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Town Twinning and German City Growth

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BRAKMAN S., GARRETSEN H. and OUMER A. Town twinning and German city growth, *Regional Studies*. After the Second World War, town twinning became popular, notably in Germany. This was mainly a reaction to the war experience, and it was initially aimed at creating renewed international understanding and cooperation between former enemies. It also reduced transaction costs. The results show that counties that engage in town twinning grow faster than cities that do not have twinning partners. In particular, both the number and the intensity of twinning relations as well as town twinning with French cities positively affect city growth. Positive population growth effects of town twinning are also mostly confined to the larger German cities.

Town twinning German cities Economic integration Population growth

BRAKMAN S., GARRETSEN H. and OUMER A. 城镇配对与德国城市的成长, *区域研究*。第二次世界大战以降, 城镇配对开始盛行, 特别是在德国。这主要是对战争经验的回应, 最初旨在为过往的敌人之间, 创造更新的国际理解与合作, 而此举亦减少了交易成本。研究结果显示, 参与城镇配对的郡县, 较未拥有配对伙伴的城市而言, 成长较为快速。特别的是, 配对关系的数量与程度, 以及与法国城市进行的城镇配对, 正面地影响城市的成长。城镇配对的正向人口成长效应, 亦主要侷限于较大型的德国城市。

城镇配对 德国城市 经济整合 人口成长

BRAKMAN S., GARRETSEN H. et OUMER A. Le jumelage de villes et la croissance urbaine en Allemagne, *Regional Studies*. Suite à la Seconde Guerre mondiale, le jumelage de villes s'est répandu, notamment en Allemagne, ce qui s'expliquait en grande partie par une réaction à l'expérience de la guerre. Dans un premier temps, il visait à créer une meilleure compréhension et une meilleure coopération à l'échelle internationale entre les anciens adversaires. Il réduisait aussi les coûts des transactions. Les résultats laissent voir que les comtés qui s'engagent dans le jumelage se réjouissent d'un taux de croissance plus élevé par rapport aux villes qui ne se sont pas jumelées. En particulier, à la fois le nombre et l'intensité des relations de jumelage ainsi que le jumelage avec des villes françaises influent de façon positive sur le taux de croissance des villes. Les effets positifs de la croissance démographique suite au jumelage se limitent principalement aux plus grandes villes allemandes.

Jumelage de villes Villes allemandes Intégration économique Croissance démographique

BRAKMAN S., GARRETSEN H. und OUMER A. Städtepartnerschaften und das Wachstum deutscher Städte, *Regional Studies*. Städtepartnerschaften wurden nach dem Zweiten Weltkrieg vor allem in Deutschland beliebt. Dies war in erster Linie eine Reaktion auf die Erfahrungen des Krieges und sollte anfangs für erneuertes internationales Verständnis und Zusammenarbeit zwischen den früheren Feinden sorgen. Zugleich verringern sich hierdurch die Transaktionskosten. Aus den Ergebnissen geht hervor, dass Landkreise mit Städtepartnerschaften rascher wachsen als Städte ohne solche Partner. Insbesondere wirken sich sowohl die Anzahl als auch die Intensität der partnerschaftlichen Beziehungen sowie der Städtepartnerschaften mit französischen Städten positiv auf das Städtewachstum aus. Ebenso sind die positiven Auswirkungen von Städtepartnerschaften auf das Bevölkerungswachstum überwiegend auf die größeren deutschen Städte beschränkt.

Städtepartnerschaften Deutsche Städte Wirtschaftliche Integration Bevölkerungswachstum

BRAKMAN S., GARRETSEN H. y OUMER A. Hermanamiento de ciudades y el crecimiento de las ciudades alemanas, *Regional Studies*. Después de la II Guerra Mundial se hizo popular el hermanamiento de ciudades, sobre todo en Alemania. Esto fue principalmente una reacción a la experiencia de la guerra, y al principio su finalidad era crear una comprensión y cooperación internacionales y renovadas entre antiguos enemigos. De este modo también se reducían los costes de transacción. Los resultados demuestran que las regiones que participan en el hermanamiento de ciudades crecen más rápidamente que las ciudades sin estas alianzas. En particular, tanto el número como la intensidad de las relaciones de hermanamiento, así como el hermanamiento

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con ciudades francesas, tienen un efecto positivo en el crecimiento urbano. Asimismo los efectos positivos del hermanamiento de ciudades en el crecimiento de la población se limitan sobre todo a las ciudades alemanas más grandes.

Hermanamiento de ciudades Ciudades alemanas Integración económica Crecimiento de población

JEL classifications: F19, F20, J19, R12

INTRODUCTION

Shocks like the creation or abolition of national borders are associated with a change in market access. The fall of the Berlin Wall in Germany in 1989 is an example of such a shock. This created sudden economic opportunities for cities along the former border between Western and Eastern Germany. After reunification, these former 'border' cities experienced higher population growth rates than more centrally located cities within Germany (REDDING and STURM, 2008; see also AHLFELDT *et al.*, 2012). Other examples of shocks are the expansion of the European Community (EC) and, subsequently, the European Union (EU). As a consequence, the increased economic integration between member countries and between new members increased market access for cities along the borders of the EU. BRAKMAN *et al.* (2012) show, for instance, that the cities and regions along borders that experienced EC/EU economic integration were positively affected by this change in market access, which to some extent compensates a negative border effect.

Central in this paper is the so-called town twinning (TT), which is another form of integration that might affect the (international) market access of a city. TT involves cooperation, in the broadest sense, between towns or cities across national borders. Although TT has a long history, dating back to the 19th century, the heydays of TT began after the Second World War (ZELINSKY, 1991; FURMANKIEWICZ, 2005; CLARKE, 2009). The need for countries to reacquaint themselves with their former enemies was mostly felt in the post-war period, especially in Germany. As a side-effect of this largely politically motivated twinning episode, transaction costs between cities could be reduced. Over time the need to reacquaint oneself with former enemies became less important and the economic content of TT increased. The hypothesis in this paper is that the increased interaction between twinning cities reduces transaction costs, and consequently stimulates migration to these cities. Population growth in TT cities can thus be more pronounced compared with cities that have no (or fewer) international TT partners.

The main topic of this paper is to analyse whether TT has a positive effect on population growth in German cities. To the authors' knowledge, the only empirical attempts to measure the effects of TT are DE VILLIERS *et al.* (2007) and BAYCAN-LEVENT *et al.* (2010). Both studies are based on a survey of municipal officials who were asked whether they consider TT to be

successful. However, a fully fledged econometric analysis is still missing. This article tries to fill this gap. The motivation is that twinning cities have transaction cost advantages over other cities as they, by cooperating with each other, reduce transaction costs and increase economic proximity. At the same time, the organization and maintenance of TT involves (coordination) costs. So, it is not clear from the outset if TT will be beneficial for the cities concerned. The difference between this paper and those of REDDING and STURM (2008) or BRAKMAN *et al.* (2012) is that neither national borders nor shocks are emphasized. Instead, the focus is on the evolutionary influence that TT has on transaction cost and as a consequence on city population growth. Germany is central in the analysis, as it is the main actor in TT in post-Second World War Europe (see below).

The paper is organized as follows. The history of TT is discussed in the second section. The third section describes the data set. The estimation strategy is developed in the fourth section. The main results are discussed in the fifth section. In general the results suggest a positive relationship between TT and German city growth. This effect is magnified if the number of TT relationships with French cities or neighbouring countries is taken into account. Finally, the sixth section concludes.

TOWN TWINNING: HISTORY, MOTIVES AND THEORY

TT is a relatively old phenomenon. The term was used as early as the 1850s to describe the cooperative activities of building transportation and other public infrastructure between, for example, the neighbouring US cities of Minneapolis and St. Paul, Minnesota (BORCHERT, 1961). The world fairs that were initiated in the 19th century also stimulated contacts between cities (FIGHIERA, 1984, cited in ZELINSKY, 1991). Following these early attempts, many others followed in order to enhance cooperation between cities. For example, the foundation of the International Union of Local Authorities (IULA) at Ghent, Belgium, in 1913 was specifically aimed at stimulating international cooperation between cities (ZELINSKY, 1991). Ties between cities were also stimulated by ad hoc initiatives by city councils or private enthusiasts for more cooperation between cities (CLARKE, 2009).

The concept of TT is rather opaque. It involves all sorts of interactions that are aimed to foster mutual

understanding between the inhabitants of cities that take part, such as: bilateral visits of officials, musical events, language courses or exchanges of letters between schoolchildren. Cooperation between cities is sometimes also motivated by religious motives (missionary efforts), initiatives by freemasons, Rotarians and the like (for these initiatives systematic data are lacking). However, TT also encompasses the sharing of technical expertise, the sharing of knowledge and advice that have more direct economic consequences (ZELINSKY, 1991). The economic content of TT is becoming more important as the Great European wars are becoming distant history. All these activities can result in a form of TT. As is clear from the historical overview in ZELINSKY (1991) and, *inter alia*, CLARKE (2009, 2010), TT is very much a European phenomenon. From ZELINSKY (1991, table 3, p. 12), it can be deduced that the top 20 of countries in 1988 involved in international twinning is dominated by EU countries (15 of the 20). The leading TT countries are France, the UK and Germany that together have almost 8500 twinning relations, a number comparable with the other 17 countries combined. Most TT takes place between *neighbouring* countries, but not necessarily between border cities (ZELINSKY, 1991).

Data on TT show that it became very popular after the Second World War, especially during the 1950s. The promotion of TT was one of the priorities of the Council of European Municipalities, which explains the huge increase in the number of TTs in the 1950s.¹ The Second World War experience was a great stimulus for TT initiatives.² As a consequence, most of the TTs were between towns from countries that were enemies during the Second World War. Germany became the centre of the twinning activities. By 2012, German municipalities together had over 5000 international twinning

partners, mostly with European partners and especially French partners. The TT orientation towards France is not surprising if one realizes that France and Germany were arch-enemies in three main wars between 1870 and 1945. During the Cold War an ideological dimension was added to the motives to form partnerships; TT could help to promote understanding for different ideological systems. The latter initiatives were often met by distrust (CLARKE, 2010). It is unlikely that these ideological forms of TT reduced transaction costs in a way that could stimulate population growth. Fig. 1 shows recent data for TT in European countries. The map illustrates that TT is most popular in Germany and France.

This brief overview of TT suggests that, in general, two motives for TT stand out:

- A political motive; following the Second World War, TT was used as a tool in the process of reconciliation between former enemies (e.g. FALKENHAIN *et al.*, 2012; CLARKE, 2010; VION, 2002).
- An economic motive; TT is aimed at economic cooperation (GROSSPIETSCH, 2009; JAYNE *et al.*, 2011, 2013).

In the literature on TT, few examples exist to measure the effects of TT. DE VILLIERS *et al.* (2007) and BAYCAN-LEVENT *et al.* (2010) use opinion polls among municipal officials. Their results suggest that the success of TT depends on the existence of already existing relations with partner cities and similarities in the urban problems they face. FALKENHAIN *et al.* (2012) show that geographical proximity is an important factor for TT.

This paper adds to this literature by explicitly estimating the effects of TT on city population growth for German cities. The key hypothesis is that TT increases international (market) access of cities by specifically

Fig. 1. The geography of town twinning in Europe

Sources: Authors' own construction based on ZELINSKY (1991) and CCRE (2013)

reducing transaction costs between cities that have international partners (for the micro-economic foundations that are motivated by New Economic Geography, see REDDING and STURM, 2008; and BRAKMAN *et al.*, 2012). These positive effects of TT might outweigh the coordination costs of being engaged in TT such that TT can indeed have an overall positive effect on a city's population growth.

German cities involved in TT are located throughout the country, implying that the attention is not on border effects per se. The reduction in economic distance between these locations and foreign cities, *ceteris paribus*, is thought to stimulate local economies and boost population growth. A theoretical analysis of the effects can, for instance, be found in BRAKMAN *et al.* (2009, ch. 11, table 11.4). In a 12-city simulation, based on a Krugman-type New Economic Geography model (KRUGMAN, 1991), it can be shown that building 'a bridge' between pairs of cities stimulates growth in cities on both sides of the bridge. In this New Economic Geography setting the causality runs from increased market access to population growth, with (higher) wages as an intermediate variable. This line of reasoning points towards using population growth as the dependent variable. In addition it can be expected that the positive growth effects of TT are larger for cities that have a larger number of TT relationships as this enlarges market access.

DATA SET

As discussed above in the second section, Germany is the centre of twinning activities and, in contrast to most other countries, data for Germany are systematically available. The data are obtained from the *Rat der Gemeinden und Regionen Europas* (see <http://www.rgre.de/>), and the German section of the Council of European Municipalities and Regions (CEMR). The sample includes over 5000 twinning relationships of more than 600 German towns, cities and municipalities with locations around the world. The population data are obtained from the *Statistisches Bundesamt* (see <http://www.destatis.de/>). The data cover the period

1976–2007. The population data relate to the municipality or county level. If possible, data for the lowest level of aggregation are used. The spatial units of the population data and the TT data differ. Appendix A (in the Supplementary data online) illustrates the matching between population and TT data. In this paper, *Kreise* is the smallest spatial unit of observation. Cities within *Kreise* that are involved in TT are aggregated. The data on spatial units are obtained from GfK Geo-Marketing (see <http://www.gfk-geomarketing.de/>).

Table 1 shows some summary statistics. The data for Germany cover two forms of TT relationships: *partnerships* and *friendships*. Partnership is a form of twinning in which the partners engage in activities based on contracts, whereas friendships are less far-reaching and are based on non-contractual agreements. The effects of partnership TT on population growth are expected to be relatively stronger than those of friendships. Table 1 shows that the number of twinning connections is larger than the number of twinning towns and cities; cities can and often do have more than one twinning relationship: 366 Germany towns and municipalities with complete coverage for all years had 1502 twinning connections by 1976. This increased to 610 towns having 5067 twinning connections in 2007.

Fig. 2(a) shows the average numbers for German TT, where 'all municipalities/counties' includes non-twinners as well, whereas the group 'twinning municipalities/counties' includes only those with at least one TT relationship. In 1976, twinning municipalities/counties had on average about 4.5 twinning partners. Including non-twinners reduces the average to about three. By the year 2012, these numbers are 13 and 10, respectively. Hence, a gradual increase in the average number of TT relationships is visible for both groups. Fig. 2(b) shows the absolute number of municipalities/counties or *Kreise* with at least one twinning connection in the categories partnership, friendship, or both, over time. In Fig. 2(b), the 'partners' and 'partners + friends' are very similar because the same city which has partnership TT also typically has some friendship TT connections. This implies that partnership and friendship connections are not mutually exclusive.

Table 1. German town twinning, 1976–2007, partnerships and friendships

	Year	All twinings (partnership plus friendship)		Partnership		Friendship	
		N	%	N	%	N	%
(a) Cumulative twinning towns and cities	1976	366	100	357	98	65	18
	1990	419	100	410	98	122	29
	2007	610	100	579	95	239	39
(b) Cumulative twinning connections	1976	1502	100	1426	95	76	5
	1990	3071	100	2890	94	181	6
	2007	5067	100	4565	90	502	10

Note: Percentages under partnership and friendship do not add up to 100% because of multiple partnerships or friendships per town.

Fig. 2. (a) Mean number of twinnings; (b) number of municipalities/counties with at least one twinning connection; and (c) municipalities/counties with at least one (or more than the mean number) of twinning relations

Even after aggregating into the municipalities/counties or *Kreise*, a large number of German *Kreise* do not have a TT connection. In the estimations the *intensity* of twinning is also taken into account. Fig. 2(c) gives a sense of the difference between TT as such and the intensity. The striped bars show

whether German towns have at least one twinning connection, and the solid bars show the intensity by displaying the number of German *Kreise* with more than the mean number of twinning connections. Fig. 2(c) illustrates that TT grew until the year 2000 and then levelled off. The number of towns with

Table 2. Top 40 German twinning partners (98%), 2012

s.n.	Partner country	Number of twins	%	Cumulative %	s.n.	Partner country	Number of twins	%	Cumulative %
1	France	2054	36.41	36.41	21	Greece	34	0.60	92.27
2	Britain	440	7.80	44.21	22	Ukraine	32	0.57	92.84
3	Poland	417	7.39	51.60	23	Nicaragua	26	0.46	93.30
4	Italy	364	6.45	58.06	24	Romania	26	0.46	93.76
5	Austria	304	5.39	63.45	25	Lithuania	24	0.43	94.19
6	Hungary	251	4.45	67.90	26	Croatia	23	0.41	94.59
7	Czech Republic	168	2.98	70.87	27	Latvia	21	0.37	94.97
8	USA	168	2.98	73.85	28	Luxemburg	20	0.35	95.32
9	Netherlands	167	2.96	76.81	29	Portugal	18	0.32	95.64
10	Russia	121	2.15	78.96	30	Slovenia	18	0.32	95.96
11	Belgium	120	2.13	81.08	31	Slovakia Republic	16	0.28	96.24
12	Denmark	89	1.58	82.66	32	Estonia	15	0.27	96.51
13	Israel	79	1.40	84.06	33	Belarus	13	0.23	96.74
14	Turkey	76	1.35	85.41	34	Norway	13	0.23	96.97
15	Switzerland	72	1.28	86.69	35	Ireland	12	0.21	97.18
16	China	63	1.12	87.80	36	Burkina Faso	11	0.20	97.38
17	Finland	61	1.08	88.88	37	Bosnia and Herzegovina	10	0.18	97.55
18	Sweden	57	1.01	89.90	38	Bulgaria	10	0.18	97.73
19	Japan	53	0.94	90.83	39	Ruanda	7	0.12	97.85
20	Spain	47	0.83	91.67	40	Serbia	7	0.12	97.98

Source: Authors' own calculation from the data.

more than the average number of TT is approximately 120.

When it comes to the geography of the German TT counterparts, Table 2 shows that 36% of all German TTs are with French cities; over 90% of TTs are with European countries, including Russia.

Within Germany, the twinning activities are historically concentrated in the western part of Germany (Fig. 3).

As a visualization of Table 2, Fig. 4 shows the geographical distribution of the major twinning partners' countries and again illustrates the fact that the neighbours of Germany are most important for German TT.

ESTIMATION STRATEGY

The difference-in-differences (DID) method is central in the analysis. Furthermore, instrumental variables are used to deal with reverse causality. The DID approach can be used to analyse the effects of (non-)policy measures applied to subsamples of the complete sample. The DID method allows for time-invariant unobserved differences between the control and treatment groups. It removes differences in unobserved characteristics that are constant over time and that can affect the dependent variable, here population growth. The basic specification is (see also REDDING

Fig. 3. Geographical distribution of German twinning and time trend

Source: Authors' own calculation from the data

Fig. 4. Major twinning partner countries for Germany

Source: Authors' own calculation from data based on the absolute number of twinning partners

and STURM, 2008; BRAKMAN *et al.*, 2012) for a discussion):

$$\text{popgrowth}_{m,t} = \varphi \text{twinning}_{mt} + D_t + D_l + \varepsilon_{mt} \quad (1)$$

$$\begin{aligned} \text{popgrowth}_{m,t} = & \beta \text{twinning}_{mt} + \gamma(\text{twinning}_{m,t} \\ & \times \text{partners}_{m,t}) + D_t + D_l + \varepsilon_{mt} \quad (2) \end{aligned}$$

where $\text{popgrowth}_{m,t}$ is annual population growth of German municipality (or county) m at time t ; and twinning_{mt} indicates whether a twinning relationship between a German municipality with an international partner city exists. It equals 1 if the municipality has one or more international twinning partner(s); and 0 otherwise. Alternatively, twinning_{mt} can indicate the number of international partners, n . The variable $\text{partners}_{m,t}$ refers to a particular country or group of countries with which TT exists. It could, for instance, only refer to the subsample of French TT, or only neighbouring countries.

Treating twinning_{mt} as a binary dummy variable refers to what might be called the extensive margin of TT (is there TT at all?). Treating twinning_{mt} as the actual number of TT partners, n , refers to the intensive margin of TT (how much TT is going on). Given that TT also invokes (coordination) costs on the part of the German TT city, German cities that are more heavily involved in TT have more experience in setting up and maintaining TT relationships. For these cities the effect of TT on population growth is stronger than for less experienced cities; in other words, the intensive margin of TT is stronger than the extensive margin of TT. Furthermore, the nature of the TT arrangements might matter; partnerships are more relevant for population growth than friendships.

The variable $\text{partners}_{m,t}$ refers to the following subsamples: French TT counterparts, TT with only neighbouring countries, TT with European countries, TT

with the founding fathers of the EU (EU-6), the 1980s' members (EU-12), and the 1990s' members (EU-15). D_t , D_l and ε_{mt} indicate time dummies, location dummies and a stochastic error term, respectively. The time dummies are annual, whereas location dummies are related to the 15 states of Germany (*Bundesländer*) and as such capture unobserved characteristics of the states. The time dummies control for common shocks affecting the population growth throughout the sample. City size effects are controlled for by differentiating between large and small German counties and municipalities. Furthermore, robust standard errors are used in the estimations.

As so often, reverse causality might be an issue, that is, TT might stimulate population growth or, vice versa, population growth might make cities more attractive for TT activities. Instrumental variable (IV) estimation deals with this problem. Information on Second World War destruction of German cities can be used for the instruments. To be specific: the level of destruction of residential houses, the number of people killed, tax revenue loss and tons of rubble resulting from the bombing of German cities are used as instruments. The motivation for these instruments is that those cities that experienced Second World War destruction directly and more intensively are more interested in strengthening ties between former enemies in order to increase mutual understanding and prevent future wars than those cities that escaped war destruction. The data for the instruments are obtained from BRAKMAN *et al.* (2004). The Sargan (SARGAN, 1958) and Basman (BASMANN, 1960) tests are used to check the power of the instruments.

ESTIMATION RESULTS

Baseline results

Table 3 presents the baseline results when estimating equation (1) only, including location fixed effects that

Table 3. *Twinning by German cities and population growth (full sample)*

Variables	Partnerships plus friendships		Partnerships only		Friendships only	
	(Dummy = 1) (1)	(Intensity = <i>n</i>) (2)	(Dummy = 1) (3)	(Intensity = <i>n</i>) (4)	(Dummy = 1) (5)	(Intensity = <i>n</i>) (6)
Twinning _{mt}	−0.0756 (0.0566)	0.00675*** (0.00106)	−0.0955 (0.0559)	0.00724*** (0.00118)	0.108*** (0.0218)	0.0208*** (0.00549)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191
R ²	0.119	0.119	0.119	0.119	0.119	0.119

Notes: Robust standard errors are shown in parentheses; intensity = *n* indicates the number of twinning partner cities; dummy = 1 if a municipality is involved in town twinning.

****p* < 0.01; ***p* < 0.05; **p* < 0.1.

are related to the 15 states in Germany. Each of the *Kreise* in the sample is part of a state, and because *Kreise* are a lower level of aggregation, states consist of more than one *Kreis*. The inclusion of state fixed effects captures the idea that states might have special treatments for TT (which are unobserved).³ The columns indicated by dummy = 1 correspond to equation (1), and capture whether TT exists at all (extensive margin); columns with intensity = *n* capture the intensity of TT and uses '*n*', the number of TT relationships, explicitly. Furthermore, time dummies are used, and partnerships and friendships are treated separately.

The results for population growth for the extensive margin of twinning are mixed (columns 1, 3 and 5). Only in the case of TT friendships does a significant and positive relation exist. For the intensive margin of TT, the population growth effect is positive throughout (columns 2, 4 and 6).⁴

As France is by far the most important twinning partner of Germany, Table 4 provides separate information on France. In Table 4; France_{mt}^a stands for the TT partners between Germany and France. Separating

France from TT in general shows that France dominates the positive population growth effects of TT. The twinning variable becomes ambiguous and is only significantly positive in columns (5) and (6). Having a partner in France is important for German cities, both from the extensive (column 3) and the intensive (column 4) margin perspectives.⁵ Location fixed effects are used to separate eastern from western German cities.

The conclusion is that TT has a small but detectable effect on population growth when TT with French cities is involved. This effect is due to *partnerships*, which are more extensive than *friendships*. Next the possibility of reverse causality is addressed by an instrumental variable estimation. Instruments are: the level of destruction of residential houses, the number of people killed, tax revenue loss and tons of rubble resulting from bombing of the German towns and cities during the Second World War by Allied forces.

Table A10 in Appendix A (in the Supplementary data online) has an analysis of the strength of the instruments. The instruments are clustered in three categories: 'a' = all four instruments are used together; 'b' = residential buildings loss, rubble per capita and tax revenue loss;

Table 4. *Twinning with France*

Variables	Partnerships plus friendships		Partnerships only		Friendships only	
	(Dummy = 1) (1)	(Intensity = <i>n</i>) (2)	(Dummy = 1) (3)	(Intensity = <i>n</i>) (4)	(Dummy = 1) (5)	(Intensity = <i>n</i>) (6)
Twinning _{mt}	−0.218*** (0.0248***)	−0.00162 (0.00204)	−0.244*** (0.0660)	−0.00312 (0.00235)	0.123*** (0.0228)	0.0248*** (0.00630)
Twinning _{mt} × France _{mt} ^a	0.441*** (0.0815)	0.0170*** (0.00436)	0.443*** (0.0785)	0.0198*** (0.00475)	−0.101** (0.0403)	−0.0377 (0.0246)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191
R ²	0.121	0.120	0.122	0.120	0.119	0.119

Notes: Robust standard errors are shown in parentheses.

The coefficients for *Twinning* and *Twinning* × *France* cannot simply be added because *partnerships*/*friendships* are measured as shares (for a discussion, see Appendix A in the Supplementary data online).

^aFrance_{mt} = share of French towns and cities in the total international twinning partners of a Germany municipality or county.

****p* < 0.01; ***p* < 0.05; **p* < 0.1.

Table 5. All twinings, instrumental variable (IV) estimates

Variables	Partnerships plus friendships		Partnerships plus friendships		Partnerships plus friendships	
	(Dummy = 1) (1)	(Intensity = n) (2)	(Dummy = 1) (3)	(Intensity = n) (4)	(Dummy = 1) (5)	(Intensity = n) (6)
Twinning _{mt}	-3.762*** (0.875)	0.0578*** (0.00998)	-4.521*** (1.052)	0.0816*** (0.0118)	-6.666*** (1.515)	0.0851*** (0.0122)
Instruments	A	a	b	b	c	c
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191
R ²	—	0.066	—	0.021	—	0.013
Sargan score (p -value)	21.60 (0.000)	20.55 (0.000)	16.69 (0.000)	3.48 (0.176)	4.89 (0.027)	1.77 (0.183)
Basman score (p -value)	21.55 (0.000)	20.50 (0.000)	16.64 (0.000)	3.47 (0.177)	4.87 (0.027)	1.76 (0.184)

Notes: Standard errors are shown in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

and ‘c’ = residential buildings loss and tax revenue loss. Table 5 shows the results of the IV estimates for equation (1). It includes a full set of fixed effects. The results for the extensive margin are again ambiguous, but the intensive margin stands out. In all variants that deal with the *number* of twinning relations, the effect of twinning is positive.

The Sargan (SARGAN, 1958) as well as Basman (BASMAN, 1960) test statistics show that instrument ‘a’ does not meet the requirement of the over-identifying restriction. However, instruments ‘b’ and ‘c’ fulfil the test of over-identification when the intensity of TT is considered (columns 4 and 6). In these cases, the number of TTs has a positive and statistically significant effect on population growth.

Table 6 focuses on France and shows the IV estimates. As in the other cases it includes a full set of fixed effects. In line with the results of Table 4, the estimates indicate that the extensive margin as well as the intensive margin of TT with France are positive and significant. The tests for over-identifying restrictions show that the instruments meet the requirement of the over-

identifying restrictions.⁶ A causal relationship is confirmed as all instrument combinations are valid, except column (2).

The literature suggests that large urban locations not only are more efficient than smaller ones, but also they have an advantage in innovation and their economies can grow faster than smaller locations (see also FAINI *et al.*, 1999). Following this idea, German municipalities that are smaller than the median population size are treated as small, and those that are larger than the median population size as large (see Tables A2 and A3 in Appendix A). Without instruments, TT has positive effects for large and small municipalities, which is stronger when the intensity of twinning is accounted for (see Tables A2 and A9 in Appendix A). After instrumenting, however, the significant and positive TT effects only remain valid for *large* municipalities (see Table A3 in Appendix A). See also the discussion surrounding Table 9.

Timing could also be a factor. Early twinning could be different from late twinning (see Tables A5 and A8 in Appendix A). The years 1960 and 1970 are used as

Table 6. Twinning with France, instrumental variable (IV) estimates

Variables	Partnerships plus friendships		Partnerships plus friendships		Partnerships plus friendships	
	(Dummy = 1) (1)	(Intensity = n) (2)	(Dummy = 1) (3)	(Intensity = n) (4)	(Dummy = 1) (5)	(Intensity = n) (6)
Twinning _{mt}	-0.720*** (0.106)	-0.0734*** (0.0163)	-0.737*** (0.108)	-0.153*** (0.0261)	-0.745*** (0.109)	-0.154*** (0.0262)
Twinning _{mt} × France _{mt}	1.997*** (0.280)	0.163*** (0.0327)	2.049*** (0.287)	0.324*** (0.0526)	2.076*** (0.290)	0.326*** (0.0529)
Instruments	a	a	b	b	c	c
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191
R ²	0.074	0.071	0.072	—	0.072	—
Sargan score (p -value)	3.05 (0.383)	23.88 (0.000)	2.26 (0.322)	4.23 (0.121)	1.81 (0.178)	4.05 (.044)
Basman score (p -value)	3.04 (0.385)	23.82 (0.000)	2.26 (0.324)	4.21 (0.122)	1.80 (0.180)	4.03 (.045)

Notes: Standard errors are shown in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

dividing dates to discriminate between early and late TT. These dates distinguish between the original, but limited, EU integration and the time when EU expansion started (with the UK, Ireland and Denmark becoming members in 1973, followed by other countries joining the EU in the 1980s, 1990s and 2000s). Table A5 in Appendix A presents the results using instruments ‘a’ and ‘c’. The results for instrument ‘b’ are not reported for space reasons and because they are very similar to the results for instrument ‘a’. Tables A4 (no instruments) and A5 (instruments) in Appendix A in general show that early TT has a stronger effect than later TT, although the effects remain positive over the whole period.

Additional estimations and robustness checks

As German TT with France turns out to be important for the effects of TT, it could also be that other EU connections are also important for the impact of twinning, too. Countries that are more involved in German TT than others are, for instance, the countries that are (founding) members of the EC. The original six members of the pre-1973 European Communities (EC-6) are Belgium, France, Luxembourg, the Netherlands, Italy and (West) Germany; the EC-9 includes the EC-6 as well as the UK, Ireland and Denmark who joined in 1973; the EC-12 includes the EC-9 as well as Greece, Spain and Portugal who joined in the 1980s; the EU-15 includes EC-12 members as well as Finland, Austria and Sweden who joined in 1995; and the EU-25 includes the EU-15 as well as Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia and Slovakia who joined the EU in 2004 (for more details, see BRAKMAN *et al.*, 2012). Estimating separately for the ‘partnership plus friendship’, ‘partnership only’ and

‘friendship only’ gives a similar pattern of results as above, i.e. the results are stronger for partnerships than friendships. The results in Table 7 combine the IV estimation results of both TT partnerships and friendships, i.e. ‘partnership plus friendship’. Controlling for EC (or EU) membership shows that only the intensive margin of TT with EC member countries has a significant positive effect throughout the estimates. However, in the EC-6 case, the instruments are weak, implying that there is no strong evidence of TT with EC and EU members leading to higher population growth (see also Tables A6 and A7 in Appendix A).

After observing the differences between the effects from twinning with France and TT with the various historical compositions of EC and EU countries, geographical proximity or contiguity could also be a factor. Countries that are nearby in a geographical sense are also, *ceteris paribus*, near in other respects, like a common culture. It may be less costly to set up TT relationships with these countries (recall that these countries, like France, were typically invaded by Germany during the Second World War). The descriptive Table 2 shows that in addition to France, seven neighbouring countries (with additionally 1200 TT relationships) are in the top 15 of German TT partners. The estimation results are presented in Table 8.

For both the extensive and intensive margin of TT (columns 2, 4 and 6), the effects are significant and positive, which is not very surprising given the dominance of (neighbour) France for German TT (recall Table 6).⁷

Dividing the sample into large and small locations shows that the results are again only significant for the larger municipalities (Table 9). This supports the argument that large urban locations are not only more efficient than smaller ones, but also have an advantage in innovation, and grow faster than smaller locations.

Table 7. Twinning with the European Community (EC) and European Union (EU) countries, instrumental variable (IV) estimates

Variables	EC-6		EC-12		EU-15		EU-25	
	(Dummy = 1) (1)	(Intensity = <i>n</i>) (2)	(Dummy = 1) (3)	(Intensity = <i>n</i>) (4)	(Dummy = 1) (5)	(Intensity = <i>n</i>) (6)	(Dummy = 1) (7)	(Intensity = <i>n</i>) (8)
Twinning _{mt}	-1.380*** (0.437)	0.289*** (0.0793)	0.793 (0.544)	0.432*** (0.0990)	0.732 (0.550)	0.411*** (0.0924)	2.159*** (0.626)	0.200*** (0.0472)
Twinning _{mt} × EC(.)	1.871*** (0.622)	-0.0101*** (0.00283)	-1.224 (0.763)	-0.0127*** (0.00297)	-1.134 (0.769)	-0.0112*** (0.00256)	-3.135*** (0.874)	-0.0045*** (0.00111)
Instruments	a	a	a	a	a	a	a	a
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191	11 191	11 191
R ²	0.084	—	0.078	—	0.082	—	—	—
Sargan score (<i>p</i> -value)	45.33 (0.00)	17.09 (0.001)	51.39 (0.000)	5.72 (0.126)	52.05 (0.00)	7.08 (0.070)	36.29 (0.00)	26.16 (0.00)
Basman score (<i>p</i> -value)	45.31 (0.00)	17.04 (0.001)	51.40 (0.000)	5.70 (0.127)	52.06 (0.00)	7.05 (0.070)	36.25 (0.00)	26.11 (0.00)

Notes: Standard errors are shown in parentheses; EC(.) corresponds to EC-6, EC-12, EU-15 and EU-25.

****p* < 0.01; ***p* < 0.05; **p* < 0.1.

Table 8. *Twinning with neighbouring countries, instrumental variable (IV) estimates*

Variables	Partnerships plus friendships		Partnerships plus friendships		Partnerships plus friendships	
	(Dummy = 1) (1)	(Intensity = n) (2)	(Dummy = 1) (3)	(Intensity = n) (4)	(Dummy = 1) (5)	(Intensity = n) (6)
Twinning _{mt}	-0.710*** (0.102)	-0.0896*** (0.0160)	-0.724*** (0.104)	-0.123*** (0.0195)	-0.737*** (0.105)	-0.128*** (0.0200)
Twinning _{mt} × Neighbor _{mt}	1.289*** (0.176)	0.147*** (0.0241)	1.319*** (0.180)	0.198*** (0.0294)	1.345*** (0.182)	0.206*** (0.0302)
Instruments	a	a	b	b	c	c
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11 191	11 191	11 191	11 191	11 191	11 191
R ²	0.104	0.092	0.103	0.074	0.102	0.071
Sargan score (p -value)	1.64 (0.651)	12.50 (0.006)	0.92 (0.632)	2.62 (0.269)	0.12 (0.730)	1.06 (0.303)
Basman score (p -value)	1.63 (0.653)	12.45 (0.006)	0.91 (0.633)	2.63 (0.269)	0.12 (0.731)	1.06 (0.304)

Notes: Robust standard errors are shown in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 9. *Twinning with neighbouring countries, instrumental variable (IV) estimates (small versus large German cities)*

Variables	Partnerships plus friendships		Partnerships plus friendships		Partnerships plus friendships	
	(Dummy = 1) (1)	(Intensity = n) (2)	(Dummy = 1) (3)	(Intensity = n) (4)	(Dummy = 1) (5)	(Intensity = n) (6)
<i>Small municipalities</i>						
Twinning _{mt}	-0.0420 (0.351)	-0.0641 (0.0752)	-0.0418 (0.351)	-0.0683 (0.0770)	-0.0221 (0.359)	-0.0570 (0.0789)
Twinning _{mt} × Neighbor _{mt}	0.595 (0.482)	0.0885 (0.0935)	0.595 (0.482)	0.0938 (0.0957)	0.565 (0.495)	0.0797 (0.0980)
Instruments	a	a	b	b	c	c
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4588	4588	4588	4588	4588	4588
R ²	0.055	0.053	0.055	0.052	0.055	0.053
Sargan score (p -value)	0.73 (0.867)	2.03 (0.566)	0.73 (0.694)	1.96 (0.375)	0.66 (0.417)	1.54 (0.214)
Basman score (p -value)	0.72 (0.868)	2.02 (0.569)	0.72 (0.670)	1.95 (0.378)	0.65 (0.419)	1.53 (0.216)
<i>Large municipalities</i>						
Twinning _{mt}	-0.856*** (0.0632)	-0.0992*** (0.00832)	-0.908*** (0.0655)	-0.145*** (0.0112)	-0.911*** (0.0655)	-0.148*** (0.0114)
Twinning _{mt} × Neighbor _{mt}	1.465*** (0.0804)	0.167*** (0.0122)	1.549*** (0.0849)	0.235*** (0.0166)	1.554*** (0.0851)	0.240*** (0.0168)
Instruments	a	a	b	b	c	c
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Location fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4526	4526	4526	4526	4526	4526
R ²	0.306	0.376	0.192	0.376	0.182	0.181
Sargan score (p -value)	18.99 (0.000)	59.45 (0.000)	8.46 (0.015)	5.55 (0.062)	7.36 (0.007)	0.82 (0.365)
Basman score (p -value)	18.87 (0.000)	59.62 (0.000)	8.39 (0.015)	5.50 (0.064)	7.30 (0.007)	0.81 (0.367)

Notes: Standard errors are shown in parentheses.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Tables A11 and A12 in Appendix A provide alternative results for twinning with France and with neighbouring countries. A more detailed analysis of city sizes is provided. The main message from Tables A11 and A12 is that the positive effects of TT (with neighbouring countries) are still present. The results suggest that, *ceteris paribus*, German municipalities or countries twinning

with France have on average about 2% higher population growth than non-twinning municipalities over the sample periods (see the top half of Table A11). The effect is around 1.3% when twinning with all neighbouring countries is considered (see the top half of Table A12). For the intensity of twinning, the effects are smaller in both cases (see the bottom half of Tables A11 and

A12).⁸ The results are stronger for large cities but, in general, the main conclusions are confirmed.

It could also be interesting to analyse migration flows between various types of cities. This could reveal where the TT population growth comes from, however the necessary data are non-available. Fig. A1 in Appendix A suggests that twinning municipalities benefit in terms of population growth from wider range of sources than only from the neighbouring or nearby municipalities and counties alone, indicating that the effects of TT are not only local.

CONCLUSIONS

Although TT has been around for a long time, it really took off after the Second World War. In the post-war period, TT was initially aimed at political reconciliation and enhancing mutual understanding between former enemies, especially for Germany, but over time the economic content of TT became more important. If successful, TT could be looked upon as reducing the economic distance between the cities that are involved in these initiatives, which stimulates the growth of the cities involved in TT. Existing research on TT is to a large extent descriptive. This paper adds to this literature by explicitly focusing on the quantitative consequences of TT for the case of Germany.

The focus is on Germany because it became the main actor in TT after the Second World War. Applying a DID approach, and distinguishing between the extensive margin of TT (whether TT exists at all for a given city) and the intensive margin (the number of TT relations), the results show that German counties and municipalities that engage in TT often have had a significantly higher population growth compared with German cities that do not have twinning partners. This effect is more pronounced: if the number or intensity of twinning relations is large, if it is with French cities or with neighbouring countries. Furthermore, positive population growth effects of TT are confined to the larger German cities. TT could thus facilitate relocation or migration of workers and firms to more optimal locations, as larger cities are more productive than smaller cities.

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Twinning data are available at: www.rgre.de (specific link to the data page with updates: <http://www.rgre.de/partnerschaften0.html>). For more information: Rat der Gemeinden und Regionen Europas/Deutsche Sektion (RGRE/DS), Gereonstr. 18–32, D-50670 Cologne, Germany. Tel: +49(0)221/3771–311. Fax: +49(0)221/3771–128. Email: post@rgre.de. The population data came from: http://www.destatis.de/themen/d/thm_bevoelk.php/. For more information: Tel: +49(0)611.754865. Fax +49 (0) 611.753977. Email: wanderungen@destatis.de.

NOTES

1. The website of The Council of European Municipalities – with a separate entry on TT – gives many examples of economic cooperation (see http://www.ccre.org/en/papiers/index_broch_by_activite/9). For example, Sarajevo and Barcelona started a project in 2003 to stimulate small business start-ups by offering management support and marketing courses. More examples can be found on this website.
2. For a history of TT in some individual countries, see: for the UK, CLARKE (2009, 2010, 2011) and JAYNE *et al.* (2011); for France, VION (2002) and CAMPBELL (1987); for Greece, PAPAGAROUFALI (2006); for Northern Europe, JOENNIEMI and SERGUNIN (2011); and for Poland, FURMANKIEWICZ (2005).
3. Since state fixed effects are used, this also deals with the difference in TT between the former states of West and East Germany prior to German reunification in 1990.
4. Urbanization and twinning could be related. Inspection of the correlation between these variables, however, indicates that the correlation between (various definitions of) twinning and urbanization is low (between 0.08 and 0.28); only 31 of the top 100 twinning cities are also present in the top 100 fastest growing counties; and 54 of the top 100 twinning cities are in the top 100 largest counties.
5. Other neighbouring countries give, in a qualitative sense, similar results. Results are available from the authors upon request.
6. After separating partnership and friendship for each group of instruments, the results remain consistent and the instruments, in general, remain valid. For instance, see Table A1 in Appendix A in the Supplementary data online for the separate estimates using the instruments group ‘b’.
7. Results (not presented) with non-neighbouring countries are negative.
8. Table A13 in Appendix A in the Supplementary data online also provides additional sensitivity analysis, including: population density in cities (is a proxy of – the net effect of – all kinds of variables related to city size, such as knowledge spillovers, congestion, land rents, etc.); household income as an additional aspect of market access; and distance to the state capital as a measure for a ‘capital city’ effect (capital cities are usually more attractive than other types of cities, and nearby cities might benefit from this effect).

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