

**CYCLES, SHOCKS, AND SENTIMENT:  
REUNIFICATION, REALIGNMENT OF PUBLIC SPENDING  
AND THE CYCLICAL GROWTH-NATIONAL  
SPORTING SUCCES NEXUS**

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***Abstract** – This study analyzes the relationship between cyclical growth and national sporting success. The literature attributes this nexus to two channels: pro-cyclical public spending for national sports or a sort of q-driven investment activity induced by national sporting success. To analyze whether such a relationship can be established using German data, we adhere to a primarily descriptive methodology. We examine daily stock market data and macroeconomic time series in annual and quarterly frequency for a relationship between these data and the results of roughly 500 matches played by the German national soccer squad in the period from 1959 to 2004. Our methods of choice are techniques from time series analysis and event study analysis. We are able to establish a nexus in the decades prior to German reunification. This relationship fades in the period after reunification. As a result the nexus for the total period is obscured and asymmetric. For the stock market, it is predominantly a pessimistic market that coincides with losses of the national team. As it is virtually impossible to disentangle the spending channel from q-driven investment effects, we attribute this finding to both disproportionate expectations and a realignment of public spending in the aftermath of reunification.*

**Key-words** : MACROECONOMIC COMOVEMENT, NATIONAL SPORTS, REUNIFICATION

**JEL classification** : E32, G14, A12

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## 1. INTRODUCTION

A well established relationship between economic activity in the short and medium run and national sporting success is a most apparent prerequisite for a successful national hosting of a mega sports event. The literature attributes this nexus to two channels. The first one describes more or less implicitly causality as running from pro-cyclical public spending to national sporting success. See, among others, Rathke and Woitek (2008) who specify national medal shares and Olympic diplomas conditioned on domestic GDP as central input measure. The second channel is more concerned with the myopic perspective. It describes national sporting success as impacting on economic activity through enhancing investors' expectations and thereby fostering investment by raising Tobin's  $q$ . This transmission is also referred to as a propagation mechanism of psychological factors such as investors' sentiment or "feelgood" factors (Ashton *et al.*, 2003; Boyle and Walter, 2003; Edmans *et al.*, 2007).

Relying on four and a half decade of data for post-war Germany, the present study is the first to combine these two perspectives by descriptively analyzing the relationship between economic activity in the short and medium run and national sporting success. To this end, we examine daily stock market data and macroeconomic time series in annual and quarterly frequency for a relationship between these data and the results of 490 matches played by the German national soccer squad – the *Nationalmannschaft* – in the period from 1959 to 2004. Our methods of choice are techniques from time series analysis and event study analysis. We are able to establish a nexus in the decades prior to German reunification. This relationship fades in the period after reunification. As a result the nexus for the total period is obscured and asymmetric. For the stock market, it is predominantly a pessimistic market that coincides with losses of the national team. The finding that the nexus changed and became asymmetric after reunification is reinforced by spectral estimates for macroeconomic time series. As it is virtually impossible to disentangle the spending channel from  $q$ -driven investment effects, we attribute this finding to both disproportionate expectations and a realignment of public spending in the aftermath of reunification.

## 2. THE SHORT RUN: EVENT STUDY ANALYSIS

We focus our analysis on the period from 1959 to 2004 for two reasons: The starting year 1959 is the earliest for which we can rely on a continuous series of stock market returns. The year 2004 is chosen as the end of our observation period as it covers the year of the last major tournament final (the Euro 2004) preceding the world championship hosted by Germany in 2006. As we seek to isolate the relationship between economic activity and national sporting success from economic effects implied by the mere fact of staging the corresponding events and their increased commercial potential over the last decades, we end our analysis with the year 2004.

In the following event study exercise we discriminate three types of matches played by the German national soccer squad in the period from 1959 to

2004: tournament finals (TF), tournament finals and qualifying games (TFQ), and all international matches (All). As noted by Edmans *et al.* (2007), international soccer competitions have used slightly different formats throughout the last decades. A common feature, however, is that national teams from different geographic regions play against each other in order to qualify for the supranational championships, that is, the European Championship or “the Euro” and the World Cup. Based on the performance in these qualifying rounds a number of teams is selected as competitors in the TF. The stages of the TF are played in the format of an eliminating tournament in a predefined setting with regard to time schedule of matches and host nation or area. Besides TFQ matches, there are matches played by the national teams irrespective of their relevance for the participation in tournament-format competitions. In this sense our classification represents a categorization in terms of media attraction, implied gain or loss of national reputation, and overall relevance of the respective matches. Taking all internationals together (All), the German national team is continuously involved in a cycle of qualifying competitions for major international tournament finals as well as playing non-tournament “friendly” matches.

In order to quantify the stock market reaction to the outcome of the above outlined games, we apply standard techniques from event study analysis to share index movements on the Frankfurt Stock Exchange following these matches. Essentially, there are two channels through which the sporting performance of a national team may impact on Tobin’s  $q$  as defined in standard texts:

$$q = \frac{MV}{RCC} \wedge \frac{\partial I}{\partial q} > 0, \quad (1)$$

where  $I$ ,  $MV$ , and  $RCC$  denote private investment, market value, and replacement cost of capital, respectively.

First, there may be an investors’ sentiment effect with national sporting success engendering greater confidence about the future, increasing the nominator of (1). Second, given the increasing commercial importance of international tournament finals, an efficient stock market will revise expectations of potential economic benefits to be derived from national team performance in the light of individual match results and the likelihood of the team progressing further in the tournament. For example, Dohmen *et al.* (2006) provide evidence in this direction. Their study not only finds that the outcomes of World Cup soccer matches can systematically affect individual perceptions about economic prospects, both on a personal and economy-wide level. Additionally, it also shows that these perceptions are consistently higher after the group matches as well as after all matches in the second phase of the tournament. For further evidence and the theoretical arguments of underlying causes in this vein the reader is referred to the recent contributions by Ashton *et al.* (2003), Boyle and Walter (2003), Dohmen *et al.* (2006), and Edmans *et al.* (2007).

For our event study analysis we comprise daily data on the *Deutsche Aktienindex* (DAX) for the period from 5th October 1995 to 21st December 2004. This daily index measures as a weighted index the performance of the 30 largest German companies in terms of order book volume and market capitalization, which are traded on the Frankfurt Stock Exchange. Actually, the compilation of the DAX commenced on 30th December 1987. In order to obtain a longer historical DAX series, we follow the common practice to link the official DAX series (starting January 1988) with its predecessors, the *Börsenzeitungsindex* (BZ-Index, 1981-1987) and the Hardy-Index (September 1959 to 1981). Due to the originator of this practice, Frank Mella, it is sometimes labelled “Mella DAX”. Germany’s national soccer team results from 5th October 1995 to 21st December 2004 were obtained from the German national soccer federation, *Deutscher Fußball-Bund* (DFB). They were collated with the DAX data allowing the stock market return for the first trading day after each of the matches to be identified.

Following Ashton *et al.* (2003, p. 784-785), we use standard methodology for quantifying security market regularities in order to assess the relationship between national sporting performance and stock market returns. In a first step, the mean and median return on the DAX after a loss, draw or win in a national soccer game is recorded (Table 1 and 2). The second stage of the assessment involves testing whether the return on the next trading day given a particular match’s result differs from the unconditional mean return on all trading days. The test used is the binomial test which is robust to the underlying data distribution and so is appropriate for investigations involving stock market data which is autocorrelated and heteroscedastic.

**Table 1. Descriptive Statistics: Total period 1959–2004**

	After Loss Return (No. of losses)			After Draw Return (No. of draws)			After Win Return (No. of wins)		
DAX – Period of investigation: Oct 5 1959 – Dec 21 2004 Unconditional mean daily return: 0.02890%									
	Mean	Median	Std d	Mean	Median	Std d	Mean	Median	Std d
All	-0.15%	-0.67%	0.03 (89)	0.16%	0.29%	0.79 (103)	-0.03%	-0.02%	1.20 (298)
TFQ	-0.13%	-0.25%	1.83 (28)	0.13%	-0.68%	1.34 (50)	-0.06%	-1.26%	0.89 (145)
TF	-0.13%	-0.25%	1.83 (20)	-0.11%	-0.68%	0.66 (22)	1.90%	1.90%	0.57 (62)

Note: Number of observations in parentheses; shaded areas mark counterintuitive (as defined in the text) moments.

**Table 2. Descriptive Statistics: Sub-sample 1959-1990 (FRG/GDR period)**

	After Loss Return (No. of losses)			After Draw Return (No. of draws)			After Win Return (No. of wins)		
DAX – Period of investigation: Oct 5 1959 – Aug 29 1990 Unconditional mean daily return: 0.02890%									
	Mean	Median	Std d	Mean	Median	Std d	Mean	Median	Std d
All	-0.29%	-2.16%	2.14 (55)	0.13%	0.74%	0.67 (63)	0.02%	1.65%	1.68 (188)
TFQ	-0.12%	-0.19%	1.74 (18)	0.04%	-1.17%	0.67 (30)	0.03%	-0.09%	0.78 (91)
TF	-0.01%	-0.19%	1.74 (12)	-0.18%	-1.17%	0.67 (14)	0.87%	0.87%	0.57 (44)

Note: Number of observations in parentheses; shaded areas mark counterintuitive (as defined in the text) moments.

FRG – Federal Republic of Germany (West Germany); GDR – German Democratic Republic (East Germany).

Binomial statistics test whether the expected return on the next trading day is greater (less) than the unconditional mean return after a winning (losing) match by considering the proportion of returns after a particular match outcome that exceed the unconditional mean return (Table 3).

The first “intuitive” result to note from Table 1 is shown in the mean figures reported in its last row: TF match results correspond to a positive mean return after a win and a negative mean return after either a loss or a draw. For this type of games and statistical moments the results are also “transitive”, with the mean return after a win being greater than the mean return after a draw being greater than that observed after a loss. As can be seen from columns reporting the median figures in the last row of Table 1, this transitivity of results is not preserved for the less outlier sensitive median figures. For TFQ games and all international matches (All) the results are also not intuitive in the above sense as some mean and median figures show positive (negative) returns for draw (win) outcomes of the matches. However, if we focus on the relationship of stock returns and national sporting performance for the period from 1959 to 1990, that is, before German reunification, the number of counterintuitive findings more than halves (shaded areas in Table 2). The binomial statistics presented in Table 3 indicate that the average return for the DAX, after a win of the national soccer squad in a TF match is statistically significantly higher than the unconditional mean return. For the whole period of observation and all international matches the average return of DAX stocks falls statistically significantly below the unconditional mean return after losses of the national team. Therefore, we may interpret with some caution the findings reported in Table 3 as lending support to the view of a relatively higher commercial importance of TF matches.

**Table 3. Binomial Statistics: Comparison total period vs. FRG/GDR period**

	Total period: 1959-2004 No. of returns after WIN or LOSS > or ≤ unconditional mean (total no.)			Pre-Reunification: 1959-1990		
	Total No.	WIN	LOSS	Total No.	WIN	LOSS
All	490	145 (298)	46*** (89)	306	97 (188)	31 (55)
TFQ	223	73 (145)	15 (28)	139	50 (91)	10 (18)
TF	104	32*** (62)	12 (20)	70	23*** (44)	7 (12)

Note: \*\*\* significance at any conventional level.

Finally, we should note that if we do not discriminate different types of games of the *Nationalmannschaft*, that is, concentrate on all international matches, we find an asymmetric result for the total period of observation. In this case it is only losses that consistently coincide with a pessimistic market. This relationship is also statistically significant in the binomial tests. The latter result, however, should be interpreted with some caution as in the case of the pre-reunification period some of the events may be underrepresented and suffer from a small sample bias.

## 2. THE MEDIUM RUN: TIME SERIES ANALYSIS

### 2.1. Time Domain Analysis

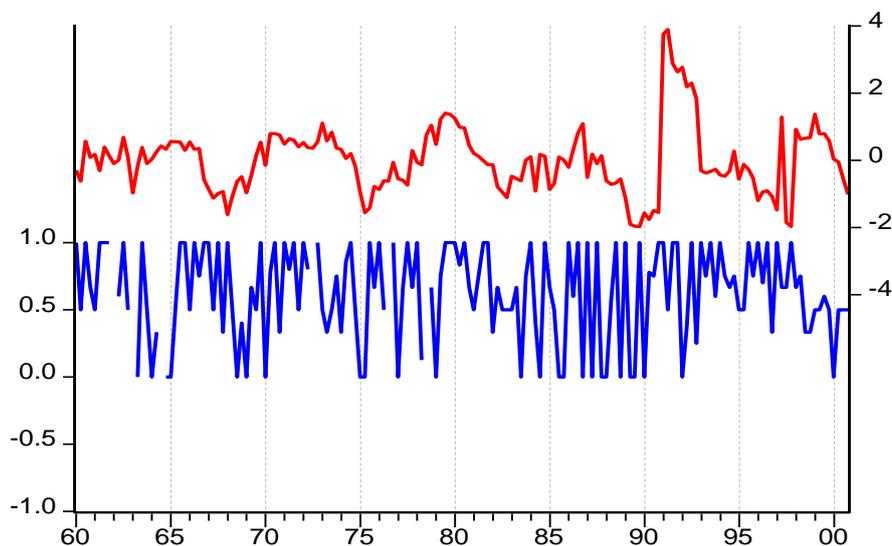
Do the myopic effects of the preceding section aggregate to the macro-level and sustain also for time series of lower frequency of observation? To address this issue we suggest starting with a basic eyeballing exercise.

Figure 1 shows the business cycle component in the German real GDP series, where the nominal series was obtained from the OECD Statistical Compendium (on CD-ROM) and deflated with the standard CPI-procedure using IMF data from the International Financial Statistics database (on CD-ROM) in order to render the series in prices of 1995. The final time series starts in the first quarter of 1960 and ends the fourth quarter of 2000. We extracted the GDP business cycle component by applying a standard high-pass filter, that is, the HP-Filter (Hodrick and Prescott, 1997):

$$\min_{\tau_t} \sum_{t=1}^T (y_t - \tau_t)^2 \quad \text{s.t.} \quad \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2 \leq \lambda, \quad (2)$$

with  $y_t$  denoting the original series,  $\tau_t$  the trend that is subtracted from the series, and the Lagrangian  $\lambda$  the smoothing weight that is set equal to 1,600 for quarterly data. Figure 1 plots the correspondingly extracted business cycle component in German real GDP against the win ratio (in percent) of the national soccer team for the respective quarter.

**Figure 1. Win ratio vs. business cycle in real GDP 1960:1–2000:4**



First series, depicted on right ordinate: business cycle in real GDP series 1960:1-2000:4.

Second series, depicted on left ordinate: win ratio of the Nationalmannschaft in respective quarter.

Note: GDP series in prices of 1995, detrending: HP(1600) filter; data sources: OECD, IMF, DFB.

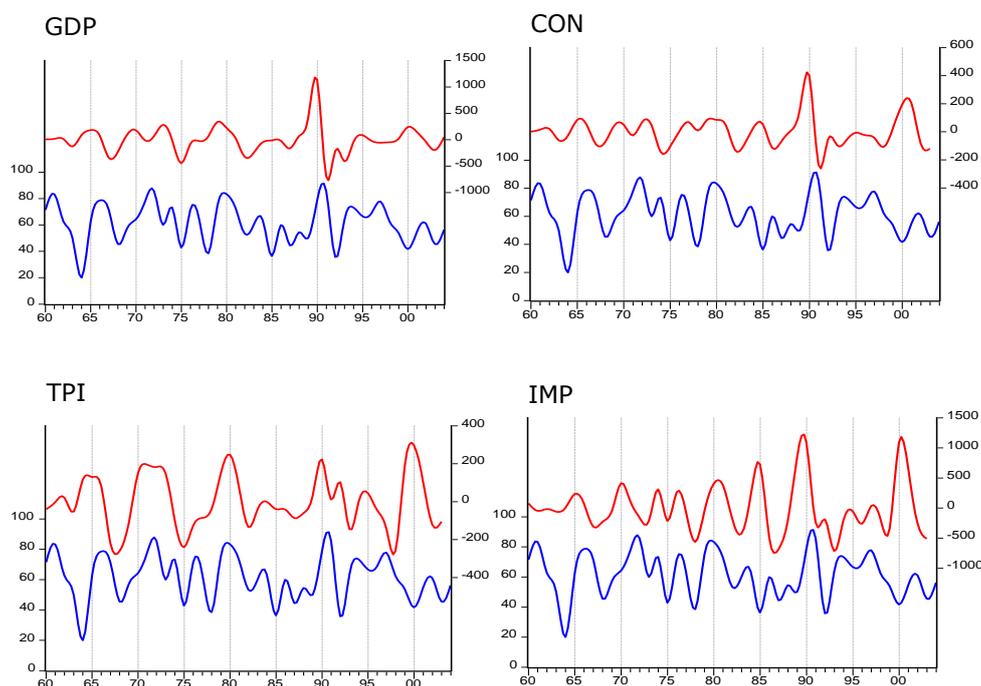
Already at first sight, we recognize a contemporaneous association between the two series. A closer look reveals, at least, three full trough-to-trough cycles in both series. The first one is starting in the early- to mid-1960s and ends in the late-1960s. The second one proceeds. It is peaking around 1972-73 and ends in 1975. The third one follows and reaches its ending trough some quarter around 1982-83. A fourth quasi-cycle can be identified in the GDP business cycle component. However, this does not hold for the win ratio series. Obviously, a basic visual inspection for the total period of observation reveals that the two time series move in-phase or “entrained” up to the mid-/late-1980s, while they develop asynchronously or out-of-phase thereafter. This latter indication suggests a structural break in the national sporting and economic performance nexus coinciding with the quarters around German reunification that we also found in our analysis of the stock market data.

However, before proceeding with analyzing this reunification break, we should be most clear about the following point. Our rather descriptive methods of choice do not allow us to draw inference of the direction of causality running from athletic to economic performance or the other way around. Figure 2 makes the point and highlights major potential channels of propagation, where “shocks” denotes the channel of an unexpected success of the national team (in particular in TF games) leading to an enhanced commercialization and fueled demand of more or less directly involved industries and companies. At the ma-



nificance is found for the IMP series. This series, however, is available only beginning with the first quarter 1979. It is also only the IMP series that shows a statistically significant correlation with the win ratio of the German national soccer team for the total period of observation.

**Figure 3. Annual business cycle components and win ratios (all internationals)**



For each panel:

First series, depicted on right ordinate: business cycle in real NIPA component series.

Second series, depicted on left ordinate: win ratio of the Nationalmannschaft in respective year.

Note: NIPA components in prices of 1995, detrending: HP(100) filter; data sources: OECD, IMF, DFB.

For illustrative purposes series were splined using a cubic spline function.

Concentrating on the pre-reunification period, we find that there is in nearly two third of the cases (that is, in five out of eight cases) a positive and statistically significant relationship. In particular, there seems to be a profound relationship between the *Nationalmannschaft's* win ratio and the cyclicalities contained in the respective NIPA components for the private investment series in the case of all international games and the IMP series in the case of TFQ matches. What is the reason for these latter findings? In order to answer this question, we suggest to focus on the pre-reunification period and to use spectral analysis techniques.

**Table 4. Contemporaneous Correlation Analysis: Quarterly series  
[1995 prices]***Filter: HP(1600)*

	Games	GDP	CONS	GFCF	IMP <sup>a</sup>
1960:1 – 2000:4	All	0.073 <sup>+++</sup>	0.090 <sup>+++</sup>	0.099 <sup>++</sup>	0.088
	TFQ	0.089 <sup>+</sup>	0.040	0.116	0.333 <sup>***</sup>
1960:1 – 1990:3	All	0.140 <sup>**</sup>	0.130 <sup>**</sup>	0.160 <sup>*</sup>	0.185
	TFQ	0.180 <sup>*</sup>	0.090	0.172	0.481 <sup>***</sup>

*Light grey shaded areas: Structural break in linear relationship for quarter 1990:4.**Dark grey shaded areas: Significant correlations at business cycle frequencies.**Note: <sup>+</sup>, <sup>++</sup>, <sup>+++</sup> Chow Breakpoint Test for quarter 1990:4 significant at 10%, 5%, 1% level.**<sup>\*</sup>, <sup>\*\*</sup>, <sup>\*\*\*</sup> significance at 10%, 5%, 1% level (Newey and West HAC).**<sup>a</sup> IMP series available as of 1979:1.***Table 5. Contemporaneous Correlation Analysis: Annual series  
[1990 prices]***Filter: HP(6.25)*

	Games	GDP p.c.	CONS p.c.	TPI p.c.	IMP p.c.
1960 – 2004	All	0.116 <sup>+</sup>	0.068 <sup>++</sup>	0.153 <sup>++</sup>	0.081
	TFQ	0.103	0.095 <sup>+</sup>	0.099	0.105
1960 – 1990	All	0.279 <sup>*</sup>	0.270 <sup>**</sup>	0.376 <sup>*</sup>	0.215
	TFQ	0.209	0.225 <sup>*</sup>	0.185	0.254 <sup>*</sup>

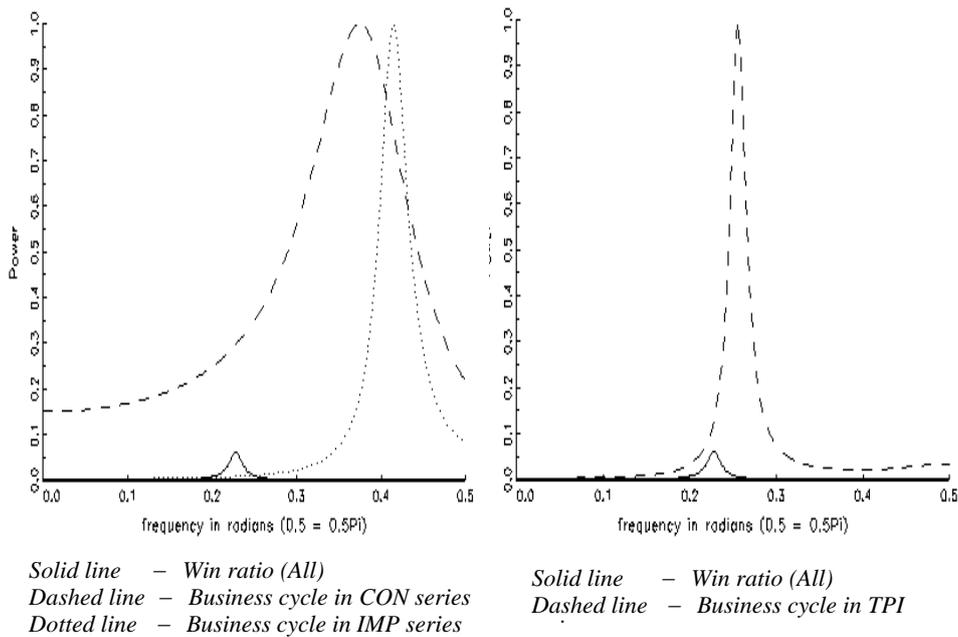
*Light grey shaded areas: Structural break in linear relationship for year 1990.**Dark grey shaded areas: Significant correlations at business cycle frequencies.**Note: <sup>+</sup>, <sup>++</sup>, <sup>+++</sup> Chow Breakpoint Test for year 1990 significant at 10%, 5%, 1% level.**<sup>\*</sup>, <sup>\*\*</sup>, <sup>\*\*\*</sup> significance at 10%, 5%, 1% level (Newey and West HAC).*

## 2.2. Frequency Domain Analysis

To study why the national sporting performance and private investment series in the case of all international games and the IMP series in the case of TFQ matches are obviously interrelated we suggest to have a closer look at spectral density estimates of the respective series. The underlying methodology

of such spectral density estimation is extensively outlined, for example, in Süßmuth (2002, p. 20-32).

**Figure 4. Spectral Density Estimates: All internationals 1959–1990**



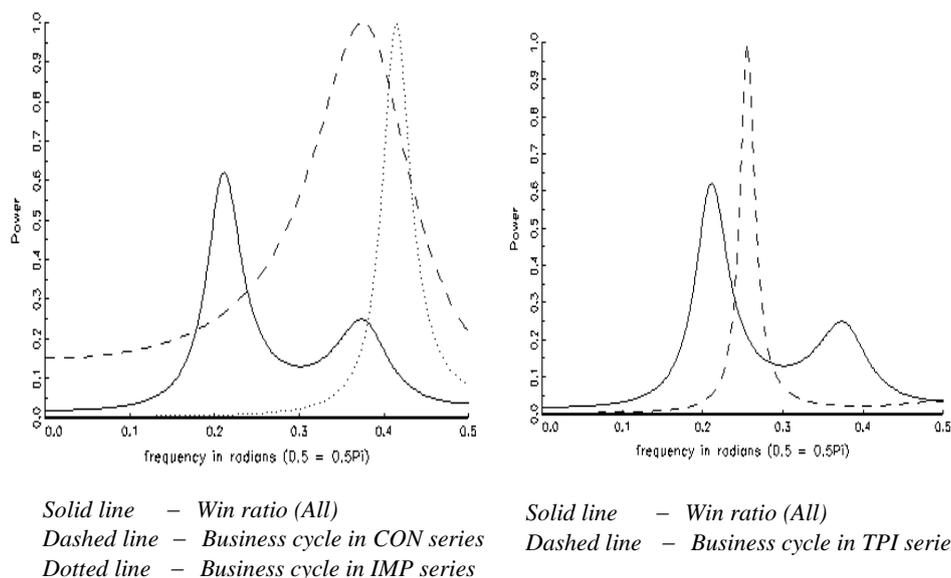
Note: NIPA components in prices of 1995, detrending: HP(100) filter; data sources: OECD, IMF, DFB.

The advantage of an analysis in the frequency domain is that it summarizes the cyclical properties of the periodicities contained in the series at stake in an intuitive and comprehensive way. For the interpretation of the spectral density estimates shown in Figure 4 and 5 it suffices to know about the following points. Depending on the number of contained periodicities the univariate spectrum may show one single peak or several peaks. The more profound a peak corresponding to a certain frequency in radians denoted on the abscissa, the more spectral mass is explained by a systematic periodicity contained in the analyzed series. Therefore, the narrower the estimated density, the more is the dynamics of the series characterized by the respective cycle. This measure is usually referred to as (spectral) “power” in frequency domain time series analysis.

As noted before, the unit on the abscissa of Figure 4 and 5 is frequency in radians. The maximum frequency of 0.5 can broadly be interpreted as representing the so-called Nyquist frequency, that is, twice the maximum frequency in sampling units. As we focus on annual data in this section, it corresponds to a cycle with a periodicity of two years.

The first thing to note with regard to the spectrum of the annual win ratio series for all international matches plotted against the spectra of the detrended NIPA component series is that all spectral density estimates are single-peaked (Figure 4). This suggests that there is one periodicity dominating the cyclical dynamics in the respective time series. Obviously, the periodic dynamics contained in the win ratio series of the German national team for all matches is of rather low spectral power. However, it should be noted that it shows fairly more regular periodicity in terms of spectral power if we restrict the analysis to TFQ matches (Figure 5). The spectrum of the win ratio series reaches its maximum peak at a frequency of approximately 0.2, that is, about five years.

**Figure 5. Spectral Density Estimates: Tournament finals and qualifying games 1959–1990**



*Note:* NIPA components in prices of 1995, detrending: HP(100) filter; data sources: OECD, IMF, DFB.

Considering, an imaginary line at a frequency of 0.3 (corresponding to a 3.3 years cycle), we see that the CON and IMP cycle is dominated by a periodicity of rather high frequency. The spectrum of the CON series is of comparatively flat shape and typically less distinct as for the other series. The second window of Figure 4 shows that the opposite applies to the TPI series. It is characterized by a cyclic dynamics that obviously compares to the five years cycle in the win ratio series. This suggests the interpretation that it is rather the investors' sentiment than shocks channel (Figure 2) of propagation that matters in the case of all international games.

A look at the spectral densities in Figure 5 reveals that the win ratio series of TFQ matches is characterized by two periodicities corresponding to a cycle

of around 5 years and another one with a relatively high frequency of approximately 2.5 to 3 years. The first window of Figure 5 shows that the high frequency periodicity coincides with the ones contained in the CON and, in particular, also in the more regular IMP series. This confirms our earlier finding that it is particularly the IMP series that is in the case of TFQ matches significantly interrelated with the sporting performance of the national team. This association with final demand components at relatively high frequencies suggests enhanced commercialization and fueled demand of more or less directly involved industries and companies as an underlying cause. As the progress of the national squad may only partially be internalized by the concerned markets we suggest the “shocks”-channel (Figure 2) to be the predominant one in the case of TFQ matches.

### 3. DISCUSSION AND CONCLUSION

Several authors, in particular (economic) historians and social scientists, attribute to the unexpected winning of the World Cup tournament in 1954 in Bern (the “*Wunder von Bern*”) the entrance of West Germany into the international community of nations. See, for example, Heinrich (2003) and Gethard (2006) – the more critical position of a “myth” is advanced in Jordan (2005). Moreover, these authors ascribe it a triggering role in the establishment of the Federal Republic as a democratic structure and in eliciting the “*Wirtschaftswunder*”. The latter expression denotes the rapid reconstruction and development of the West German economy nine years after the defeat of the Nazi regime and its war economy.

Taking this position for granted it raises the question how it reconciles with our finding of a national sporting and economic performance nexus that we established for daily, quarterly, and annual time series as of the late 1950s up to German reunification. Thereafter we found this relationship to be obscured and the respective series to move out-of-phase. There are several economic explanations that come to mind in the search for a reasoning why Bern 1954 triggered the regime of a well-established nexus, while Rome 1990 (some weeks preceding German reunification the German national team won the 1990 World Cup in Italy) led to the end of this regime. Rather behavioral arguments for this structural break are the missing national identification with reunified Germany and disproportionate expectations that were raised by persons like Franz Beckenbauer. The latter was the national coach at the time who dazzled by the 1990 success predicted an athletic dominance of the national team of reunified Germany. This expectation was never met. A more substantial and economic difference in the two regime starting points is the following: While both German states, FRG and GDR, witnessed a period of full employment from 1955 to the beginning of the 1960s, young reunified Germany faced many pressing economic problems, in particular, youth unemployment in the former East German states. It is, therefore, straightforward to ascribe the reason for the structural break also to a realignment of public spending in the aftermath of reunification.

A major finding of our event study analysis of the German stock market is that, in general, the average return of DAX stocks falls significantly below the unconditional mean return after losses of the national soccer team. Our descriptive tests also revealed a relatively higher commercial importance of tournament final matches reflected in the stock market data.

Another major finding of this paper is the disentangling of two central channels of propagation of national sporting success at the macroeconomic level. We find that it is particularly time series of final demand components that – in the case of tournament finals and qualifying matches – are significantly inter-related with the sporting performance of the national team. As this association is given at relatively high frequencies, it captures enhanced commercialization and fueled demand of more or less directly involved industries and companies that did not internalize the progress of the national squad. This propagation of shocks can be separated from q-driven investment activity reflecting investors' sentiment. The latter is characterized by a periodicity of lower frequency which is typically found in private investment series. It obviously matters for all international games.

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**DÉPENSES PUBLIQUES, SENTIMENT NATIONAL, CYCLES DE  
CROISSANCE ET PERFORMANCES SPORTIVES EN ALLEMAGNE  
AVANT ET APRÈS LA RÉUNIFICATION**

**Résumé** - Cet article étudie la relation entre les cycles de croissance économique et les performances sportives des équipes nationales allemandes. Dans la littérature, la relation entre les deux phénomènes s'explique par une accélération des dépenses en faveur d'un sport donné, soit avant une performance de haut niveau, soit après, compte tenu de l'effervescence populaire suscitée. L'analyse empirique s'appuie sur des séries temporelles retraçant les résultats de l'équipe de football allemande sur la période 1959-2004. L'analyse montre que la relation de cause à effet était plus forte avant la réunification allemande, tandis que dans la période actuelle cette relation est moins significative.