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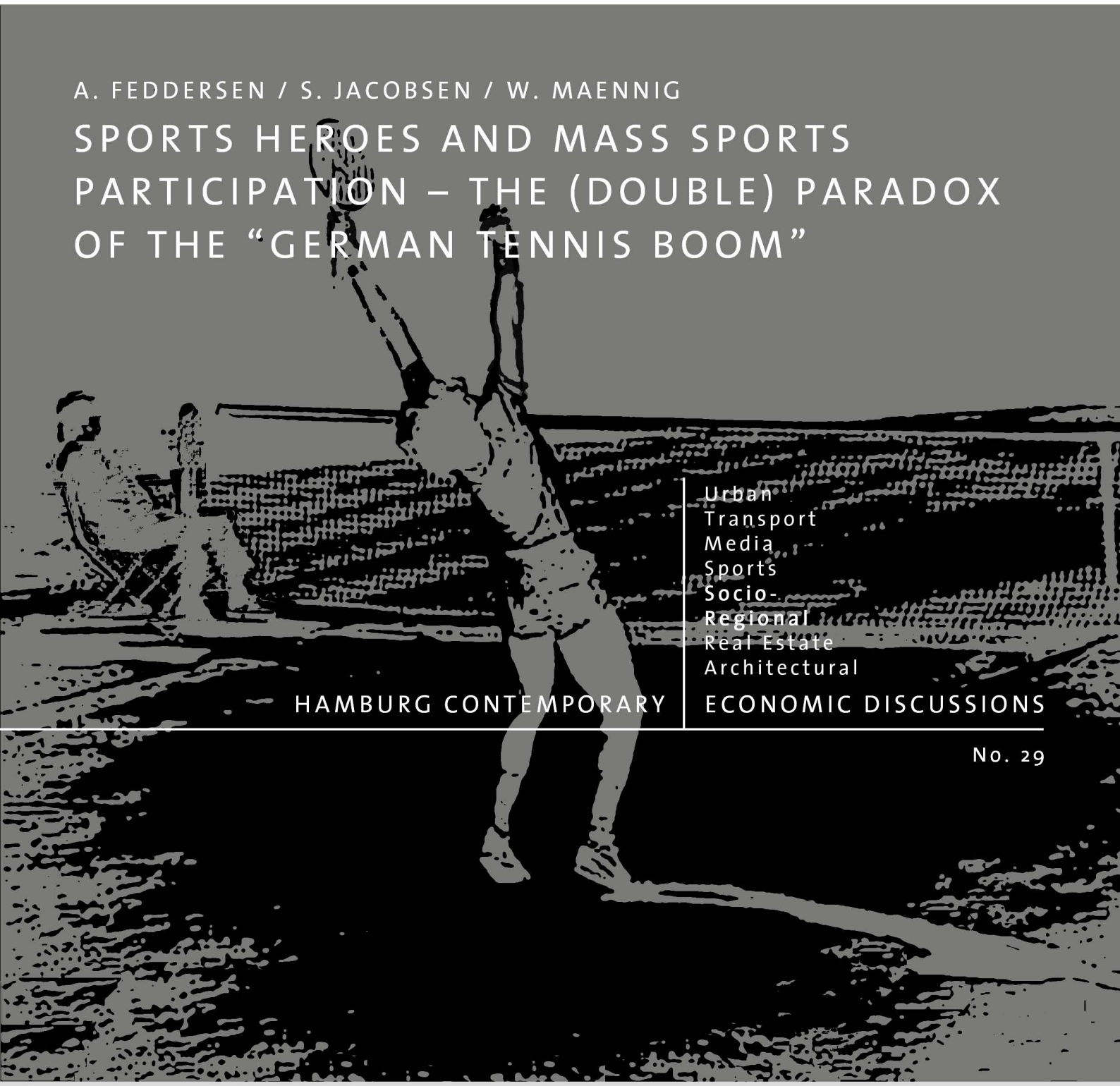

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HAMBURG CONTEMPORARY ECONOMIC DISCUSSIONS

No. 29

Hamburg Contemporary Economic Discussions
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ISSN 1865 - 2441 (Print)
ISSN 1865 - 7133 (Online)

ISBN 978 - 3 - 940369 - 72 - 7 (Print)
ISBN 978 - 3 - 940369 - 73 - 4 (Online)

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Sports Heroes and Mass Sports Participation – The (Double) Paradox of the "German Tennis Boom"*

Abstract: The major sporting success of one's countrymen and women is often supposed to promote the growth of general participation in that sport. This study is the first to analyse the impact of sports heroes on the membership figures of the corresponding sports association by means of an econometric analysis. We do so by evaluating the so-called "Boris Becker effect" by simultaneously testing for the effects of the rise and retirement of the three stars Boris Becker, Stefanie Graf, and Michael Stich. As a first paradox, our results indicate a negative tennis growth effect associated with the time period of the ascendency of the sport stars. With the first paradox, their retirement should then have a positive effect. In this sense, our second result of a statistically negative tennis growth since the declining success of the German tennis stars must be regarded as a second paradox.
Keywords: Tennis, Sport Association Memberships, Boris Becker Effect, Mass Sport Participation
JEL classification: L83, C23
Version: November 2009

1 Introduction

On June 7th, 1985, Boris Becker, a seventeen-year-old boy, won the All England Tennis Championships in Wimbledon. He was both the youngest and first unseeded player to be the champion of the world's most important tennis tournament. In 1986, he successfully defended his title in Wimbledon. During his career, Boris Becker won 49 tournaments, including six Grand Slam victories and three ATP World Championships, and in January 1991, he reached the top position in the ATP ranking. He was elected Germany's Athlete of the Year (category: men) in 1985, 1986, 1989, and 1990.

Only two years after Becker's victory in Wimbledon, Stefanie Graf climbed to the top of the WTA ranking after her victory at the tournament in Los Angeles on Au-

* We gratefully acknowledge the German Sports Federation (DSB/DOSB) and the German Tennis Association (DTB) for providing extensive data for sports participation (members).

gust 17th, 1987. Stefanie Graf's career was similarly outstanding and included 107 tournament victories, 22 Grand Slam victories, and one Olympic gold medal. She led the WTA ranking for 377 weeks and was elected Germany's Athlete of the Year (category: women) in 1986, 1987, 1988, 1989, and 1999.

The group of outstanding German tennis stars during this period was completed by a third member, Michael Stich. Stich won 18 tournaments, including one victory in Wimbledon versus Boris Becker in 1991 and one ATP championship in 1993. After his victory in Wimbledon and participating in the semi-finals of the French Open, he was elected Germany's Athlete of the Year (category: men) in 1991. In 1993, he reached his best position in the ATP ranking at number two. Teamed with Boris Becker, he won the doubles tournament at the 1992 Olympics in Barcelona. Finally, from 1988 to 1993, the German Davis Cup team led alternatively by Boris Becker and Michael Stich won the cup three times.

The rise of these three athletes awakened an interest in tennis among Germans. Until then, the sport tended to be sidelined. Outside of the success of a few professional tennis players (i.e., Gottfried von Cramm, Wilhelm Bungert, and Helga Masthoff), the German sports audience cared little about this sport. Instead, TV networks focused more on other sports such as soccer, swimming, and track and field. Following the rise of these tennis heroes together with the emergence of private TV networks, the hours of tennis television broadcasts increased tremendously from 95 hours in 1985 to 2,738 hours in 1995. German Tennis Federation (DTB) TV revenues per year grew from about €500,000 in 1985 to over €12 million during the early 1990s (N.N., 2008).

The major sporting success of one's countrymen and women may not only generate increased media coverage of the sport but also may promote the growth of general participation in that sport (Wann, 2001). At first glance, this assumption seems to be supported by the increase in membership in German tennis clubs, which rose from 1.7 million in 1984 to 2.3 million in 1995 (+35%). It is no surprise that this increase in tennis participation was labelled the "Boris Becker effect" (Van Bottenburg, 2002). However, this development might not have been caused by these tennis heroes, but instead it may be attributed to a general phenomenon

in German sports participation (e.g., trends or demographic determinants). Surprisingly, with the exception of Van Bottenburg (2002), who finds some evidence for a Boris Becker effect in his visual inspection of a time series, no scholarly work has directly supported the hypothesis that sports heroes increase mass participation in sports.[1]

The aim of this paper is to use the case of the "German tennis boom" to isolate any membership effect sparked by the rise of tennis heroes while accounting for general developments in sport participation. Therefore, we will conduct a difference-in-difference (DD) analysis in which German Tennis Association (DTB) memberships as the treatment group will be compared to memberships in a control group of other sports.

The remainder of the paper is organized as follows. After providing some background information, Section 2 describes the data and presents some descriptive statistics. Section 3 outlines the empirical strategy, while Section 4 contains the empirical results. Section 5 concludes.

2 Data

We use data on the German Tennis Association (DTB) membership. For a difference-in-difference (DD) analysis, in addition to data on DTB memberships (i.e., the treatment group), we consider a counterfactual control group consisting of the membership numbers of other Olympic sports and golf. These data are provided by the German Sports Federation (DSB/DOSB) and are available from 1974 onwards. We exclusively consider federations for which data are available for the complete time period.[2] Namely, the control group contains the following sports: badminton, basketball, bobsled and luge, boxing, ice sports, fencing, football (soccer), golf, team handball, field hockey, track and field, cycling, equestrian,

1 See also the literature cited therein.

2 Baseball and softball, snowboard, taekwondo, and triathlon were excluded. Also not included are large non-Olympic sports associations such as alpine walking, billiard, bowling, and chess.

rowing, aquatics, table tennis, gymnastics, volleyball, weight lifting, judo, canoe and kayak, wrestling, shooting (including archery), sailing, and skiing.

The DSB/DOSB collects membership numbers for all affiliated German sports associations annually. In addition to total membership, data are provided on age and gender. Since some sports associations do not differentiate by age or gender and since the definition of the age groups changed during the observation period, we simply divide the number of members into "youth" (i.e., younger than 19 years old) and "adults".

Tab. 1 Descriptive Statistics of Overall Membership by Sports Association

Sport	No. of years	Mean	Std. Dev.	Min	Max
Aquatics	34	598,071	32,624	545,210	644,185
Badminton	34	152,429	70,943	33,538	234,282
Basketball	34	138,932	55,375	46,416	207,780
Bobsled & Luge	34	7,854	1,413	4,526	10,131
Boxing	34	48,997	8,632	36,721	67,097
Canoe & Kayak	34	99,947	13,019	75,895	114,424
Cycling	34	117,867	36,050	57,308	156,898
Equestrian	34	588,732	145,450	288,322	764,542
Fencing	34	23,850	2,095	19,046	27,773
Field Hockey	34	54,532	10,716	35,926	72,538
Football (Soccer)	34	5,192,861	945,520	3,413,076	6,490,008
Golf	34	194,172	162,367	27,331	527,427
Gymnastics	34	4,014,217	855,766	2,680,247	5,132,778
Ice sports	34	133,024	33,978	72,956	176,129
Judo	34	225,666	37,513	142,853	276,231
Rowing	34	73,554	5,003	66,848	79,344
Sailing	34	167,525	23,479	96,105	192,446
Shooting	34	1,322,169	241,559	826,493	1,589,079
Skiing	34	602,011	125,501	302,055	713,340
Table Tennis	34	667,732	86,800	425,183	797,816
Team Handball	34	759,058	102,192	495,775	859,528
Tennis	34	1,737,834	509,888	578,358	2,9,559
Track and Field	34	806,566	70,445	637,140	899,520
Volleyball	34	381,722	137,367	90,057	535,627
Weight lifting	34	31,703	11,528	12,143	43,810
Wrestling	34	72,119	4,943	61,072	82,659

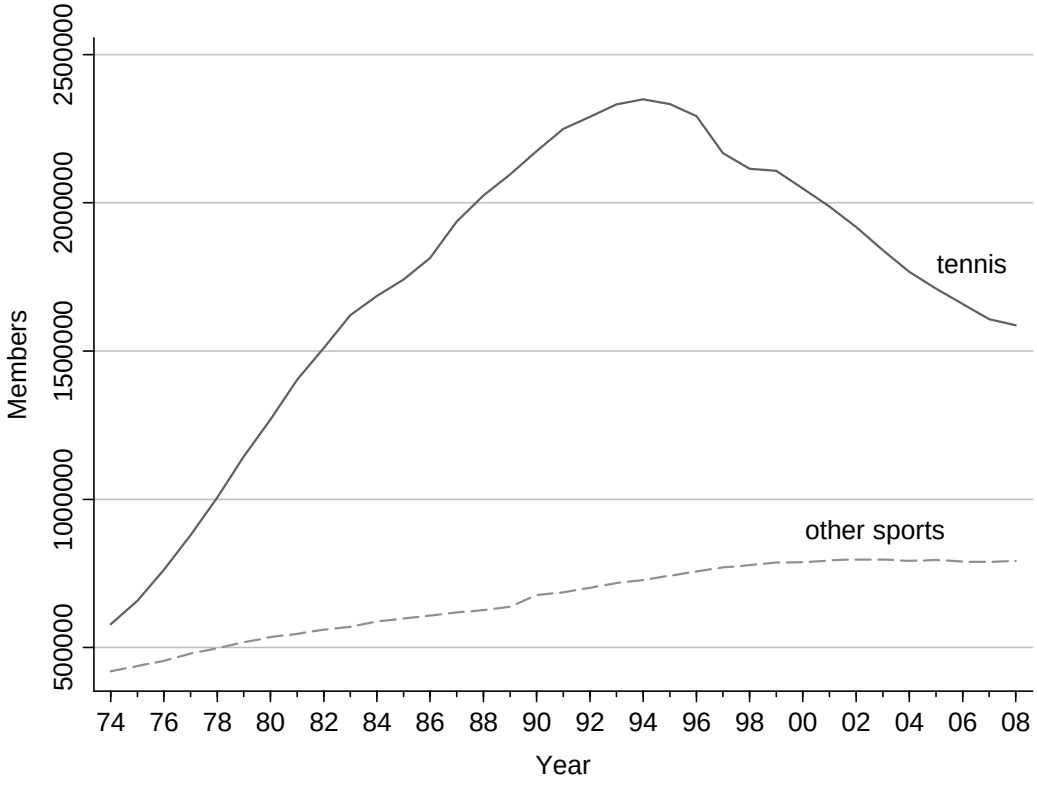
Source: Calculations based on DSB/DOSB (various years).

The heterogeneity of the sports associations with respect to the number of members is obvious. In terms of means, the smallest association (bobsled and luge) has only about 8,000 members, while the largest association (football) has more than 5 million members. Only four associations – including tennis – show more than one million members on average. Comparing the 1974 and 2007 numbers, a positive trend in sports participation in Germany can be found over the last 34 years. For all included associations during our observation period, the initial value was lower than the 2007 value. The total increase in membership for all associations is 92.5%. The lowest increase is 6.7% (aquatics and rowing), while some as-

sociations show extreme growth rates of 1,830% (golf), 530% (badminton), and 435% (volleyball).

Figure 1 compares the development of DTB membership with average membership numbers for the other sports associations. In the early 1970s, tennis membership was just slightly above the mean of German sports associations. After that period, a tremendous increase in memberships occurred. The membership numbers rose from 578,000 in 1974 to approximately 2.3 million in the years from 1994 to 1996 for an increase of 300%. A comparison of DTB memberships and those for other German sports associations seems, at this point in the analysis, to confirm the Becker effect.

Fig. 1 Membership: DTB versus Mean of Other Sports (Overall)



Source: Calculations based on DSB/DOSB (various years).

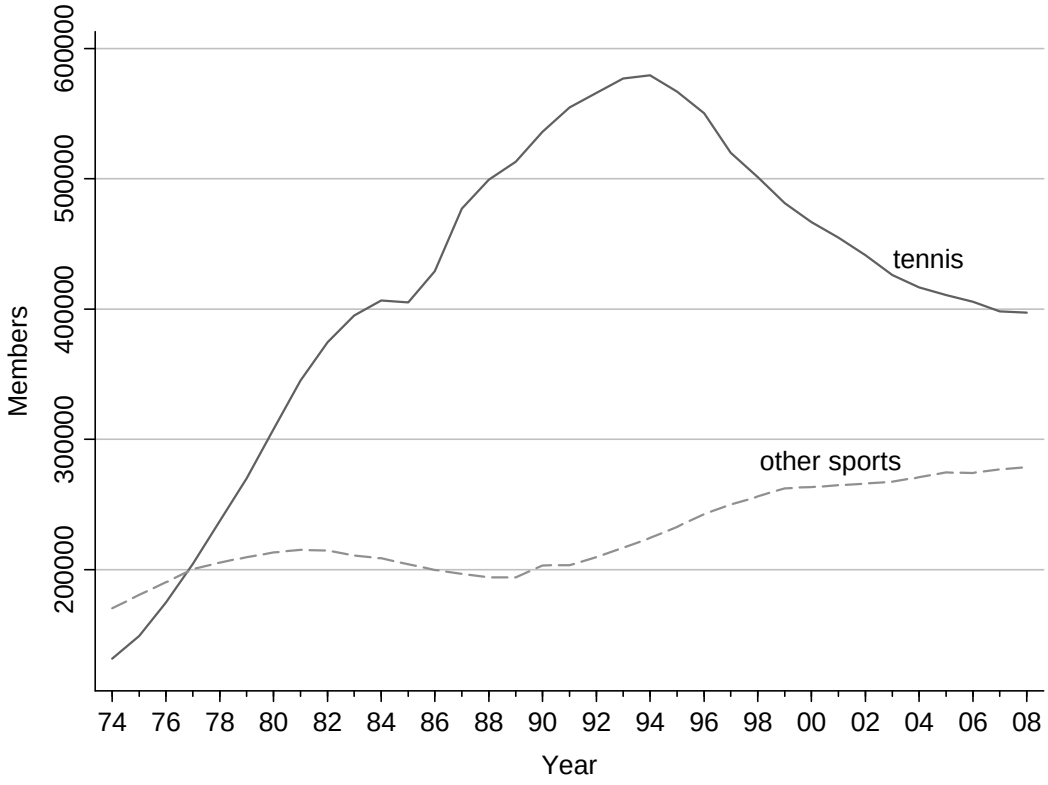
During 1990 and 1991, a structural break can be observed in the data for organisations other than DTB. This break is the result of German reunification; until 1990, the data represent members from West German regions alone. No corre-

sponding effect can be seen for tennis; tennis was not supported in the German Democratic Republic (GDR) like other sports that promised more Olympic medals.

A decline in tennis membership numbers began in the mid-to-late 1990s. At first glance, even this development seems to be related to the emergence of German tennis stars. The last great victories in German tennis took place in 1996, when Stefanie Graf won three grand slam tournaments. After this point, injuries caused her career to decline; she subsequently played only 19 matches in 5 tournaments due to several injuries and lost the first rank in the WTA raking to Martina Hingis (CH). From June 1997 to June 1998, she played no matches. In 1999, she celebrated a comeback and won the French Open. Shortly after, she retired from professional tennis due to repeated injuries. Boris Becker won his last Grand Slam title in early 1996 (Australian Open). After a hand injury in June of 1996, he played fewer tournaments and finally retired in the summer of 1999. Michael Stich retired in 1997, also due to repeated injuries. Note that 1998 was the first year without a tournament victory by a German tennis player after 14 successful years. None of the professional tennis players in Germany that followed (e.g., Tommy Haas, Nikolas Kiefer, and Rainer Schüttler) seemed able to follow in the footsteps of the three previous tennis super stars. By the time Becker and Graf retired in 1999, DTB TV revenues had decreased by one third (N.N., 2008).

Children and young people might be more susceptible to the ascendance of a sports star since the star functions as a role model (Van Bottenburg, 2002). Thus, the recruiting effect of sports heroes may be especially pronounced in young people. Figure 2 compares the development of the number of youth members of the DTB to the average youth membership of other sports associations.

Fig. 2 Membership: DTB versus Mean of Other Sports (Youth)



Source: Calculations based on DSB/DOSB (various years).

For young people specifically, the figure shows that following a strong increase during the 1970s, membership counts seems to reach a plateau before beginning to increase again around 1985. The membership numbers peak in 1994 and 1995 and decline substantially afterwards. Figure 2 depicts an even more pronounced development for younger tennis players than seen for membership across all age groups depicted in Figure 1. It therefore appears worthwhile to perform separate empirical analyses for youth membership and general membership.

3 Empirical Strategy

From the stylized facts and descriptive statistics presented in the introduction and data sections, it seems worthwhile to test whether the rise of German tennis heroes has a positive effect on the willingness to join the German Tennis Association and whether the retirement of Becker, Graf, and Stich caused the strong decline in the DTB membership figures. For our analysis, a difference-in-difference

(DD) method is chosen. This is a common approach to identifying the effect of a specific intervention or treatment. Under this method, one compares the differences in outcome before and after an intervention for groups affected by the intervention to the differences for unaffected groups (BERTRAND, DUFLO, & MULLAINATHAN, 2004, p. 249).

In this DD analysis, the membership of the German Tennis Association is the treatment group, while that of all other sports associations is regarded as the control group. As membership numbers reported by the DOSB/DSB refer to January 1st of each year, 1986 is the natural point of first intervention, as it is the first year after the unexpected win of the Wimbledon championships by Boris Becker in 1985. Determining the second intervention point is less straightforward. Becker's last of many great successes was his Olympic victory in the 1992 doubles match, while Stich reached his best position of second place in the ATP ranking in 1993. With the exception of Stefanie Graf's French Open win in 1999, the most recent major victories of any of the trio date back to 1996. From 1997 on, with limited exceptions, the players were less successful and played remarkably fewer matches due to several injuries. By July of 1999, all three players had announced their retirement. Thus, all years between 1994 (which shows the highest tennis membership of all years under study) and 1999 should be tested as possible second interventions.

As shown by BERTRAND, DUFLO, & MULLAINATHAN (2004), DD models are frequently subject to serial correlation, which might lead to an overestimation of the significance of the "intervention" dummy. To check for such problems, we performed an LM test for serial correlation in a fixed effects model as suggested by BALTAGI (2001, pp. 94-95).[3] This test was performed on the residuals of standard fixed effects regressions of the models mentioned above. In the case of serial correlation, BERTRAND, DUFLO, & MULLAINATHAN (2004) suggest using an arbitrary

[3] The LM test statistic is $LM_5 = \sqrt{NT^2/(T-1)}(\tilde{v}'\tilde{v}_{-1}/\tilde{v}'\tilde{v})$, which is asymptotically distributed as $N(0,1)$.

variance-covariance matrix, which is consistent in the presence of any correlation patterns within cross-sections over time.

Our DD model in Equation (1) allows the slope of DTB membership to differ after the rise of the new heroes as well as after their disappearance while controlling for a common sports-participation effect. In our spline models, the two turning points of membership numbers are represented by spline knots, which join the three differently-sloped regression lines in a defined point (Marsh & Cormier, 2001, p. 2):

$$\begin{aligned}\ln Z_{it} = {} & \alpha_i + \beta_1 X_t + \beta_2 X_t T_i + \beta_3 DP1_t(X_t - P1) + \\ & \beta_4 T_i DP1_t(X_t - P1) + \beta_5 DP2_{it}(X_t - P2) + \\ & \beta_6 T_i DP2_{it}(X_t - P2) + \beta_7 U_t + \nu_{it}\end{aligned} \quad (1)$$

Note that Z_{it} are the membership numbers of sports association i in year t. X_t is a time trend expressed as years starting in 1974. This variable covers the common growth effects affecting all considered sports associations. T_i is a dummy variable that indicates the treatment group (that is, tennis). The variable takes the value of 1 for the German Tennis Association and 0 for all other sports associations. The coefficient β_2 measures the difference in the growth of tennis in comparison to all other sports for the observation period. $P1$ and $P2$ indicate the two treatments, or intervention points. While $P1$ marks the rise of Boris Becker and thus takes the 1986 value, $P2$ should capture the end point of the ascendency of German tennis stars.

As explained above, we allowed an endogenous determination by running a set of regressions using 1994 to 2000 as values for $P2$. Subsequently, $DP1_t$ is a dummy variable that turns from 0 to 1 in 1986. Consequently, prior to 1986, the term $DP1_t(X_t - P1)$ is 0 because $DP1_t = 0$. At the year 1986, the term $DP1_t(X_t - P1)$ is still 0 because $(X_t - P1) = 0$. After 1986, the term $DP1_t(X_t - P1)$ gradually increases to 1, 2, 3, ..., 22 as X_t takes on the values of 1986, 1987, 1988, ..., 2008. Therefore, the term $DP1_t(X_t - P1)$ captures the overall difference in membership growth from the long-term growth path for all considered sports associations after 1985. $DP2_t$ is a dummy variable that takes the value of zero for years before

the second intervention point and the value of one for years following that point. As mentioned above, seven different years were tested as possible years of the second intervention. U_t is a dummy variable capturing the effect of German reunification and takes the value of 1 from 1992 on and 0, otherwise, for all cross sections. Greek letters represent coefficients to be estimated. α_i covers the unobserved individual specific effects (i.e., fixed effects), while v_{it} denotes the remainder disturbance.

Due to the two intervention points, the slope of the regression equation is separated into three segments. In Equation (1), the coefficient of the term $DP1_t(X_t - P1)$ captures the difference in membership growth from the long-term growth path between 1986 and the second intervention point, while the coefficient of the term $DP2_t(X_t - P2)$ measures the difference in membership growth after the second intervention point in comparison to the aggregated growth path of the second period. The corresponding terms, which are interacted with the treatment dummy, display the associated differences between the growth of the treatment group and the control group for each of the three time periods. To illustrate with an example, for the treatment group, the slope is $\beta_1 + \beta_2$ for the period from 1974 to 1985, $\beta_1 + \beta_2 + \beta_3 + \beta_4$ for the period from 1986 to $T2$, and $\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6$ for the period from $T2$ to the end of the observation period. In accordance with the aim of this analysis, β_4 and β_6 are the variables of interest because they measure the change in the slope for the treatment group caused by the interventions beyond a general sports participation effect.

In interpreting these coefficients, it is important to note that if they are positive (negative), this does not mean that tennis membership necessarily increases (declines). To be able to derive statements with respect to the absolute growth rates for the treatment or control group for a given segment, one must aggregate the corresponding coefficients. For instance, if β_4 is negative but the aggregate of $\beta_1 + \beta_2 + \beta_3 + \beta_4$ is positive, then membership growth of the DTB is still positive after the first intervention point, but at a reduced level. Only if the sum of all coefficients for a given segment is negative can a decline be concluded. Moreover, in

addition to the coefficient of the long-run growth path (β_1), it is possible to interpret single coefficients as relative developments. This means that if, for example, β_4 is significantly positive, an increasing effect or boost effect of the tennis stars in comparison to the development in the previous time period cannot be rejected. However, if β_4 is negative, then the positive (negative) trend in the preceding period will be reduced (intensified).

4 Results

The results of the DD analyses are presented in Table 3. While columns (2) and (3) contain the regression results for the overall membership figures, columns (4) and (5) display the results for the corresponding youth membership numbers. As described above, different years were tested as a second intervention point (1994-2000). For clarity reasons, only the results for 1999 as well as the year with the best model fit according to the Akaike information criterion (AIC) are displayed for both samples.[4] Fixing the second intervention at 1995 yields the best fit for the overall sample, while 1994 yields the best fit for the youth subsample. Due to the fact that membership dimensions vary substantially between sports associations, the logarithms of membership numbers have been taken. Thus, as the regression is a semi-logarithmic model, the coefficients can be interpreted as percentage changes.[5]

[4] Alternative selection criteria (adjusted R^2, Bayesian Information Criterion, and Deviance) led to the same result. If not indicated otherwise, discussion is focused on the best-fit model. The omitted results, which are similar to the displayed results, can be obtained from the authors by request.

[5] To avoid a bias while interpreting the regression coefficients of semi-logarithmic regression equations, the coefficients must be corrected according to HALVORSEN & PALMQUIST (1980). For a parameter value of b, the percentage effect is equal to $(e^b - 1)$.

Tab. 2 DD Analysis

	all		Youth	
	P2 = 1995	*P2* = 1999	*P2* = 1994	*P2* = 1999
Constant	-92.1678 *** (11.6486)	-96.6579 *** (11.9017)	-52.3240 *** (15.8686)	-45.3667 *** (15.9977)
X_t	0.0506 *** (0.0061)	0.0527 *** (0.0062)	0.0287 *** (0.0083)	0.0247 *** (0.0084)
$X_t T_i$	0.0479 *** (0.0061)	0.0504 *** (0.0062)	0.0848 *** (0.0083)	0.0978 *** (0.0084)
$DP1_t(X_t - P1)$	-0.0258 *** (0.0067)	-0.0395 *** (0.0066)	-0.0313 *** (0.0090)	-0.0128 (0.0077)
$T_i DP1_t(X_t - P1)$	-0.0508 *** (0.0067)	-0.0540 *** (0.0066)	-0.0555 *** (0.0090)	-0.1014 *** (0.0077)
$DP2_t(X_t - P2)$	-0.0313 *** (0.0055)	-0.0262 *** (0.0058)	0.0136 * (0.0075)	-0.0069 (0.0071)
$T_i DP2_t(X_t - P2)$	-0.0229 *** (0.0055)	-0.0287 *** (0.0058)	-0.0710 *** (0.0075)	-0.0423 *** (0.0071)
U_t	0.0580 *** (0.0154)	0.1152 *** (0.0148)	0.1689 *** (0.0262)	0.0705 ** (0.0287)
Obs.	910	910	910	910
R^2	0.6006	0.5997	0.3658	0.3630
adj. R^2	0.5975	0.5966	0.3608	0.3580
LM_5	27.3765	27.3752	26.8118	26.8345
AIC	-163.2737	-161.1476	-6.7530	-2.7560

Notes: *** p<0.01, ** p<0.05, * p<0.10. *P1* = 1986 in all four regressions. Standard errors are in parentheses. Standard errors are computed using an arbitrary variance-covariance matrix as suggested by BERTRAND, DUFLO, & MULLAINATHAN (2004, pp. 270-272).

In Table 3, the line titled LM_5 contains a test for serial correlation in a panel model with fixed effects. The test statistics exceed the critical value, and thus, the null hypothesis of no serial correlation has to be rejected in all cases. According to BERTRAND, DUFLO, & MULLAINATHAN (2004, pp. 270-272), an arbitrary variance-covariance matrix is used that adjusts standard errors for clusters in the cross sections. The displayed R^2 and adjusted R^2 do not include the positive model fit effect of the sports association-specific fixed effects. Regarding this fact, the power of the models is satisfactory. In the youth subsample, regressions of all coefficients regarding the tennis association are significant at the 1% level; in the overall sample, regressions of all non-tennis coefficients are also significant at this level.

The dummy for German reunification is significant in all models at least at the 5% level, indicating a level shift in the membership of German sports associations by about 6.0%.

Regarding the overall sample and concentrating on the $P2$=1995 regression, which has the better fit, membership numbers in the control group grew by some 5.2%.[6] In the period from 1974 to 1985, tennis membership numbers grew by an additional 4.9%. This might reflects a good job done by the officials of the German Tennis Association and the associated clubs and coaches in that period as it means that tennis showed an annual membership growth rate of 10.1%. Indicated by the coefficients of the terms $DP1_t(X_t - P1)$ and $T_i DP1_t(X_t - P1)$, which measure the difference in growth rates from 1986 onwards in comparison to the long-term growth rate, a flattening of the slope for both the control group as well as tennis can be observed in this period. Since the intervention point of the victory of Boris Becker in Wimbledon 1985, the strong growth of DTB membership decreased by about 5.2%, still implying an absolute positive growth of about (5.2+4.9-2.6-5.2=)2.3% annually. Membership growth in the control group was reduced from 5.2% to 2.6%. Thus, there was a general trend towards reduced membership growth in German sports associations, but the tennis association was more affected by this trend than other sports. A positive effect of the rise of Boris Becker must be rejected. If the difference in the growth experience between tennis and non-tennis federations is attributed to the rise of Boris Becker, a negative effect must be admitted. This is a first paradox.

After the second intervention point $P2$ in 1995, the membership growth rate for the control group is negative at -0.6% (5.2-2.6-3.2). The decline in the membership numbers for tennis is significantly higher by an additional 2.3% than for the control group. In sum, tennis membership numbers experience a negative growth rate of -3.2% (5.2+4.9-2.6-5.2-3.2-2.3).

[6] Here and in the following sections, the coefficients in Table 3 are converted to growth rates according to the aforementioned formula of Halvorsen & Palmquist (1980).

The results for the youth membership numbers are similar to those for the overall figures. In this subsample, the endogenously determined second intervention point is 1994. For the period from 1974 to 1985, the number of youth members grew annually by 2.9% in the control group and by 11.8% (2.9+8.9) in the tennis treatment group. During the period from 1986 to 1994, the slope of the control group was reduced by 3.2 percentage points and, thus, became negative at -0.3 (2.9-3.2). This finding reflects a general decrease of youth sports participation in German mass sports on the eve of German reunification. In relative terms, the membership growth for tennis flattened out more than for the control group, as the coefficient of the term $T_i DP1_t(X_t - P1)$ has a value of 5.7%. However, due to the enormous growth rates in the first period, tennis still showed a positive growth rate of 2.9% (2.9+8.9-3.2-5.7). While membership growth recovered for the control group during the third period from 1995 to 2008 and turned into a positive rate of 1.1% (2.9-3.2+1.4), the number of youth tennis players declined. The absolute trend for tennis during the last period is characterized by an annual growth rate of -3.1% (2.9+8.9-3.2-5.7+1.4-7.4). To summarise the foregoing, the DTB youth membership grew from 1974 to 1985 by 11.8% annually, from 1986 to 1994 by 2.9% annually, and fell from 1995 to 2008 by 3.1% annually.

The significantly negative development of tennis membership numbers (overall and youth) since 1994/5, which is the year indicating the start of the declining success of the German tennis greats, could be regarded as a confirmation of the widely-expected, beneficial (but temporary) “Boris Becker effect.” However, if this relative negative tennis growth effect were attributed to the retirement of the three tennis stars, it would only be logical to attribute the membership numbers preceding this period to the effect of the tennis stars as well.

We were forced to reject any positive effect of the rise of the three German stars on tennis membership numbers from 1986 until 1994/5. We even found a negative effect on tennis membership growth in that time period, which, if attributed to the tennis stars, forms a first paradox. With the first paradox of a negative effect of the rise of the German tennis stars, their retirement should then have a

positive effect. In this sense, the statistically negative tennis growth from 1994/5 onwards must be regarded as a second paradox.

5 Summary and Conclusions

The field of sports pedagogy often points to the supposed positive relationship between high-performance sports and mass sport participation. This supposed relationship is also used often in sports economics, for example, to justify public financing for major sporting events (e.g. Olympic Games). In both cases, an inspirational function of high performance sports on mass sport participation, followed by an increase in public health and well being, is implicitly assumed.

This study is the first to analyse the impact of sports heroes on the membership figures of the corresponding sports association by means of an econometric analysis.[7] We do so by evaluating the so-called "Boris Becker effect" by simultaneously testing for the effects of the rise and retirement of the three stars Boris Becker, Stefanie Graf, and Michael Stich on DTB membership. To control for a potential common trend in German society affecting all sports associations, a DD approach was chosen. Most observers might have expected a significant positive effect of the rise of the three tennis stars, while some others might have expected no significant effects. Surprisingly, our results indicate a negative tennis growth effect associated with the time period of the ascendency of the sport stars. For the period after the retirement of Boris Becker, Stefanie Graf, and Michael Stich, most observers might have expected a significant negative effect on tennis membership numbers. This hypothesis is confirmed by our tests.

Admittedly, explaining the counterintuitive results for the first intervention is more difficult than explaining results aligned with the supposed Boris Becker effect would have been. There are many reasons why successful sports heroes do not affect sports participation, however. This is demonstrated by the many sports that remain fringe sports in terms of mass participation, even though a co-

[7] For a analysis on the basis of correlations, see BOTTENBURG (2002).

national athlete is extremely successful in those sports. One possible explanation for the negative observed effect is potential athletes' perception of inaccessibility of the outstanding performances of sports heroes. Furthermore, in times of doping scandals, outstanding national performances in certain sports may raise health concerns among parents and young athletes. A final possible explanation is that the increased promotion of tennis in Germany since 1985, as well as the penetration of television broadcasts of the sport, might have led to some degree of "tennis fatigue," thereby decreasing general interest in the sport.

Nevertheless, we hesitate to directly attribute the negative relative tennis growth from 1986 until 1994/5 to the rise of the tennis stars. However, we feel that we are on solid ground in concluding from the DD method and the available data that we are not able to identify any significant positive effect of the rise of Boris Becker, Steffi Graf, and Michael Stich on tennis membership numbers.

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ISSN 1865-2441 (PRINT)
ISSN 1865-7133 (ONLINE)

ISBN 978-3-940369-74-1 (PRINT)
ISBN 978-3-940369-75-8 (ONLINE)