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HAS THE GERMAN REUNIFICATION STRENGTHENED GERMANY'S NATIONAL INNOVATION SYSTEM? TRIPLE HELIX DYNAMICS OF GERMANY'S INNOVATION SYSTEM

Seung-Kyu YI
Seoul National University
Bogang JUN
University of Hohenheim
Massachusetts Institute of Technology

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Seung-Kyu Yi and Bogang Jun

Abstract

This paper investigates whether the German reunification strengthened the country's national innovation system, using the Triple Helix model. In particular, it assesses the various dimensions of the innovation system by analyzing co-authorship networks from 1973 to 2014. Despite the series of policies promoting collaboration between the two regions and the rise in the number of regional collaborations and in the number of papers, the results show that the national innovation system of Germany has worsened since the reunification in 1990, and the role of government is critical in encouraging collaboration. Finally, this paper uses survey data on the type of Triple Helix configuration that actually occurred in East Germany as a robustness check.

Keywords Triple Helix model, German reunification, National innovation system

Seung-Kyu Yi Technology Foresight Division, Korea Institute of S&T Evaluation and Planning (KISTEP) and Technology Management, Economics and Policy Program (TEMEP), Seoul National University, Seoul, South Korea

Bogang Jun Massachusetts Institute of Technology, The MIT Media Lab, MA 02139, USA email: bjun@mit.edu

1. Introduction

The fall of the Berlin Wall in 1989, leading to the reunification of Germany in 1990, was one of the prominent events of the 21st century. The scene of people celebrating the country's reunification on the fallen wall represented German people's optimistic expectations about their future. Indeed, in the first election after the reunification, people in the former East Germany voted for parties that insisted on a quick integration of the East into West German society (Bach & Trabold 2000). However, although 270 billion euros has been spent on reunification costs, East Germany had only reached 70% of the GDP level of West Germany by 2011. In addition, life satisfaction in East Germany has remained significantly below that in West Germany because of lower income and higher unemployment levels compared with those of the West, although these gaps are gradually beginning to disappear (Shields et al. 2003).

The German government has made various efforts to integrate these two regions, including formulating policies on building an innovation system to equalize standards of living across Germany (Meske 1993; Günther et al. 2010). Restructuring and building a new innovation system in unified Germany aims to encourage the creation and diffusion of knowledge, which is one of the main inputs of production that determines the extent of economic development and growth in knowledge-based economies (OECD 1996; Lundvall & Johnson 1994). However, whether the German reunification strengthened Germany's national innovation system by providing a system for knowledge creation and diffusion is underexplored in the literature.

This paper assesses the various dimensions of Germany's innovation system by analyzing co-authorship networks. The above-mentioned growing importance of the creation and management of knowledge in knowledge-based economies encourages the development of networks of researchers that share a common problem or paradigm (Crane 1972; Powell & Grodal 2006). Such research collaborations that determine how knowledge flows and how communities influence the diffusion and expansion of knowledge can be captured by understanding their co-authorship networks (Acedo et al. 2006; Katz & Hicks 1997). In addition, co-authorship networks provide good databases for examining the true acquaintances of researchers, because researchers who write a paper together tend to be familiar with one another (Newman 2001a; Newman 2001b).

This paper applies the Triple Helix (TH) model to examine the innovation system in Germany through its co-authorship networks, using publication data from 1972 to 2014, which allows us to track the change in the system before and after the reunification. The TH

model suggests that universities are the dominant actors in the innovation system and that innovation does not rely on a single institutional sphere but rather on the interaction among universities, industry, and governments (Ranga & Etzkowitz 2013). Therefore, we can apply the TH model of university–industry–government relationships to examine the extent to which the institutional actors in national innovation systems interact across institutional boundaries and determine the resulting status of knowledge infrastructure in the innovation system (Etzkowitz & Leydesdorff 1995; Etzkowitz & Leydesdorff 2000a). In addition, given that this study examines how the reunification affected the innovation system after 1990, the TH model importantly allows us to track the system dynamics (Ranga & Etzkowitz 2013).

The presented results show that the German innovation system worsened after the reunification. Indeed, the network's positive effect generally declined over time in both West and East Germany, except for the two-dimensional university–industry relationship in the East and that between the government and the other region of Germany in the East and West. Although publications and collaborations between the two regions rose, the quality of the innovation system did not increase in line with this quantitative change; indeed, only when the government participated in these collaborations did the innovation network improve. This study also investigates surveyed data as a robustness check. The survey data show that after the reunification, the ideal TH configuration was not implemented in order to restructure the innovation system in East Germany.

The remainder of this paper proceeds as follows. Section 2 provides the related literature and theoretical background. Section 3 presents the historical background, focusing on German policies for strengthening innovation networks. Section 4 provides the results of the TH indicators and Section 5 shows the results of the survey on the innovation system in East Germany. Finally, Section 6 provides concluding remarks.

2. Related literature and theoretical background

The TH system was introduced as an analytical framework that systematizes the characteristics of university–industry–government interactions (Ranga & Etzkowitz 2013). This framework is located in the line of research on the innovation system approach that emerged in the mid-1980s, which perceived innovation and economic development as resulting from the learning process (Ranga & Etzkowitz 2013). This approach describes the actors, behaviors, and interactions in national innovation systems at the aggregate level, focusing on the creation and diffusion of new knowledge as well as the effect of this new knowledge on the economy (Lundvall 1992; Freeman 1987).

The emergence of knowledge-based economies has heightened research on the creation and diffusion of knowledge with respect to collaboration and learning among actors (OECD 1996; Lundvall & Johnson 1994). In a knowledge-based economy "directly based on the production, distribution and use of knowledge and information" (OECD 1996), industries such as IT, biotechnology, and nanotechnology become dominant and the main input of these industries (i.e., knowledge) is more likely to be generated in a university compared with in traditional industrial economies (Kim & Heshmati 2013). Accordingly, a university whose role is the creation of knowledge becomes the main actor in the production process.

However, not only the university itself but also the institutional network structure surrounding the university affects the quality of the innovation system (Foray 2004). Crane (1972) defined the invisible college as the informal networks among researchers who share a common norm or paradigm and analyzed how such networks influence the creation and diffusion of knowledge. Hence, the TH model captures the quality of the innovation system, which consists of institutions, by measuring the quality of the networks surrounding the university.

Moreover, publications that occur through such collaborations as university–industry–government ones are often used as an indicator in the TH model. Given that university–industry–government collaboration has increased over time, Powell & Owen-Smith (1998), Link (1996, 2006), Acedo et al. (2006) and Katz & Hicks (1997) stated that analyzing their co-authorship networks can capture their collaborative knowledge networks. Similarly, Leydesdorff & Sun (2009) analyzed publication data on Japan by using the TH model, showing that collaborations with researchers overseas have grown in importance over time in the national innovation system. Concordantly, Kwon et al. (2011) showed the impact of co-authorship networks on the Korean innovation system by using the TH model.

Although the TH model using co-authorship data may only capture a narrow definition of the national innovation system (Lundvall 2007), it contributes to the body of research by enabling researchers to quantify the dynamics of innovation systems with a relevant measurement method. While the most relevant performance indicators of a national innovation system should reflect its efficiency and effectiveness at producing, diffusing, and exploiting economically useful knowledge, such indicators are not well developed (Lundvall 1992; Godin 2009). In this sense, the TH model provides a suitable method for measuring an innovation system.

One indicator of the TH system is the mutual information among actors. University–industry–government dynamic interactions comprise three sub-dynamics, namely (i) the

creation of wealth, (ii) knowledge-based innovation, and(iii) government policy (May & Leonard 2006; May 1976; Sonis 2000). In these sub-dynamics, the policy implemented by the government can affect and be affected the first two sub-dynamics (Leydesdorff 2009). In other words, whether the relationship between university and industry is well constructed is significant for a government's policy implication. Borrowing an analogy previously presented in the literature of Leydesdorff & Sun (2009), the relationship between parents is significant before their child is shaped among family members. Therefore, when the relationship between two agents is well established, the uncertainty of the third agent's point of view is diminished.

Under this TH configuration, the possibility of decreasing uncertainty can be measured by using mutual information with three or more dimensions (Leydesdorff & Sun 2009). Moreover, we can also measure the balance of the system between the integration and differentiation of institutions in terms of the relative frequency of relations among partially overlapping sets. In general, mutual information can be regarded as "information-theoretical analogues of covariance," where the covariance between two variances decreases both sides of uncertainty (Leydesdorff & Sun 2009).

According to Shannon (1948), the uncertainty of variable *x* can be measured by using the following equation:

$$H_x = -\sum_x p_x^2 \log p_x \tag{1}$$

If its dimension is expanded into two, the uncertainty becomes two-dimensional as follows:

$$H_{xy} = -\sum_x \sum_y p_{xy}^2 \log p_{xy} \tag{2}$$

Then, transmission T_{xy}, which is the mutual information between two distributions in information theory, can be depicted as

$$T_{xy} = (H_x + H_y) - H_{xy} \tag{3}$$

When the distributions of variable *x* and *y* are independent of each other, T_{xy} is equal to zero, resulting in $H_{xy} = H_x + H_y$. Otherwise, as T_{xy} is greater than or equal to zero, resulting in $H_{xy} \leq H_x + H_y$ (Theil 1972).

All information can be fully decomposed, since it is also dealt with in Equations (1) and (2). In addition, the logarithm in Equations (1)–(3) uses base two, resulting in all values expressing pieces of information. Considering that Equations (1)–(3) show the formal

probability measure, the measure is independent of the size or any other empirical system under study.

A previous study expanded this concept into three dimensions as follows (Abramson 1963):

$$T_{xyz} = H_x + H_y + H_z - H_{xy} - H_{yz} - H_{zx} + H_{xyz} \tag{4}$$

Because we are interested in information in the university–industry–government relationship, we can rewrite Equation (4) by using subscripts u, i, and g for the university, industry, and government, respectively:

$$T_{uig} = H_u + H_i + H_g - H_{ui} - H_{ig} - H_{gu} + H_{uig} \tag{5}$$

The present paper examines Germany's co-authorship networks to assess the degree to which the collaboration between East and West has strengthened the country's national innovation system. Therefore, we investigate the (i) Eastern region, (ii) Western region, and (iii) all of Germany. For the Eastern region, we consider four agents, namely university, industry, the government of the Eastern region, and the Western region, regardless of the institutional types in the West. For the Western region, the institutional agents under study are university, industry, the government of the Western region, and the Eastern region, again without distinguishing among institutions. Lastly, when the entire German innovation network is under consideration, there are three dimensions, namely university, industry, and government, with no regional distinction.

Therefore, when we investigate whether reunification has strengthened the Eastern region of Germany by increasing collaboration with West German researchers, Equation (5) must be expanded as follows (Leydesdorff & Sun 2009; Kwon et al. 2011; Sun et al. 2007), using a subscript w to represent the West:

$$\begin{aligned} T_{uigw} = {} & H_u + H_i + H_g + H_w \\ & - H_{ui} - H_{ig} - H_{gw} - H_{wu} - H_{ug} - H_{iw} \\ & + H_{uig} + H_{uiw} + H_{ugw} + H_{igw} \\ & - H_{uigw} \end{aligned} \tag{6}$$

Likewise, for the Western region, mutual information in this four-dimensional case is captured as follows, where the subscript e represents the East:

$$\begin{aligned} T_{uige} = {} & H_u + H_i + H_g + H_e \\ & - H_{ui} - H_{ig} - H_{ge} - H_{eu} - H_{ug} - H_{ie} \\ & + H_{uig} + H_{uie} + H_{uge} + H_{ige} \\ & - H_{uige} \end{aligned} \tag{7}$$

Finally, we also use Equation (5) to investigate the entire German region.

3. Historical background

After the German reunification in 1990, the new national government strived to integrate the two regions, investing 270 billion euro. However, considering the remaining economic gap between East and West, more investment in the East is necessary to achieve full unification. According to the Federal Ministry for Economic Affairs and Energy in Germany (BMWi), the nominal GDP per capita of the former East Germany was 24,324 euro in 2014 compared with 36,280 euro in the West (BMWi 2015). In addition, DIW Berlin reported that productivity and wages in the East are still only around 70% of those of the West (Eickelpasch 2015).

The German government has implemented various R&D initiatives and technological programs in the former East Germany to bridge this regional gap and encourage economic development in the region. The Federal Ministry for Economic Affairs and Energy and Federal Ministry of Education and Research have operated most such programs, which can be classified into three regimes: the first regime (1990–1997) restructured the old system to boost its innovation potential, the second regime (1998–2006) built the new system to expand the creation of new links among various innovation agents, and the third regime (2007–current) stabilized the new system as well as expanded its boundary to all of Germany and overseas to reinforce nationwide innovation capacity and use the outcomes of the innovation system commercially (BMBF 2015; Günther et al. 2010). Table 1 depicts these policy programs that promoted the innovation capacity in the East and rebuilt the innovation system.

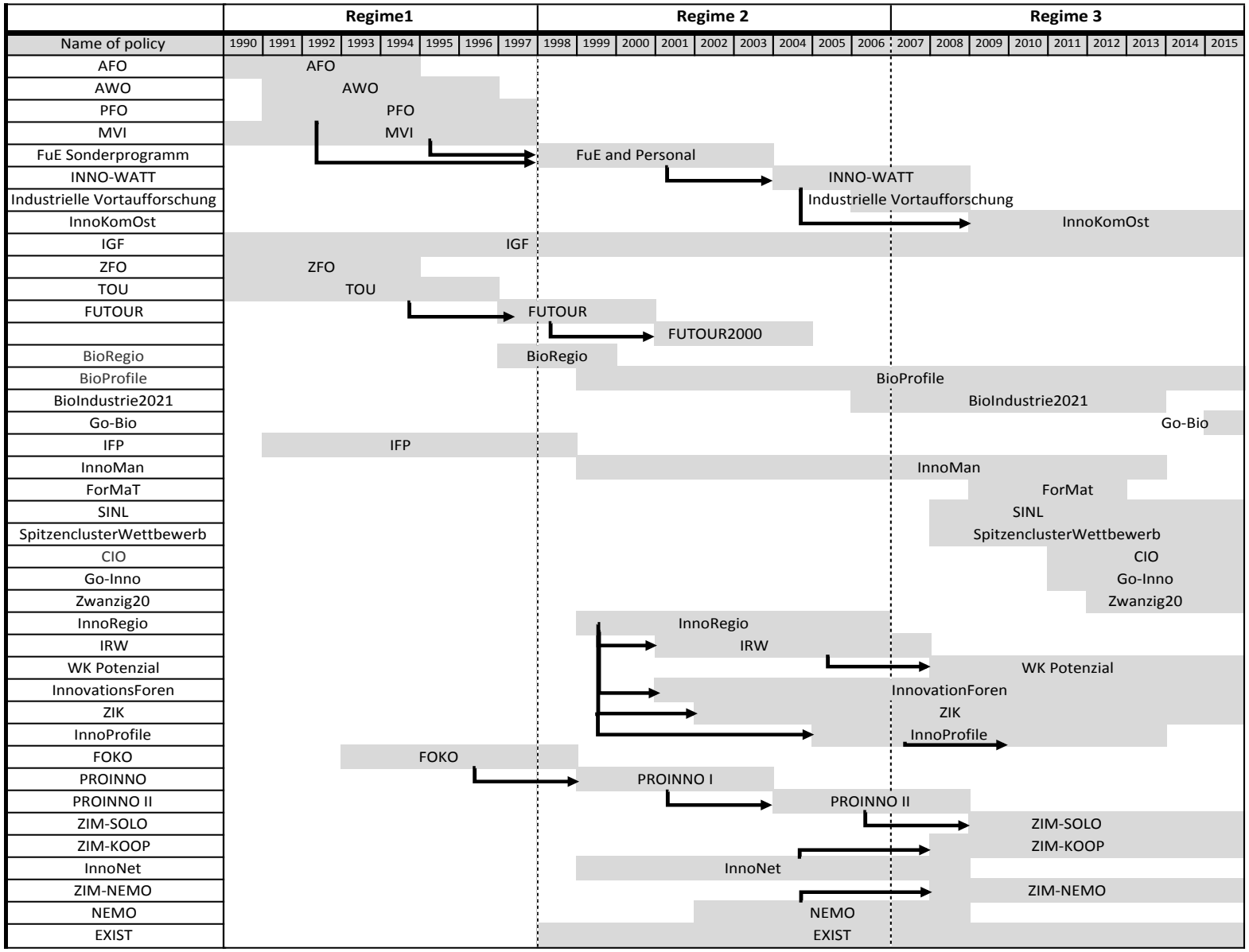

Table 1 Policies that boosted innovation capacity and rebuilt the innovation system of East Germany (Yi 2015)

4. Empirical results

4.1 Data

Our dataset was collected from the Web of Science (*WOS*), mainly from the SCI web version database. We selected all types of articles including journal articles, proceeding papers, reviews, letters, news items, and book reviews from 1973 to 2014 if at least one author was based in Germany.[1] In particular, we collected the author's address, the number of citations for each article, the fields of study, and the author's institution. The number of published papers we considered was 2,846,334. Table 2 shows the annual breakdown of our dataset.

Year	Within-sectors				Between-sectors				Between Western sectors and East Germany							*N*
	U	*I*	*G*	*WG*	*UI*	*UG*	*IG*	*UIG*	*U-WG*	*I-WG*	*G-WG*	*UI-WG*	*UG-WG*	*IG-WG*	*UIG-WG*	
1973	8.77	1.23	1.19	85.22	0.17	0.07	0.00	0.00	0.28	0.05	0.07	0.00	0.00	0.00	0.00	23433
1974	8.52	0.75	0.90	86.06	0.21	0.12	0.00	0.00	0.07	0.01	0.01	0.00	0.00	0.00	0.00	28121
1975	6.75	0.75	0.58	88.86	0.23	0.12	0.01	0.00	0.06	0.00	0.02	0.00	0.00	0.00	0.00	25847
1976	6.91	0.44	0.66	89.36	0.18	0.13	0.01	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.00	21885
1977	8.59	0.74	3.05	85.03	0.16	0.21	0.03	0.01	0.05	0.00	0.06	0.00	0.00	0.00	0.00	35961
1978	8.24	0.89	3.32	82.92	0.02	0.10	0.01	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	38519
1979	8.13	0.93	3.64	82.25	0.04	0.07	0.02	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.00	39520
1980	7.40	0.91	3.35	83.20	0.04	0.09	0.01	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.00	39687
1981	7.43	1.02	3.26	82.99	0.07	0.10	0.02	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	41906
1982	7.45	1.02	3.55	82.57	0.05	0.14	0.04	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	45325
1983	7.34	0.92	3.43	82.92	0.09	0.16	0.03	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	46087
1984	7.09	0.66	3.47	83.35	0.06	0.15	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	46939
1985	6.95	0.68	3.47	83.35	0.07	0.22	0.03	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.00	48509
1986	6.82	0.54	3.46	83.46	0.07	0.22	0.02	0.00	0.05	0.00	0.03	0.00	0.00	0.00	0.00	48912
1987	6.36	0.54	3.19	84.18	0.07	0.21	0.05	0.01	0.06	0.00	0.04	0.00	0.01	0.00	0.00	51706
1988	6.97	0.52	3.15	83.21	0.03	0.19	0.04	0.02	0.09	0.00	0.04	0.00	0.00	0.00	0.00	49748
1989	12.64	1.40	4.62	73.38	0.14	0.35	0.04	0.02	0.07	0.00	0.03	0.00	0.01	0.00	0.00	46586
1991	9.86	1.48	2.71	74.55	0.11	0.12	0.01	0.01	0.77	0.24	0.37	0.02	0.03	0.00	0.00	49210
1992	8.32	1.55	2.53	76.41	0.07	0.10	0.03	0.01	0.93	0.27	0.53	0.02	0.02	0.00	0.00	49667
1993	7.75	1.62	2.47	77.56	0.09	0.15	0.02	0.00	0.99	0.29	0.55	0.02	0.05	0.01	0.00	52582
1994	8.22	1.40	2.45	77.88	0.07	0.15	0.02	0.01	1.12	0.21	0.49	0.01	0.08	0.01	0.00	59493
1995	8.41	1.44	2.72	77.10	0.10	0.23	0.02	0.00	1.35	0.29	0.49	0.02	0.12	0.01	0.00	65007
1996	9.18	1.35	2.78	76.25	0.10	0.26	0.03	0.01	1.40	0.26	0.53	0.03	0.09	0.02	0.00	69475
1997	9.59	1.27	2.99	75.75	0.16	0.34	0.05	0.01	1.79	0.38	0.64	0.04	0.15	0.01	0.00	77544
1998	9.92	1.04	2.98	77.55	0.25	0.57	0.08	0.03	2.73	0.46	1.00	0.07	0.18	0.02	0.00	81136
1999	10.09	1.06	3.19	76.82	0.24	0.58	0.08	0.03	2.95	0.46	1.08	0.05	0.21	0.02	0.01	82238
2000	10.10	1.11	3.48	76.27	0.28	0.63	0.06	0.03	3.03	0.48	1.15	0.08	0.22	0.03	0.01	83111
2001	10.09	1.09	3.69	75.76	0.24	0.59	0.09	0.03	3.22	0.51	1.22	0.09	0.23	0.02	0.01	83046
2002	10.24	1.16	3.82	74.82	0.30	0.76	0.10	0.04	3.52	0.55	1.33	0.09	0.25	0.03	0.01	83895
2003	10.27	1.07	4.05	74.72	0.28	0.72	0.08	0.02	3.63	0.55	1.39	0.12	0.28	0.03	0.02	86080
2004	10.15	1.08	4.21	74.22	0.26	0.80	0.10	0.03	3.83	0.54	1.49	0.10	0.33	0.04	0.01	92479
2005	10.31	1.02	4.14	73.66	0.28	0.96	0.09	0.05	4.06	0.52	1.51	0.11	0.38	0.03	0.02	96341
2006	10.22	0.94	4.35	73.83	0.28	0.99	0.09	0.04	4.10	0.51	1.51	0.12	0.40	0.04	0.03	100145
2007	10.32	0.93	4.44	73.20	0.30	1.04	0.07	0.04	4.30	0.52	1.70	0.14	0.44	0.03	0.02	106775
2008	10.66	0.72	4.66	72.46	0.27	1.27	0.08	0.05	4.48	0.51	1.72	0.14	0.50	0.04	0.02	110585
2009	9.96	0.71	4.83	71.53	0.27	1.34	0.08	0.06	5.19	0.48	1.96	0.17	0.59	0.05	0.02	114691
2010	9.20	0.57	4.34	65.29	0.35	2.21	0.07	0.07	10.38	0.62	2.12	0.40	1.55	0.05	0.07	116316
2011	9.18	0.65	4.95	72.20	0.22	1.65	0.08	0.05	4.56	0.49	2.13	0.13	0.66	0.05	0.02	122560
2012	9.20	0.64	5.03	71.96	0.21	1.82	0.06	0.07	4.61	0.54	2.04	0.13	0.74	0.06	0.03	126202
2013	9.18	0.61	4.89	72.25	0.23	1.85	0.08	0.06	4.47	0.51	2.12	0.13	0.84	0.06	0.04	129613
2014	8.96	0.65	4.98	71.97	0.24	2.05	0.08	0.07	4.52	0.54	2.16	0.14	0.89	0.05	0.04	129452
																2846334

Table 2 (a) Percentages of East German articles in *WOS*, including West Germany

[1] We use information on the affiliation of each publication to classify the institution. After ignoring

Year	Within-sectors				Between-sectors				Between Western sectors and East Germany							*N*
	U	*I*	*G*	*EG*	*UI*	*UG*	*IG*	*UIG*	*U-EG*	*I-EG*	*G-EG*	*UI-EG*	*UG-EG*	*IG-EG*	*UIG-EG*	
1973	59.69	7.80	12.12	10.11	0.61	1.95	0.16	0.03	0.12	0.01	0.02	0.00	0.00	0.00	0.00	23433
1974	57.78	6.87	11.22	13.44	0.71	2.23	0.15	0.03	0.07	0.01	0.01	0.00	0.01	0.00	0.00	28121
1975	59.64	6.87	12.10	10.84	0.98	2.55	0.19	0.05	0.12	0.00	0.02	0.00	0.00	0.00	0.00	25847
1976	62.09	6.44	12.20	10.45	1.03	2.64	0.16	0.04	0.08	0.00	0.01	0.00	0.00	0.00	0.00	21885
1977	56.48	7.40	11.08	14.47	0.90	1.75	0.14	0.03	0.07	0.01	0.02	0.00	0.00	0.00	0.00	35961
1978	54.49	7.93	11.22	14.42	0.35	0.70	0.04	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	38519
1979	54.84	7.17	10.88	14.75	0.41	0.76	0.06	0.02	0.02	0.00	0.01	0.00	0.00	0.00	0.00	39520
1980	55.38	6.33	12.15	13.53	0.36	0.92	0.06	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00	39687
1981	55.20	6.52	11.72	13.46	0.41	0.88	0.06	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	41906
1982	54.96	6.85	11.12	13.95	0.43	0.86	0.07	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	45325
1983	55.62	6.77	11.38	13.25	0.56	0.99	0.07	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	46087
1984	55.59	6.88	11.63	12.53	0.60	1.14	0.09	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	46939
1985	56.30	6.38	11.30	12.58	0.63	1.12	0.08	0.04	0.02	0.00	0.01	0.00	0.00	0.00	0.00	48509
1986	55.95	6.39	11.24	12.28	0.71	1.27	0.10	0.06	0.03	0.01	0.01	0.00	0.01	0.00	0.00	48912
1987	56.27	6.29	11.88	11.58	0.83	1.44	0.11	0.07	0.06	0.01	0.01	0.00	0.00	0.00	0.00	51706
1988	55.38	6.97	11.69	11.75	0.77	1.42	0.10	0.06	0.09	0.01	0.00	0.00	0.01	0.00	0.00	49748
1989	55.50	7.05	12.42	10.36	0.87	1.44	0.14	0.07	0.08	0.00	0.02	0.00	0.00	0.00	0.00	46586
1991	50.75	6.36	11.24	15.54	0.80	1.32	0.14	0.06	0.77	0.13	0.11	0.04	0.05	0.01	0.00	49210
1992	52.39	5.71	11.77	13.31	0.83	1.55	0.11	0.06	1.10	0.11	0.18	0.03	0.10	0.01	0.01	49667
1993	53.36	5.18	11.68	12.47	0.82	1.63	0.13	0.04	1.09	0.14	0.22	0.05	0.14	0.00	0.01	52582
1994	53.99	4.52	10.89	13.10	0.70	1.60	0.10	0.05	1.22	0.12	0.26	0.05	0.13	0.01	0.01	59493
1995	53.56	4.32	10.63	13.87	0.78	1.74	0.11	0.05	1.54	0.16	0.27	0.07	0.16	0.00	0.01	65007
1996	53.64	3.84	10.42	14.72	0.70	1.95	0.13	0.05	1.61	0.16	0.30	0.06	0.15	0.00	0.01	69475
1997	53.35	3.65	10.36	15.54	0.88	2.08	0.13	0.07	2.04	0.23	0.46	0.07	0.20	0.02	0.02	77544
1998	53.73	3.22	10.02	16.41	1.32	3.31	0.19	0.11	3.10	0.31	0.59	0.14	0.27	0.01	0.02	81136
1999	53.12	3.12	9.96	16.69	1.38	3.24	0.23	0.09	3.18	0.31	0.73	0.15	0.33	0.02	0.01	82238
2000	52.68	3.09	10.00	17.14	1.38	3.25	0.22	0.10	3.46	0.31	0.71	0.13	0.33	0.03	0.02	83111
2001	52.21	3.22	9.72	17.36	1.60	3.51	0.22	0.15	3.67	0.35	0.68	0.15	0.36	0.03	0.03	83046
2002	51.34	3.28	9.72	17.74	1.67	3.48	0.26	0.16	3.98	0.40	0.70	0.17	0.39	0.03	0.03	83895
2003	51.14	3.37	9.63	17.83	1.73	3.63	0.23	0.16	4.01	0.41	0.73	0.23	0.46	0.03	0.03	86080
2004	50.46	3.47	9.61	18.08	1.65	3.61	0.20	0.16	4.27	0.45	0.82	0.21	0.48	0.03	0.03	92479
2005	49.53	3.49	9.50	18.49	1.63	3.96	0.23	0.18	4.43	0.44	0.85	0.24	0.55	0.03	0.04	96341
2006	49.57	3.19	9.38	18.54	1.68	4.20	0.23	0.20	4.56	0.40	0.84	0.26	0.54	0.03	0.03	100145
2007	48.91	3.18	9.16	18.81	1.70	4.11	0.23	0.19	4.78	0.47	0.85	0.25	0.61	0.03	0.05	106775
2008	48.66	2.96	9.02	19.06	1.71	4.62	0.20	0.21	4.82	0.44	0.91	0.31	0.68	0.04	0.06	110585
2009	48.15	3.01	8.90	18.52	1.83	5.10	0.27	0.28	5.17	0.48	0.96	0.33	0.81	0.05	0.08	114691
2010	47.06	2.70	8.35	16.29	2.26	7.12	0.30	0.36	6.88	0.46	0.97	0.44	1.20	0.04	0.09	116316
2011	46.49	2.86	9.96	18.36	1.79	5.73	0.25	0.25	5.31	0.47	1.10	0.40	0.92	0.05	0.07	122561
2012	46.48	2.86	9.70	18.40	1.74	6.05	0.30	0.32	5.32	0.47	1.08	0.37	0.93	0.05	0.09	126202
2013	46.23	2.74	9.91	18.21	1.74	6.63	0.28	0.29	5.25	0.44	1.10	0.40	1.06	0.05	0.09	129613
2014	45.93	2.79	9.89	18.21	1.77	6.95	0.25	0.36	5.31	0.45	1.15	0.38	1.14	0.06	0.11	129452
																2846335

Table 2 (b) Percentages of West German articles in *WOS*, including East Germany

As shown in Table 2 (b), the majority of research articles were published in West Germany during our study period. However, in the post-reunification period, the percentage of East German articles, regardless of their collaboration partners (i.e., $EG + I \cdot EG + G \cdot EG + UI \cdot EG + UG \cdot EG + UIG \cdot EG$), increased from 14.9% in 1994 to 26.8% in 2014.

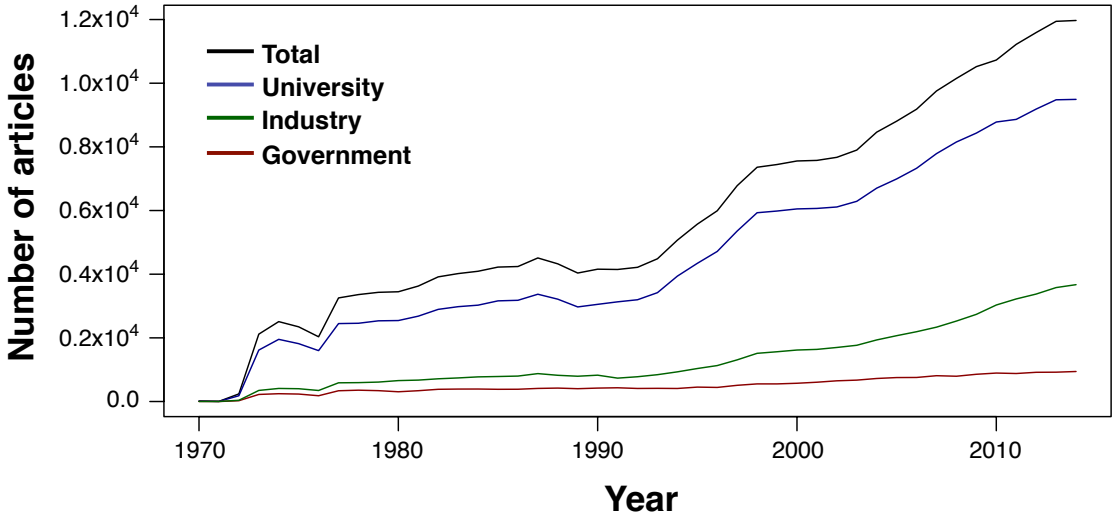

Figure 1 Number of research articles for all of Germany

Figure 1 shows that universities played a central role in research publications, followed by the government and industry. However, as depicted in Table 2 (b), while the percentage of university-published articles incorporating all types of collaborators in West Germany was rather stable throughout the study period, the number of articles published by universities alone decreased from 57.8% in 1974 to 45.9% in 2014, suggesting an increase in universities' collaborations with other institutions. In the case of the East, the percentage of university-published articles incorporating all types of collaborators grew over time, while the percentage for universities alone was stable owing to an increase in collaborations with other institutions, notably those in the West. Although the percentage of collaborations with East Germany was also growing over time in the West, considering that the majority of articles were published in West Germany, the change in universities' collaborations with other German institutions was more remarkable in the East. In addition, the role of the government in East Germany was noticeable compared with that in the West. The ratio between university alone and government alone remained at only 4 to 5 in the West, whereas it decreased from 9.5 in 1974 to 1.8 in 2014 in the East, implying that the role of government has grown over

time. This change might result from the fact that when the German government tried to restructure the science and technology system after the reunification in 1990, this process focused on the Eastern system with governmental research institutes often merging with universities to strengthen their research capabilities. Moreover, Unternehmen Region, which has been main policy program for strengthening research capability of industry-university network in East Germany, has contributed to this change after its implementation in 2000. According to Meske (2004), the science and technology system of socialist states including East Germany is a technology push-type linear innovation system. Such a system focuses its research resources on basic and strategy-related research as well as defense technology, mainly provided by the Germany Academy of Science. Given that universities typically focus on training students, and that corporations in industry side are mainly interested in achieving production goals, research and innovation activities are therefore vulnerable and deficient in cooperation between industry and university. Thus, after the reunification, the research capability of universities and industry in the East German region changed markedly. In particular, the activities of university–industrial networks and international cooperation increased, being strengthened through the transformation of the system.

After the reunification, the national innovation system of the East German region switched to a new system as research by the East German government alone and by universities alone significantly decreased below that in the West German region. In particular, the strengthening of the research capacity of universities shows that it developed greater cooperation with governmental research institutes. In other words, East German universities strengthened their basic research through structural adjustment policies, and industrial innovative capacity also increased because of the Unternehmen Region policy. Both policies exploit cooperation with the government or strengthen networks as a major policy instrument. As a result, the research ratio of universities alone significantly decreased.

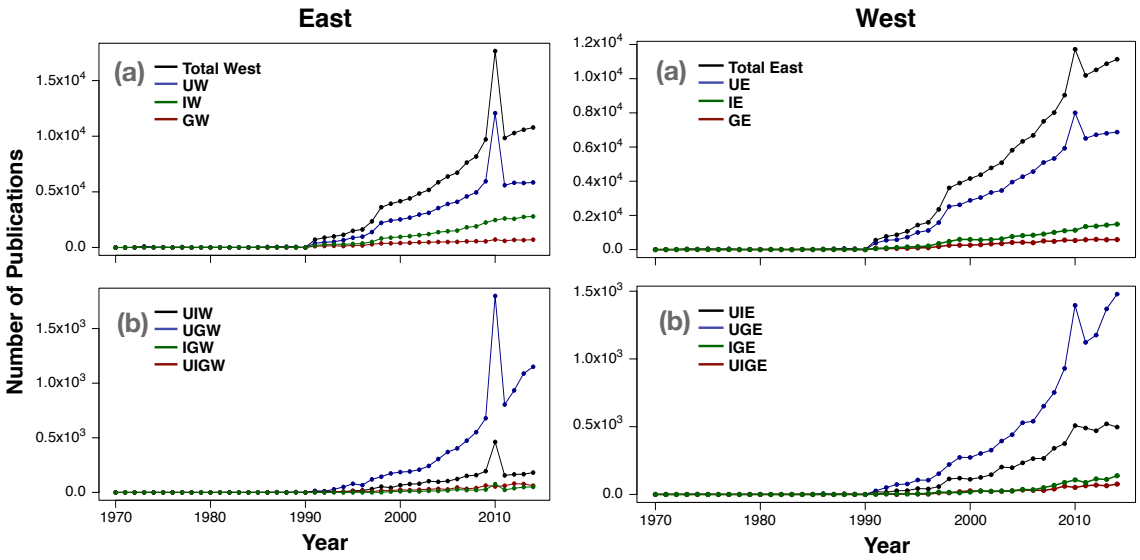

Figure 2 The number of collaborations in East Germany with (a) two-dimensional cases and (b) three-dimensional cases; the number of collaborations in West Germany with (a) two-dimensional cases and (b) three- and four-dimensional cases

The left-hand side of Figure 2 shows the number of collaboration types in East Germany with West Germany, while the right-hand side is that of West Germany. Collaboration between the two regions was rarely observed before the reunification in 1990, whereas this number soared after the reunification. Moreover, universities played a significant role as a collaboration partner in every dimensional case, in terms of quantity, followed by industry and government. Regarding the gap between university and others, the share of universities in all dimensional cases in West Germany was prominent compared with the East.

In Figure 2, we can observe one peak in 2010 owing to a published paper written by a researcher who belonged to a hospital. This study classifies university hospitals as universities and other hospitals as either industry or a governmental research institute. When we extract all types of hospitals as an independent category, this peak disappears. In other words, hospitals are likely to publish papers that have a large number of co-authors.

4.2 Results of the TH model

4.2.1 Has the German reunification strengthened East/West German innovation systems?

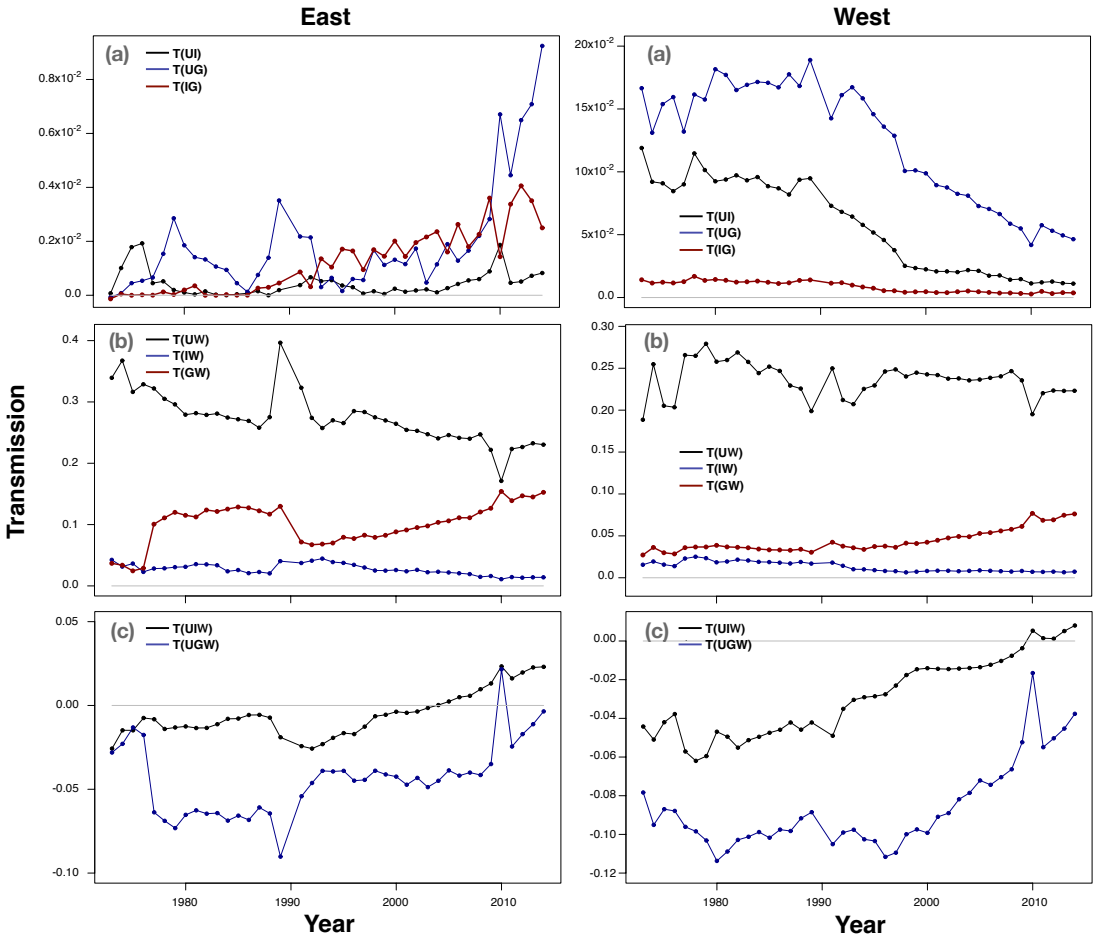

Figure 3 Mutual information in the two-dimensional and three-dimensional cases for East and West Germany

As shown in Figure 3 (a), the transmission values in the two-dimensional case showed an increasing trend for the East but a decreasing trend for the West. Therefore, regarding university–industry, industry–government, and government–university collaborations without other German regions, the synergy effect of networks rose in the East and fell in the West. However, while this change was prominent in the university–industry relationship, the transmission value of the industry–government relation in the East slightly increased and that of the West rapidly decreased in the 1990s. The industry–government relationship showed an increasing trend in the East with fluctuations over time, while it was stable with a low value in the West. Overall, if considering only two-dimensional collaborations in each region, the transmission value grew in the East and declined in the West, reflecting that each innovation system improved in the East and worsened in the West.

However, considering that, as shown in Table 2 and Figure 1, the number of two-dimensional collaborations in each region increased after reunification, the quality of these did not always correspond with this quantitative change. Figures 3 (b) and (c) show the worsening network effect in the two- and three-dimensional cases.[2] Exceptions include the relationships between each government and the other regions, such as West and the East government and East and the West government. In other words, the synergy effects of networks only improved when the government supported interregional relations by building a relevant network structure or improving the innovation system.

Regarding the network effect in three-dimensional cases in the East, as seen on the left-hand side of Figure 3 (c), the transmission value, reflecting the university, industry, and West Germany relationships, increased gradually with a negative sign, reaching zero around the mid-2000s and increasing its absolute value with a positive sign thereafter. Regarding the same composition and dimensional cases for the East (i.e., university, East government, West Germany), the value was stable until 2010 with a negative sign, changing to a positive sign thereafter. The change in sign and increase in the positive value after the change implies that the innovation systems in each region for the three-dimension cases (UIW and UIE) were not well established, or rather worsened over time.

When we compare the two- and three-dimensional cases, namely UIW/UIE and UGW/UGE, the latter show better value in terms of the synergy effect of networks measured as transmission values (i.e., a higher absolute value with a negative sign). Therefore, although the networks of each region in the three-dimensional cases (i.e., including other regions) lost synergy after the reunification in general, the government played a critical role in systemizing these three-dimensional networks.

4.2.2 Has the German reunification strengthened the national innovation system of Germany?

[2] In the two-dimensional cases, a positive sign and an increasing absolute value signifies an improvement of the network effect. By contrast, in the three-dimensional case, an increasing absolute value with a negative sign means an improvement.

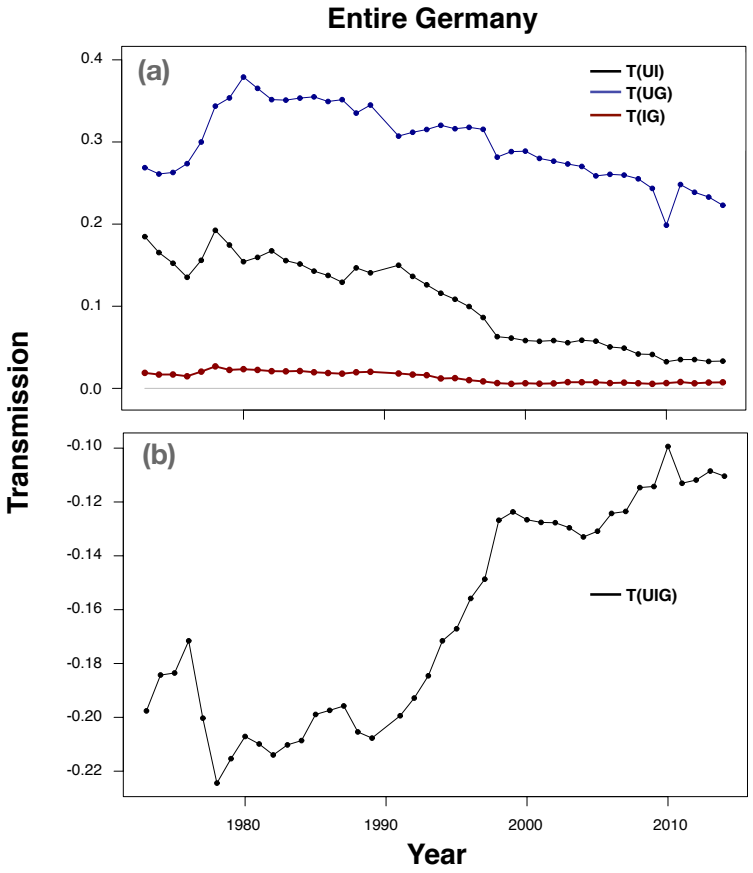

Figure 4 The transmission values in the two-dimensional and three-dimensional cases for Germany

When investigating the transmission values of the two- and three-dimensional cases for all of Germany, we find a decrease in transmission values for the former case and an increase in transmission values for the latter case, implying that innovation networks lost their positive effect. Considering that the number of publications and collaborations soared after the reunification, this result is different to our expectations. We can conclude that the innovation networks of Germany have worsened over time in terms of the synergy effect of university–industry–government networks.

5. Robustness check

By way of a robustness check, we reclassify the TH model into three configurations based on the various institutional arrangements of university–industry–government relations with respect to policy perspectives. These are labeled THI for government-controlled relations,

THII for the laissez-faire model, and THIII for the ideal model with overlapping institutional spheres, as depicted in Figure 5 (Etzkowitz & Leydesdorff 2000b). For example, we can observe THI in the former Soviet Union, while THII was implemented to give a shock to society as a remedy after abolishing THI. Most countries nowadays aim to build the THIII model as the ideal system configuration by encouraging the establishment of university spin-off firms, strategic alliances among firms, government laboratories, and so on.

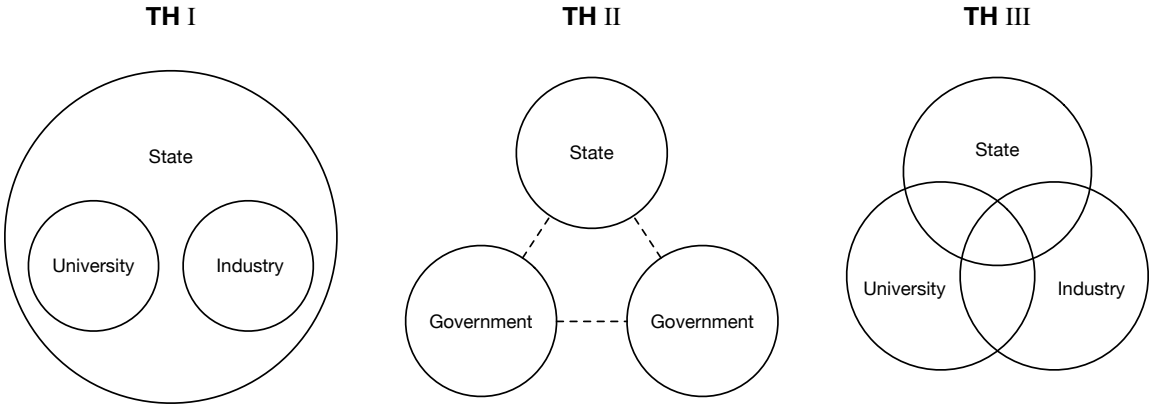

Figure 5 TH configurations (Etzkowitz & Leydesdorff 2000a)

However, have the policy goals of the German government been implemented in practice? After the reunification in 1990, the German government tried to restructure the science and technological system of East Germany that consisted of industry, university, and governmental research institute. In the course of this restructuring, two governmental organizations were involved to control this process: the German Council of Science and Humanities (*Wissenschaftsrat*) and the trust organization (*Treuhandanstalt*). The council was responsible for the rearrangement of university and governmental research centers, while the trust organization was in charge of restructuring firms and industries. The council aimed to equalize the research environment of the East with that of the West as well as internationalize the research capability in the East and fortify basic science by merging universities and governmental research institutes. On the contrary, the goal of the trust organization was to privatize Eastern firms in order to increase their market competitiveness, preserve the number of jobs, and create a reunification fund through the privatization of firms. For firms in the East, a failure to privatize meant an exit from the market.

To investigate the configuration currently in place in post-reunification Germany, we surveyed 221 scientists and engineers from either the former East Germany or current East

German regions. Before the survey, we contacted all potential respondents and then surveyed only available respondents, which included 221 scientists and engineers. All participants had at least a Master's degree including a Diplom degree of the German education system. We looked for scientists or engineers who started their careers in former East Germany before the reunification, regardless of their current addresses, or those currently working in a university, industry, or government position in the East with experience of the governmental support program. Table 3 presents the sample breakdown.

	University	**Industry**	**Government**	**Total**
Scientists/engineers who started their careers in the East before 1990	40	17	29	86
Scientists/engineers who started their careers in the West before 1990	9	3	19	31
Scientists/engineers who started their careers after 1990	32	22	50	104
Total	81	42	98	221

Table 3 Sample by institution and career start date

The questionnaire of survey includes 72 questions on the national innovation system of the reunified Germany. However, this paper focuses only on two questions related to the TH model: 1) For the process of technological progress and development of capabilities in the former East Germany, which institutional configuration was used between 1990 and 1997 and 2) For the process of technological progress and development of capabilities in the former East Germany, which institutional configuration is most relevant? The questionnaire is presented in the Research Gate[3] and Table 4 presents the survey results.

[3] Available at https://www.researchgate.net/profile/Bogang_Jun

Q 1	TH I	TH II	TH III	NA	Sum
Respondents	68	79	40	34	221
(Ratio)	30.77%	35.75%	18.10%	15.38%	100%

Q 2	TH I	TH II	TH III	NA	Sum
Respondents	20	46	130	25	221
(Ratio)	9.05%	20.81%	58.82%	11.32%	100.00%

Table 4 Results of the survey on the TH model used in the former East Germany

As shown in Table 4, 35.75% of respondents chose TH II for Q1, suggesting that the laissez-faire model was dominant in the former East Germany between 1990 and 1997, followed by TH I (30.77%), which was the government-dominated model. This finding suggests that the reunification was unanticipated in Germany (Bach & Trabold 2000). Industries in the East dismissed a number of R&D personnel to make savings after the reunification without guidance from the government (Meske 1993). As Meske (1993) stated, although the restructuring of the East innovation system "aim[s) to create an integrated research system in a unified Germany," in the agreement between West and East Research Ministers in July 1990, the course of restructuring led to increasing unemployment among researchers, especially in uncompetitive fields. At the same time, 30% of respondents chose TH I because the restructuring of the East German innovation system was basically conducted by the government (Meske 1993). Moreover, because East Germany was under socialism at that time, the strong version of model TH I was installed before the reunification (Etzkowitz & Leydesdorff 2000a).

By contrast, as shown in Table 4, for Q2, over half of respondents (58.82%) chose TH III, suggesting that the ideal model is the most relevant for technological progress and strengthening capabilities in the former East Germany. After the reunification, the R&D personnel in the innovation system experienced a laissez-faire model on the one hand and dominant government model on the other hand, mainly because the unification was unanticipated and Germany was unprepared for it. Therefore, although some restructuring was carried out under the governmental control, the majority of R&D personnel felt abandoned by the laissez-faire government.

6. Summary and conclusion

Although the reunification of Germany in 1990 was a historic event, the convergence costs between West and East, especially those spent to reduce the gap in economic development, have been vast. Among other policy initiatives, the German government has strived to bridge the gap between the two regions by building an innovation system that encourages interregional research collaborations given that knowledge is the main input in a knowledge-based economy. A well-constructed network that creates new knowledge can thus boost regional integration.

In this paper, we examined whether the German reunification strengthened the country's national innovation system by encouraging knowledge creation and diffusion. We assessed the various dimensions of the national innovation system by analyzing co-authorship networks using the TH model. The presented results show that the innovation system of all of Germany worsened after the reunification. Further, the network's positive effect generally declined over time in both East and West regions, except for the two-dimensional university–industry relationship in the East and that between the government and the other region of Germany in the East and West. Moreover, although we found an increase in the number of publications and collaborations between the two regions, the quality of the innovation system did not rise in line with this quantitative change; indeed, only when the government participated in these collaborations did the innovation network improve. Finally, this study also investigated surveyed data as a robustness check, finding that the ideal TH configuration in the post-reunification period was not implemented to restructure the innovation system in East Germany, and although some restructuring of Eastern system was carried out under the governmental control, the majority of R&D personnel in East Germany felt abandoned by the laissez-faire government.

References

Abramson, N., 1963. *Information theory and coding*, McGraw-Hill.

Acedo, F.J. et al., 2006. Co-authorship in management and organizational studies: An empirical and network analysis. *Journal of Management Studies*, 43(5), pp. 957–983.

Bach, S. & Trabold, H., 2000. Bach: Ten years after German monetary, economic and social union: An introduction. *Quarterly Journal of Economic Research,* 2, pp. 149–151.

BMBF, 2015. Programm-Monitoring, DLR Projektträger, Stand November 2015 in "25 Jahre Deutsche Einheit – 15 Jahre Unternehmen Region", 7th KISTEP Future Forum (November 25, 2015).

BMWi, 2015. Wirtschaftsdaten neue bundesländer. Available at https://www.bmwi.de/BMWi/Redaktion/PDF/W/wf-wirtschaftsdaten-neue-laender,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf.

Crane, D., 1972. *Invisible colleges; diffusion of knowledge in scientific communities*, University of Chicago Press.

Eickelpasch, A., 2015. Manufacturing in East Germany since unification. Available at https://www.diw.de/documents/vortragsdokumente/220/diw_01.c.525594.de/v_2015_eickelpasch_manufacturing_kistep.pdf.

Etzkowitz, H. & Leydesdorff, L., 1995. The triple helix – University-industry-government relations: A laboratory for knowledge based economic development. *EASST Review*, 14(1), pp. 14–19.

Etzkowitz, H. & Leydesdorff, L., 2000. The dynamics of innovation: from National Systems and "'Mode 2'" to a Triple Helix of university–industry–government relations. *Research Policy*, 29, pp. 109–123.

Foray, D., 2004. *Economics of knowledge*, MIT Press.

Freeman, C., 1987. *Technology, policy, and economic performance: Lessons from Japan*, Pinter Publishers.

Godin, B., 2009. National innovation system: The system approach in historical perspective. *Science, Technology, & Human Values*, 34(4), pp. 476–501.

Günther, Jutta, Nicole Nulsch, Dana Urban-Thielicke, and Katja Wilde. 2010. "20 Jahre Nach Dem Mauerfall: Transformation Und Erneuerung Des Ostdeutschen Innovationssystems." Studien Zum Deutschen Innovationssystem Nr. 16-2010. http://www.iwh-halle.de/asp/pubdetails.asp?lang=e&id=3287&action=details.

Katz, J.S. & Hicks, D., 1997. How much is a collaboration worth? A calibrated bibliometric model. *Scientometrics*, 40(3), pp. 541–554.

Kim, T.-Y. & Heshmati, A., 2013. *Economic growth: The new perspectives for theory and policy*, Springer.

Kwon, K.-S. et al., 2011. Has globalization strengthened South Korea's national research system? National and international dynamics of the Triple Helix of scientific co-authorship relationships in South Korea. *Scientometrics*, 90(1), pp. 163–176.

Leydesdorff, L., 2010. The knowledge-based economy and the triple helix model. *Annual Review of Information Science and Technology*, 44(1), pp. 365-417.

Leydesdorff, L. & Sun, Y., 2009. National and international dimensions of the Triple Helix in Japan: University-industry-government versus international coauthorship relations. *Journal of the American Society for Information Science and Technology*, 60(4), pp.

778–788.
Link, A., 2006. Public/private partnerships in the United States. *Industry & Innovation*, 6(2), pp. 191–217.
Link, A.N., 1996. Research joint ventures: Patterns from Federal Register filings. *Review of Industrial Organization*, 11(5), pp. 617–628.
Lundvall, B.Å., 2007. Innovation system research: Where it came from and where it might go. *Globelics Working Paper* 2007-01.
Lundvall, B.Å., 1992. *National systems of innovation: Toward a theory of innovation and interactive learning*, Pinter.
Lundvall, B.Å. & Johnson, B., 1994. The learning economy. *Journal of Industry Studies*, 1(2), pp. 23–42.
May, R.M., 1976. Simple mathematical models with very complicated dynamics. *Nature,* 261(5560), pp. 459–467.
May, R.M. & Leonard, W.J., 2006. Nonlinear aspects of competition between three species. *SIAM Journal on Applied Mathematics*, 29(2), pp. 243–253.
Meske, W., 1993. The restructuring of the East German research system: A provisional appraisal. *Science and Public Policy*, 20(5), pp. 298–312.
Meske, W., 2004. "From System Transformation to European Integration", Transaction Publishers
Newman, M.E.J., 2001a. Scientific collaboration networks. I. Network construction and fundamental results. *Physical review E*, 64(1), p. 016131.
Newman, M.E.J., 2001b. Scientific collaboration networks. II. Shortest paths, weighted networks, and centrality. *Physical review E*, 64(1), p. 016132.
OECD, 1996. *The Knowledge-Based Economy*, General Distribution OECD/GD(96) 102, Paris.
Powell, W.W. & Grodal, S., 2006. Networks of Innovators. In *The Oxford handbook of innovation*, Oxford University Press.
Powell, W.W. & Owen-Smith, J., 1998. *Commercialism in universities: Life sciences research and its linkage with industry.* Journal of Policy Analysis and Management, 17(2), pp. 253–277.
Ranga, M. & Etzkowitz, H., 2013. Triple Helix systems: An analytical framework for innovation policy and practice in the Knowledge Society. *Industry and Higher Education*, 27(4), pp. 237–262.
Shannon, C.E., 1948. A mathematical theory of communication. *The Bell System Technical Journal*, 27(3), pp. 379–423.
Shields, M., Frijters, P. & Haisken-DeNew, J.P., 2003. The value of reunification in Germany: An analysis of changes in life satisfaction. *Royal Economic Society Annual Conference*.
Sonis, M., 2000. Nonlinear socio-ecological dynamics and first principles of collective choice behavior of "Homo Socialis". *Progress of Theoretical Physics Supplement*, 139, pp. 257–269.
Sun, Y., Negishi, M. & Nishizawa, M., 2007. Coauthorship linkages between universities and industry in Japan. *Research Evaluation*, 16(4), pp. 299–309.
Theil, H., 1972. *Statistical decomposition analysis*, North-Holland.

Yi, S.-K. 2015. Lesson from Innovation system transformation of German reunification for preparing reunification of Korea, *KISTEP InI* Vol 11, PP59-81 (in Korean)

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University of Hohenheim
Dean’s Office of the Faculty of Business, Economics and Social Sciences
Palace Hohenheim 1 B
70593 Stuttgart | Germany
Fon +49 (0)711 459 22488
Fax +49 (0)711 459 22785
E-mail wiso@uni-hohenheim.de
Web www.wiso.uni-hohenheim.de