0042						
				(.0253)						
ln agg. migration stocks (1975-1979)$_{ij}$					0.7697***					
					(.0384)					
ln agg. migration stocks (1975-1979)$_{ij}$ × East-West border dummy$_{ij}$					-0.0220					
					(.0267)					
ln agg. migration stocks (1980-1984)$_{ij}$						0.8097***				
						(.0388)				
ln agg. migration stocks (1980-1984)$_{ij}$ × East-West border dummy$_{ij}$						-0.0409				
						(.0270)				
ln agg. migration stocks (1985-1989)$_{ij}$							0.8066***			
							(.0392)			
ln agg. migration stocks (1985-1989)$_{ij}$ × East-West border dummy$_{ij}$							-0.0522^{*}			
							(.0270)			
ln agg. migration stocks (1990-1994)$_{ij}$								0.8309***		
								(.0395)		
ln agg. migration stocks (1990-1994)$_{ij}$ × East-West border dummy$_{ij}$								-0.0562^{**}		
								(.0275)		
ln agg. migration stocks (1995-1999)$_{ij}$									0.9085***	
									(.0413)	
ln agg. migration stocks (1995-1999)$_{ij}$ × East-West border dummy$_{ij}$									-0.0625^{**}	
									(.0282)	
ln agg. migration stocks (2000-2004)$_{ij}$										0.9398***
										(.0433)
ln agg. migration stocks (2000-2004)$_{ij}$ × East-West border dummy$_{ij}$										-0.0584^{**}
										(.0286)
ln transportation cost$_{ij}$	-0.4638^{***}	-0.4893^{***}	-0.4737^{***}	-0.4628^{***}	-0.4396^{***}	-0.4309^{***}	-0.4271^{***}	-0.4210^{***}	-0.4067^{***}	-0.4050^{***}
	(.0474)	(.0472)	(.0470)	(.0474)	(.0463)	(.0464)	(.0464)	(.0462)	(.0460)	(.0465)
Adjacency$_{ij}$	0.2488***	0.3054***	0.2919***	0.2703***	0.1278*	0.0892	0.1079	0.1057	0.0416	0.0197
	(.0729)	(.0744)	(.0727)	(.0725)	(.0732)	(.0726)	(.0728)	(.0727)	(.0721)	(.0724)
Prefecture border dummy$_{ij}$	-1.3132^{***}	-1.5767^{***}	-1.5002^{***}	-1.3447^{***}	-0.9283^{***}	-0.8279^{***}	-0.8605^{***}	-0.7719^{***}	-0.4964^{**}	-0.3881^{*}
	(.2123)	(.2104)	(.2074)	(.2063)	(.2178)	(.2182)	(.2165)	(.2166)	(.2197)	(.2262)
Region border dummy$_{ij}$	-0.2873^{***}	-0.3732^{***}	-0.3571^{***}	-0.3340^{***}	-0.2202^{***}	-0.1662^{**}	-0.1634^{**}	-0.1224^{*}	-0.0512	-0.0110
	(.0696)	(.0700)	(.0684)	(.0677)	(.0678)	(.0671)	(.0679)	(.0680)	(.0678)	(.0676)
Sea border dummy$_{ij}$	-0.1718^{**}	-0.3343^{***}	-0.3513^{***}	-0.3488^{***}	-0.3002^{***}	-0.2301^{***}	-0.2112^{***}	-0.2234^{***}	-0.1817^{**}	-0.1751^{**}
	(.0720)	(.0725)	(.0719)	(.0722)	(.0786)	(.0788)	(.0784)	(.0785)	(.0783)	(.0789)
Fixed effects:										
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:										
Number of observations	2,116	2,116	2,116	2,116	2,207	2,207	2,207	2,207	2,207	2,207
R^2	.8588	.8560	.8576	.8585	.8534	.8545	.8544	.8554	.8569	.8564

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. For Okinawa no migration data available before 1975.

Table 17: *Agglomeration and the Intra-Japanese East-West Border Effect in 2010*

Dependent variable: Exports in tons from prefecture i to prefecture j											
Survey:	**1YS**										
Unit:	**Quantities**										
Model:	**OLS-FE**										
Year:	**2010**										
Specification:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
East-West border dummy$_{ij}$	-0.1074	-0.0988	0.0069	0.0236	0.2428	0.4488^{*}	0.4973^{**}	0.5693^{**}	0.6682^{***}	0.6283^{**}	0.6068^{**}
	(.2152)	(.2212)	(.2208)	(.2237)	(.2355)	(.2362)	(.2366)	(.2390)	(.2437)	(.2448)	(.2431)
ln agg. migration stocks (1955-1959)$_{ij}$	0.6364^{***}										
	(.0316)										
ln agg. migration stocks (1955-1959)$_{ij}$ × East-West border dummy$_{ij}$	0.0035										
	(.0262)										
ln agg. migration stocks (1960-1964)$_{ij}$		0.5869^{***}									
		(.0321)									
ln agg. migration stocks (1960-1964)$_{ij}$ × East-West border dummy$_{ij}$		-0.0017									
		(.0253)									
ln agg. migration stocks (1965-1969)$_{ij}$			0.6257^{***}								
			(.0328)								
ln agg. migration stocks (1965-1969)$_{ij}$ × East-West border dummy$_{ij}$			-0.0122								
			(.0246)								
ln agg. migration stocks (1970-1974)$_{ij}$				0.6816^{***}							
				(.0343)							
ln agg. migration stocks (1970-1974)$_{ij}$ × East-West border dummy$_{ij}$				-0.0117							
				(.0245)							
ln agg. migration stocks (1975-1979)$_{ij}$					0.8125^{***}						
					(.0378)						
ln agg. migration stocks (1975-1979)$_{ij}$ × East-West border dummy$_{ij}$					-0.0343						
					(.0262)						
ln agg. migration stocks (1980-1984)$_{ij}$						0.8577^{***}					
						(.0382)					
ln agg. migration stocks (1980-1984)$_{ij}$ × East-West border dummy$_{ij}$						-0.0590^{**}					
						(.0266)					
ln agg. migration stocks (1985-1989)$_{ij}$							0.8585^{***}				
							(.0390)				
ln agg. migration stocks (1985-1989)$_{ij}$ × East-West border dummy$_{ij}$							-0.0678^{**}				
							(.0266)				
ln agg. migration stocks (1990-1994)$_{ij}$								0.8789^{***}			
								(.0394)			
ln agg. migration stocks (1990-1994)$_{ij}$ × East-West border dummy$_{ij}$								-0.0767^{***}			
								(.0268)			
ln agg. migration stocks (1995-1999)$_{ij}$									0.9639^{***}		
									(.0409)		
ln agg. migration stocks (1995-1999)$_{ij}$ × East-West border dummy$_{ij}$									-0.0843^{***}		
									(.0275)		
ln agg. migration stocks (2000-2004)$_{ij}$										1.0078^{***}	
										(.0420)	
ln agg. migration stocks (2000-2004)$_{ij}$ × East-West border dummy$_{ij}$										-0.0822^{***}	
										(.0279)	
ln agg. migration stocks (2005-2009)$_{ij}$											0.9892^{***}
											(.0428)
ln agg. migration stocks (2005-2009)$_{ij}$ × East-West border dummy$_{ij}$											-0.0837^{***}
											(.0281)
ln transportation cost$_{ij}$	-0.3587^{***}	-0.3780^{***}	-0.3711^{***}	-0.3550^{***}	-0.3312^{***}	-0.3164^{***}	-0.3128^{***}	-0.3081^{***}	-0.2936^{***}	-0.2920^{***}	-0.3088^{***}
	(.0367)	(.0365)	(.0361)	(.0359)	(.0388)	(.0388)	(.0384)	(.0386)	(.0386)	(.0388)	(.0397)
Adjacency$_{ij}$	0.2881^{***}	0.3235^{***}	0.2992^{***}	0.2680^{***}	0.1339^{*}	0.0913	0.1051	0.1090	0.0362	0.0009	0.0148
	(.0772)	(.0791)	(.0774)	(.0768)	(.0771)	(.0773)	(.0783)	(.0783)	(.0773)	(.0775)	(.0782)
Prefecture border dummy$_{ij}$	-1.2806^{***}	-1.4822^{***}	-1.3679^{***}	-1.1881^{***}	-0.8007^{***}	-0.6923^{***}	-0.7109^{***}	-0.6355^{***}	-0.3323	-0.1768	-0.2852
	(.2028)	(.2016)	(.1974)	(.1958)	(.2116)	(.2129)	(.2127)	(.2137)	(.2161)	(.2215)	(.2282)
Region border dummy$_{ij}$	-0.2727^{***}	-0.3538^{***}	-0.3296^{***}	-0.3069^{***}	-0.1610^{**}	-0.1013	-0.0969	-0.0540	0.0247	0.0750	0.0420
	(.0689)	(.0689)	(.0670)	(.0666)	(.0691)	(.0693)	(.0698)	(.0702)	(.0694)	(.0694)	(.0694)
Sea border dummy$_{ij}$	-0.3217^{***}	-0.4871^{***}	-0.5031^{***}	-0.4979^{***}	-0.4748^{***}	-0.4052^{***}	-0.3819^{***}	-0.3988^{***}	-0.3549^{***}	-0.3443^{***}	-0.3375^{***}
	(.0745)	(.0745)	(.0736)	(.0739)	(.0779)	(.0777)	(.0774)	(.0774)	(.0769)	(.0772)	(.0783)
Fixed effects:											
Exporter (i)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Importer (j)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Summary statistics:											
Number of observations	2,116	2,116	2,116	2,116	2,207	2,207	2,207	2,207	2,207	2,207	2,207
R^2	.8606	.8593	.8617	.8638	.8657	.8669	.8672	.8677	.8696	.8700	.8678

Robust standard errors; significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. For Okinawa no migration data available before 1975.

PREVIOUS DISCUSSION PAPERS

185 Wrona, Jens, Border Effects without Borders: What Divides Japan's Internal Trade?, May 2015.

184 Amess, Kevin, Stiebale, Joel and Wright, Mike, The Impact of Private Equity on Firms' Innovation Activity, April 2015.

183 Ibañez, Marcela, Rai, Ashok and Riener, Gerhard, Sorting Through Affirmative Action: Three Field Experiments in Colombia, April 2015.

182 Baumann, Florian, Friehe, Tim and Rasch, Alexander, The Influence of Product Liability on Vertical Product Differentiation, April 2015.

181 Baumann, Florian and Friehe, Tim, Proof Beyond a Reasonable Doubt: Laboratory Evidence, March 2015.

180 Rasch, Alexander and Waibel, Christian, What Drives Fraud in a Credence Goods Market? – Evidence From a Field Study, March 2015.

179 Jeitschko, Thomas D., Incongruities of Real and Intellectual Property: Economic Concerns in Patent Policy and Practice, February 2015.
Forthcoming in: Michigan State Law Review.

178 Buchwald, Achim and Hottenrott, Hanna, Women on the Board and Executive Duration – Evidence for European Listed Firms, February 2015.

177 Heblich, Stephan, Lameli, Alfred and Riener, Gerhard, Regional Accents on Individual Economic Behavior: A Lab Experiment on Linguistic Performance, Cognitive Ratings and Economic Decisions, February 2015.
Published in: PLoS ONE, 10 (2015), e0113475.

176 Herr, Annika, Nguyen, Thu-Van and Schmitz, Hendrik, Does Quality Disclosure Improve Quality? Responses to the Introduction of Nursing Home Report Cards in Germany, February 2015.

175 Herr, Annika and Normann, Hans-Theo, Organ Donation in the Lab: Preferences and Votes on the Priority Rule, February 2015.

174 Buchwald, Achim, Competition, Outside Directors and Executive Turnover: Implications for Corporate Governance in the EU, February 2015.

173 Buchwald, Achim and Thorwarth, Susanne, Outside Directors on the Board, Competition and Innovation, February 2015.

172 Dewenter, Ralf and Giessing, Leonie, The Effects of Elite Sports Participation on Later Job Success, February 2015.

171 Haucap, Justus, Heimeshoff, Ulrich and Siekmann, Manuel, Price Dispersion and Station Heterogeneity on German Retail Gasoline Markets, January 2015.

170 Schweinberger, Albert G. and Suedekum, Jens, De-Industrialisation and Entrepreneurship under Monopolistic Competition, January 2015.
Forthcoming in: Oxford Economic Papers.

169 Nowak, Verena, Organizational Decisions in Multistage Production Processes, December 2014.

168 Benndorf, Volker, Kübler, Dorothea and Normann, Hans-Theo, Privacy Concerns, Voluntary Disclosure of Information, and Unraveling: An Experiment, November 2014.
Published in: European Economic Review, 75 (2015), pp. 43-59.

167 Rasch, Alexander and Wenzel, Tobias, The Impact of Piracy on Prominent and Non-prominent Software Developers, November 2014.
Forthcoming in: Telecommunications Policy.

166 Jeitschko, Thomas D. and Tremblay, Mark J., Homogeneous Platform Competition with Endogenous Homing, November 2014.

165 Gu, Yiquan, Rasch, Alexander and Wenzel, Tobias, Price-sensitive Demand and Market Entry, November 2014.
Forthcoming in: Papers in Regional Science.

164 Caprice, Stéphane, von Schlippenbach, Vanessa and Wey, Christian, Supplier Fixed Costs and Retail Market Monopolization, October 2014.

163 Klein, Gordon J. and Wendel, Julia, The Impact of Local Loop and Retail Unbundling Revisited, October 2014.

162 Dertwinkel-Kalt, Markus, Haucap, Justus and Wey, Christian, Raising Rivals' Costs Through Buyer Power, October 2014.
Published in: Economics Letters, 126 (2015), pp.181-184.

161 Dertwinkel-Kalt, Markus and Köhler, Katrin, Exchange Asymmetries for Bads? Experimental Evidence, October 2014.

160 Behrens, Kristian, Mion, Giordano, Murata, Yasusada and Suedekum, Jens, Spatial Frictions, September 2014.

159 Fonseca, Miguel A. and Normann, Hans-Theo, Endogenous Cartel Formation: Experimental Evidence, August 2014.
Published in: Economics Letters, 125 (2014), pp. 223-225.

158 Stiebale, Joel, Cross-Border M&As and Innovative Activity of Acquiring and Target Firms, August 2014.

157 Haucap, Justus and Heimeshoff, Ulrich, The Happiness of Economists: Estimating the Causal Effect of Studying Economics on Subjective Well-Being, August 2014.
Published in: International Review of Economics Education, 17 (2014), pp. 85-97.

156 Haucap, Justus, Heimeshoff, Ulrich and Lange, Mirjam R. J., The Impact of Tariff Diversity on Broadband Diffusion – An Empirical Analysis, August 2014.

155 Baumann, Florian and Friehe, Tim, On Discovery, Restricting Lawyers, and the Settlement Rate, August 2014.

154 Hottenrott, Hanna and Lopes-Bento, Cindy, R&D Partnerships and Innovation Performance: Can There be too Much of a Good Thing?, July 2014.

153 Hottenrott, Hanna and Lawson, Cornelia, Flying the Nest: How the Home Department Shapes Researchers' Career Paths, July 2014.

152 Hottenrott, Hanna, Lopes-Bento, Cindy and Veugelers, Reinhilde, Direct and Cross-Scheme Effects in a Research and Development Subsidy Program, July 2014.

151 Dewenter, Ralf and Heimeshoff, Ulrich, Do Expert Reviews Really Drive Demand? Evidence from a German Car Magazine, July 2014.
Forthcoming in: Applied Economics Letters.

150 Bataille, Marc, Steinmetz, Alexander and Thorwarth, Susanne, Screening Instruments for Monitoring Market Power in Wholesale Electricity Markets – Lessons from Applications in Germany, July 2014.

149 Kholodilin, Konstantin A., Thomas, Tobias and Ulbricht, Dirk, Do Media Data Help to Predict German Industrial Production?, July 2014.

148 Hogrefe, Jan and Wrona, Jens, Trade, Tasks, and Trading: The Effect of Offshoring on Individual Skill Upgrading, June 2014.
Forthcoming in: Canadian Journal of Economics.

147 Gaudin, Germain and White, Alexander, On the Antitrust Economics of the Electronic Books Industry, September 2014 (Previous Version May 2014).

146 Alipranti, Maria, Milliou, Chrysovalantou and Petrakis, Emmanuel, Price vs. Quantity Competition in a Vertically Related Market, May 2014.
Published in: Economics Letters, 124 (2014), pp. 122-126.

145 Blanco, Mariana, Engelmann, Dirk, Koch, Alexander K. and Normann, Hans-Theo, Preferences and Beliefs in a Sequential Social Dilemma: A Within-Subjects Analysis, May 2014.
Published in: Games and Economic Behavior, 87 (2014), pp. 122-135.

144 Jeitschko, Thomas D., Jung, Yeonjei and Kim, Jaesoo, Bundling and Joint Marketing by Rival Firms, May 2014.

143 Benndorf, Volker and Normann, Hans-Theo, The Willingness to Sell Personal Data, April 2014.

142 Dauth, Wolfgang and Suedekum, Jens, Globalization and Local Profiles of Economic Growth and Industrial Change, April 2014.

141 Nowak, Verena, Schwarz, Christian and Suedekum, Jens, Asymmetric Spiders: Supplier Heterogeneity and the Organization of Firms, April 2014.

140 Hasnas, Irina, A Note on Consumer Flexibility, Data Quality and Collusion, April 2014.

139 Baye, Irina and Hasnas, Irina, Consumer Flexibility, Data Quality and Location Choice, April 2014.

138 Aghadadashli, Hamid and Wey, Christian, Multi-Union Bargaining: Tariff Plurality and Tariff Competition, April 2014.
A revised version of the paper is forthcoming in: Journal of Institutional and Theoretical Economics.

137 Duso, Tomaso, Herr, Annika and Suppliet, Moritz, The Welfare Impact of Parallel Imports: A Structural Approach Applied to the German Market for Oral Anti-diabetics, April 2014.
Published in: Health Economics, 23 (2014), pp. 1036-1057.

136 Haucap, Justus and Müller, Andrea, Why are Economists so Different? Nature, Nurture and Gender Effects in a Simple Trust Game, March 2014.

135 Normann, Hans-Theo and Rau, Holger A., Simultaneous and Sequential Contributions to Step-Level Public Goods: One vs. Two Provision Levels, March 2014.
Forthcoming in: Journal of Conflict Resolution.

134 Bucher, Monika, Hauck, Achim and Neyer, Ulrike, Frictions in the Interbank Market and Uncertain Liquidity Needs: Implications for Monetary Policy Implementation, July 2014 (First Version March 2014).

133 Czarnitzki, Dirk, Hall, Bronwyn, H. and Hottenrott, Hanna, Patents as Quality Signals? The Implications for Financing Constraints on R&D?, February 2014.

132 Dewenter, Ralf and Heimeshoff, Ulrich, Media Bias and Advertising: Evidence from a German Car Magazine, February 2014.
Published in: Review of Economics, 65 (2014), pp. 77-94.

131 Baye, Irina and Sapi, Geza, Targeted Pricing, Consumer Myopia and Investment in Customer-Tracking Technology, February 2014.

130 Clemens, Georg and Rau, Holger A., Do Leniency Policies Facilitate Collusion? Experimental Evidence, January 2014.

129 Hottenrott, Hanna and Lawson, Cornelia, Fishing for Complementarities: Competitive Research Funding and Research Productivity, December 2013.

128 Hottenrott, Hanna and Rexhäuser, Sascha, Policy-Induced Environmental Technology and Inventive Efforts: Is There a Crowding Out?, December 2013.
Forthcoming in: Industry and Innovation.

127 Dauth, Wolfgang, Findeisen, Sebastian and Suedekum, Jens, The Rise of the East and the Far East: German Labor Markets and Trade Integration, December 2013.
Published in: Journal of the European Economic Association, 12 (2014), pp. 1643-1675.

126 Wenzel, Tobias, Consumer Myopia, Competition and the Incentives to Unshroud Add-on Information, December 2013.
Published in: Journal of Economic Behavior and Organization, 98 (2014), pp. 89-96.

125 Schwarz, Christian and Suedekum, Jens, Global Sourcing of Complex Production Processes, December 2013.
Published in: Journal of International Economics, 93 (2014), pp. 123-139.

124 Defever, Fabrice and Suedekum, Jens, Financial Liberalization and the Relationship-Specificity of Exports, December 2013.
Published in: Economics Letters, 122 (2014), pp. 375-379.

123 Bauernschuster, Stefan, Falck, Oliver, Heblich, Stephan and Suedekum, Jens, Why Are Educated and Risk-Loving Persons More Mobile Across Regions?, December 2013.
Published in: Journal of Economic Behavior and Organization, 98 (2014), pp. 56-69.

122 Hottenrott, Hanna and Lopes-Bento, Cindy, Quantity or Quality? Knowledge Alliances and their Effects on Patenting, December 2013.
Forthcoming in: Industrial and Corporate Change.

121 Hottenrott, Hanna and Lopes-Bento, Cindy, (International) R&D Collaboration and SMEs: The Effectiveness of Targeted Public R&D Support Schemes, December 2013.
Published in: Research Policy, 43 (2014), pp.1055-1066.

120 Giesen, Kristian and Suedekum, Jens, City Age and City Size, November 2013.
Published in: European Economic Review, 71 (2014), pp. 193-208.

119 Trax, Michaela, Brunow, Stephan and Suedekum, Jens, Cultural Diversity and Plant-Level Productivity, November 2013.

118 Manasakis, Constantine and Vlassis, Minas, Downstream Mode of Competition with Upstream Market Power, November 2013.
Published in: Research in Economics, 68 (2014), pp. 84-93.

117 Sapi, Geza and Suleymanova, Irina, Consumer Flexibility, Data Quality and Targeted Pricing, November 2013.

116 Hinloopen, Jeroen, Müller, Wieland and Normann, Hans-Theo, Output Commitment Through Product Bundling: Experimental Evidence, November 2013.
Published in: European Economic Review, 65 (2014), pp. 164-180.

115 Baumann, Florian, Denter, Philipp and Friehe Tim, Hide or Show? Endogenous Observability of Private Precautions Against Crime When Property Value is Private Information, November 2013.

114 Fan, Ying, Kühn, Kai-Uwe and Lafontaine, Francine, Financial Constraints and Moral Hazard: The Case of Franchising, November 2013.

113 Aguzzoni, Luca, Argentesi, Elena, Buccirossi, Paolo, Ciari, Lorenzo, Duso, Tomaso, Tognoni, Massimo and Vitale, Cristiana, They Played the Merger Game: A Retrospective Analysis in the UK Videogames Market, October 2013.
Published in: Journal of Competition Law and Economics under the title: “A Retrospective Merger Analysis in the UK Videogame Market”, (10) (2014), pp. 933-958.

112 Myrseth, Kristian Ove R., Riener, Gerhard and Wollbrant, Conny, Tangible Temptation in the Social Dilemma: Cash, Cooperation, and Self-Control, October 2013.

111 Hasnas, Irina, Lambertini, Luca and Palestini, Arsen, Open Innovation in a Dynamic Cournot Duopoly, October 2013.
Published in: Economic Modelling, 36 (2014), pp. 79-87.

110 Baumann, Florian and Friehe, Tim, Competitive Pressure and Corporate Crime, September 2013.

109 Böckers, Veit, Haucap, Justus and Heimeshoff, Ulrich, Benefits of an Integrated European Electricity Market, September 2013.

108 Normann, Hans-Theo and Tan, Elaine S., Effects of Different Cartel Policies: Evidence from the German Power-Cable Industry, September 2013.
Published in: Industrial and Corporate Change, 23 (2014), pp. 1037-1057.

107 Haucap, Justus, Heimeshoff, Ulrich, Klein, Gordon J., Rickert, Dennis and Wey, Christian, Bargaining Power in Manufacturer-Retailer Relationships, September 2013.

106 Baumann, Florian and Friehe, Tim, Design Standards and Technology Adoption: Welfare Effects of Increasing Environmental Fines when the Number of Firms is Endogenous, September 2013.

105 Jeitschko, Thomas D., NYSE Changing Hands: Antitrust and Attempted Acquisitions of an Erstwhile Monopoly, August 2013.
Published in: Journal of Stock and Forex Trading, 2 (2) (2013), pp. 1-6.

104 Böckers, Veit, Giessing, Leonie and Rösch, Jürgen, The Green Game Changer: An Empirical Assessment of the Effects of Wind and Solar Power on the Merit Order, August 2013.

103 Haucap, Justus and Muck, Johannes, What Drives the Relevance and Reputation of Economics Journals? An Update from a Survey among Economists, August 2013.
Published in: Scientometrics, 103 (2015), pp. 849-877.

102 Jovanovic, Dragan and Wey, Christian, Passive Partial Ownership, Sneaky Takeovers, and Merger Control, August 2013.
Published in: Economics Letters, 125 (2014), pp. 32-35.

101 Haucap, Justus, Heimeshoff, Ulrich, Klein, Gordon J., Rickert, Dennis and Wey, Christian, Inter-Format Competition Among Retailers – The Role of Private Label Products in Market Delineation, August 2013.

100 Normann, Hans-Theo, Requate, Till and Waichman, Israel, Do Short-Term Laboratory Experiments Provide Valid Descriptions of Long-Term Economic Interactions? A Study of Cournot Markets, July 2013.
Published in: Experimental Economics, 17 (2014), pp. 371-390.

99 Dertwinkel-Kalt, Markus, Haucap, Justus and Wey, Christian, Input Price Discrimination (Bans), Entry and Welfare, June 2013.

98 Aguzzoni, Luca, Argentesi, Elena, Ciari, Lorenzo, Duso, Tomaso and Tognoni, Massimo, Ex-post Merger Evaluation in the UK Retail Market for Books, June 2013.
Forthcoming in: Journal of Industrial Economics.

97 Caprice, Stéphane and von Schlippenbach, Vanessa, One-Stop Shopping as a Cause of Slotting Fees: A Rent-Shifting Mechanism, May 2012.
Published in: Journal of Economics and Management Strategy, 22 (2013), pp. 468-487.

96 Wenzel, Tobias, Independent Service Operators in ATM Markets, June 2013.
Published in: Scottish Journal of Political Economy, 61 (2014), pp. 26-47.

95 Coublucq, Daniel, Econometric Analysis of Productivity with Measurement Error: Empirical Application to the US Railroad Industry, June 2013.

94 Coublucq, Daniel, Demand Estimation with Selection Bias: A Dynamic Game Approach with an Application to the US Railroad Industry, June 2013.

93 Baumann, Florian and Friehe, Tim, Status Concerns as a Motive for Crime?, April 2013.
A revised version of the paper is forthcoming in: International Review of Law and Economics.

92 Jeitschko, Thomas D. and Zhang, Nanyun, Adverse Effects of Patent Pooling on Product Development and Commercialization, April 2013.
Published in: The B. E. Journal of Theoretical Economics, 14 (1) (2014), Art. No. 2013-0038.

91 Baumann, Florian and Friehe, Tim, Private Protection Against Crime when Property Value is Private Information, April 2013.
Published in: International Review of Law and Economics, 35 (2013), pp. 73-79.

90 Baumann, Florian and Friehe, Tim, Cheap Talk About the Detection Probability, April 2013.
Published in: International Game Theory Review, 15 (2013), Art. No. 1350003.

89 Pagel, Beatrice and Wey, Christian, How to Counter Union Power? Equilibrium Mergers in International Oligopoly, April 2013.

88 Jovanovic, Dragan, Mergers, Managerial Incentives, and Efficiencies, April 2014 (First Version April 2013).

87 Heimeshoff, Ulrich and Klein Gordon J., Bargaining Power and Local Heroes, March 2013.

86 Bertschek, Irene, Cerquera, Daniel and Klein, Gordon J., More Bits – More Bucks? Measuring the Impact of Broadband Internet on Firm Performance, February 2013.
Published in: Information Economics and Policy, 25 (2013), pp. 190-203.

85 Rasch, Alexander and Wenzel, Tobias, Piracy in a Two-Sided Software Market, February 2013.
Published in: Journal of Economic Behavior & Organization, 88 (2013), pp. 78-89.

84 Bataille, Marc and Steinmetz, Alexander, Intermodal Competition on Some Routes in Transportation Networks: The Case of Inter Urban Buses and Railways, January 2013.

83 Haucap, Justus and Heimeshoff, Ulrich, Google, Facebook, Amazon, eBay: Is the Internet Driving Competition or Market Monopolization?, January 2013.
Published in: International Economics and Economic Policy, 11 (2014), pp. 49-61.

Older discussion papers can be found online at:
http://ideas.repec.org/s/zbw/dicedp.html

Heinrich-Heine-University of Düsseldorf

Düsseldorf Institute for
Competition Economics (DICE)

Universitätsstraße 1 _ 40225 Düsseldorf
www.dice.hhu.de

ISSN 2190-9938 (online)
ISBN 978-3-86304-184-7