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**Stability in long-term growth :
evidence for a single deterministic trend
in Germany (1870-1989)**

(Working paper)

Stefan Belliveau

1. ABSTRACT.

This working paper presents analysis about long-term trend in economic growth by examining per-capita GDP in Germany for the years 1870-1989. It supports explanation for economic growth by way of a single, deterministic trend in market-centered economies, when holding non-economic features constant. This working paper's conclusions do not exclude the possibility that a change to trend growth in per-capita GDP occurs in the post-war German period; but it is suggestive that a single, deterministic trend is more influential than the surface data appear.

2. KEY WORDS: Economic growth; economic history; Germany, 1870-1989

3. JEL CODES: N0, N13, N14; O50, O52

*“The lamps are going out all over Europe.
We shall not see them lit again in our time.”*

– attributed to Edward Grey, British Foreign Secretary,
3 August 1914

*“Let the word go forth from this time and place,
to friend and foe alike,
that the torch has been passed to a new generation of Americans--
born in this century, tempered by war...”*

– from the transcript of President John F. Kennedy's Inaugural
Address, delivered 20 January 1961

1. INTRODUCTION.

The above statement attributed to Edward Grey is almost certainly true for a subject of the German Empire who was the same age as the British Foreign Secretary in 1914. After fighting two unsuccessful and wholly disastrous wars in the first half of the 20th Century, Germany was a ruined country in 1946. Yet within 10 years it recovers to its standard of living prior to the outbreak of WWII, and it recovers to its identified pre-WWI trend level within 25 years, erasing completely the economic effects of 1914-45!¹ This statement would have provoked astonishment from a casual observer in 1946. It deserves an explanation.

This working paper will explore German per-capita GDP from near the time of its unification in 1871, until the Berlin Wall fell in 1989.² During this time Germany has 4 (5) political systems (Imperial Germany, Weimar Germany, Nazi Germany, (Allied occupation), and the Federal Republic of Germany), issues 3 (4) official currencies (Mark (M), (Rentenmark), Reichsmark (RM), and Deutsche Mark (DM)), and its political boundaries change radically, including political division from 1945 to 1990. It is reasonable to conclude from this synopsis that a long period of relative economic decline begins in 1914. This is decidedly not the case, and it is the motivation for this working paper.

1 Per-capita GDP on a PPP basis is the proxy measure for a standard of living. The trend identified is explained in the next sections.

2 For the years 1946-89, the political boundaries of the Federal Republic of Germany (West Germany) from 1949-89.

Explanations other than long-run deterministic trend in economic growth have been offered to explain post-war German economic development. These include large aid from the United States during the immediate post-war years, and changes to the political-economic structure. These explanations are examined further in this working paper.

The structure of this working paper follows: this introduction followed by a brief exploration of the economic data, a presentation of the analysis, a summary of conclusions, all tables and figures cited, a list of references used, and a listing of the data sources.

2. EXPLORATION OF THE DATA.

The data for the analysis are taken largely from Maddison's monumental compilation of comparative statistics of living standards.³ The statistic primarily analyzed is the time-series of per-capita GDP for Germany. This statistic is measured in Geary–Khamis 1990 dollars, which attempts to portray constancy with respect to purchasing power across both space and time.⁴ There is discussion in the economic literature about which measures best gauge living standards, as well as how these measures should be constructed. His figures, while not without their detractors, are well within generally-accepted standards for such a construct; in fact, his work to some degree helps define general acceptance.

Figure 1 depicts with a solid line on a logarithmic scale per-capita GDP for Germany between 1870 and 1989. Like most economies classified as advanced, it is characterized by exponential growth, although the special circumstances of German history interrupt this trend from “normalcy”. The dotted line in Figure 1 depicts a simple logarithmic trend with respect to the years 1870-1913. Observation of German per-capita GDP in the literature is focused on the post-war period, where some interpret the clear divergence of per-capita GDP from its simple pre-1914 trend as indicative of an underlying

³ See the listing of data sources.

⁴ See Maddison (2010).

change to its trend, while others attribute rapid post-war growth to a “rubber-band” effect, where periods of depressed economic levels deliver naturally higher growth.

The shaded areas in Figure 1 identify the years of both world wars in Europe. They are followed by years of below-trend per-capita GDP. This captures just one aspect of what Great Britain's Foreign Secretary very presciently identifies in 1914. During the years 1914 to 1958, Germany's living standards with respect to its simple pre-1914 trend are reduced by about one-fifth on average, in some years by more than three-fifths.

Per-capita GDP with respect to its simple pre-1914 trend depicted in Figure 1 does identify a slight above-trend period near unification in 1871. The Weimar years are best characterized as short periods of growth, interrupted by declines that coincide with the German hyper-inflationary period of the early 1920s, and the Great Depression of the early 1930s. A sustained increase with respect to simple pre-1914 trend levels from the middle of the 1930s, as recovery from the Great Depression, is shown; these years coincide with German rearmament. The commencement of war by Germany in 1939 arrests this growth relative to trend, and shortly thereafter the levels sharply decline as Germany commits to a policy of “total” war and its consequences.⁵

Many Germans use two phrases to describe the post-war period in terms of economics: “Stunde Null” and “Wirtschaftswunder”, roughly translated as zero-hour and economic miracle. These signify to Germans the feeling that what came after WWII is substantially different from what came before. These are apt descriptions by those with no living memory of the years prior to 1914.

Regional variation with respect to per-capita income within the political boundaries of the German Empire is noticed by many observers. Table 1 lists the per-capita income in 1913 for the provinces of Prussia, a state which accounts for some three-fifths of the total population in the German Empire to 1918. There is clear variation in per-capita income, with a noticeable characteristic that the

⁵ Joseph Goebbels publicly announces a policy of “total” war at the Berliner Sportpalast in February 1943.

eastern provinces of Prussia are poorer on average. This regional variation will be used to support the explanation of German economic development through a stable, underlying process, characterized by a single, deterministic trend in per-capita GDP.

Table 2 lists the average rates of growth in per-capita GDP for two German economic recoveries: one in the 1930s, and the other in the first post-war years. Both periods cover seven years succeeding a local minimum in per-capita GDP. The recovery corresponding to post-war reconstruction is separated by years when aid under the Marshall Plan flowed into Germany. These four years of Marshall-Plan aid include the three largest growth rates in per-capita GDP during the two recoveries.

Figure 2 compares Germany with the US as a means of controlling for the unusual political developments in Germany between 1914 and 1945. Figure 2 depicts a decline in US per-capita GDP during the Great Depression, followed by an above-trend recovery during WWII, with a return to trend thereafter. It shows that an advanced economy, given more “normal” political conditions, exhibits a much more persistent trend rate of growth, with fewer interruptions.

3. ANALYSIS.

A cursory glance at Figure 1 suggests that development in per-capita GDP in Germany is in large part explained by a trend with respect to time. Extrapolation of the trend with respect to the years prior to WWI generates questions, however, as the post-war development diverges from this trend very significantly. By 1989, the divergence from this simple trend is almost by half. Different explanations exist to explain this divergence, when it is accepted as indicative of a change to the growth process; these include accelerated growth from direct US aid, and structural changes made possible as a result of direct US aid.⁶

Explaining the divergence from a simple pre-1914 trend through acceleration caused directly by

⁶ See De Long and Eichengreen (1991).

US aid requires both that the trend identified is a valid representation of an underlying process, and that direct US aid was sufficient to generate sustained accelerated growth in German per-capita GDP.

Ignoring for now the first condition and addressing the second, Table 2 shows that growth is accelerated during the years of direct Marshall-Plan aid. Two problems exist, however, when attributing all German post-war accelerated growth to US aid. One is that the size of Marshall-Plan aid relative to the German economy makes it difficult to explain such a large acceleration in economic growth. Total Marshall-Plan outlays for Germany during all 4 years represent under 3% of German national income in just one year: 1950. Analysis suggests that in only one year (1949) is the Marshall-Plan aid to Germany more than 1% of German national income.

The other problem with attributing directly the post-war divergence to US aid is that the period of aid is coincident with a time when many theories of economic growth predict strong recovery through a “rubber-band” effect. No attempt is made to separate these two effects in this working paper's analysis, other than to acknowledge that economic growth is most likely accelerated due to direct US aid, but with a caveat that further analysis can attribute large acceleration in economic growth to divergence from a trend.

One possible explanation largely ignored for post-war economic development in Germany is economic geography. Table 1 shows the large regional variation with respect to income per capita in the former state of Prussia in 1913. The provinces located further east are poorer on average than those to the west. They are more rural and less developed economically than other areas of Germany, being located farther from the industrial and market centers of Western Europe. Given both this regional variation and the specific changes to Germany's political boundaries after both wars, it is reasonable to hypothesize that post-war German per-capita income would be greater than in the years prior to 1914.⁷

Figure 3 depicts per-capita GDP in Germany, with an adjustment to the estimates for years

⁷ The Prussian provinces of East and West Prussias, Posen, and Silesia in the pre-1914 German Empire are not part of Germany in the post-war period.

1870-1944, based on relevant changes to political boundaries and regional variation.⁸ This crude adjustment reduces by more than half the positive deviation of per-capita GDP from its pre-1914 trend in 1989.⁹ This adjustment, based on conclusions from the economic geography of pre-1914 Germany, supports the explanation of German economic development through a single, deterministic trend.

Figure 4 compares the rate of per-capita GDP growth with its deviation from its adjusted, pre-1914 trend, for the years 1947-89 in Germany. It shows a strong negative relationship between economic growth and positive deviation from trend growth, supporting the hypothesis that forces exist which serve to reestablish a long-run trend, given a condition of “normalcy”. This explanation for post-war German economic development is called a “rubber-band” effect, and this analysis supports it.

4. CONCLUSIONS.

Analysis of the data for Germany can proceed by accepting the data without questioning problems of measurement or its representation of a single economy for the entire period. This leads to identification of large divergence in per-capita GDP from its pre-1914 trend. This working paper's analysis proceeds by first adjusting the data for regional variation in national income per capita, but accepts the measurements as accurate in portraying what they purport to measure.

Adjustments to per-capita GDP in Germany for changes to political boundaries, given regional variation in income per capita within the Prussian state, can explain much of post-war divergence in per-capita income from its pre-1914 trend. Care was taken to refrain from an overzealous use of adjustment.¹⁰ The analysis is relevant, not because it extrapolates a pre-1914 trend fully consistent with post-war German economic development, rather because it can explain over half the observed

8 No adjustment for Pomerania is made. Estimates are calculated based on regional variation in Prussian income per capita for 1913. See Borchardt (1991).

9 One very crude assumption is constant purchasing power throughout the former German Empire.

10 The data as presented in the sources referenced suggest interpolation / extrapolation from benchmarks.

divergence from a simple pre-1914 trend.¹¹ A plausible conclusion from this working paper's analysis is that German economic development reflects largely a single, deterministic trend that is interrupted in 1914, but tends towards reestablishment after 1946. Attribution of post-war German economic development to a structural change occurring after 1945 should be qualified by reference to reestablishment of a preexisting structure, herein called “normalcy”. Further analysis of the relevant data may establish greater explanatory power for regional variation, and for a single, deterministic trend in per-capita GDP in Germany as representative of a stable, underlying process with respect to economic growth, for the years 1870-1989.

The excerpt above from President Kennedy's Inaugural Address demonstrates an awareness by his generation that the war(s) in the first half of the 20th Century must serve as a lesson, if the failures that led to them are to be avoided. The final conclusion from this working paper is that German economic development during the years 1914-46 is arrested, but that permanent change to its long-term potential for growth in the post-war period is overestimated by not accounting for regional variation in income. This conclusion suggests weaker support for convergence between advanced economies once a market-driven trend path, that is in part determined by economic geography, is established. It also serves as a warning to statesmen about the consequences of failing to deliver the historical particulars of a stable political-economic structure, herein called “normalcy”.

11 Estimates provided in Maddison (2003) for GDP consistent with West Germany's 1949-89 political boundaries for the years 1870, 1913, 1936, 1950, 1973, and 1990, show no divergence from a pre-1914 trend. See Figure 5.

5. TABLES AND FIGURES.

(A) TABLES 1-2.

TABLE 1: Statistics of Prussian Income
(per-capita national income in 1913 (M))

Prussia	747
East Prussia	486
West Prussia	480
Pomerania	576
Posen	465
Silesia	603
Berlin	1,254
Brandenburg	962
Berlin-Brandenburg	1,058
Province of Saxony	700
Schleswig-Holstein	763
Hannover	697
Westphalia	735
Hesse-Nassau	899
Rhine province / Hohenzollern	832

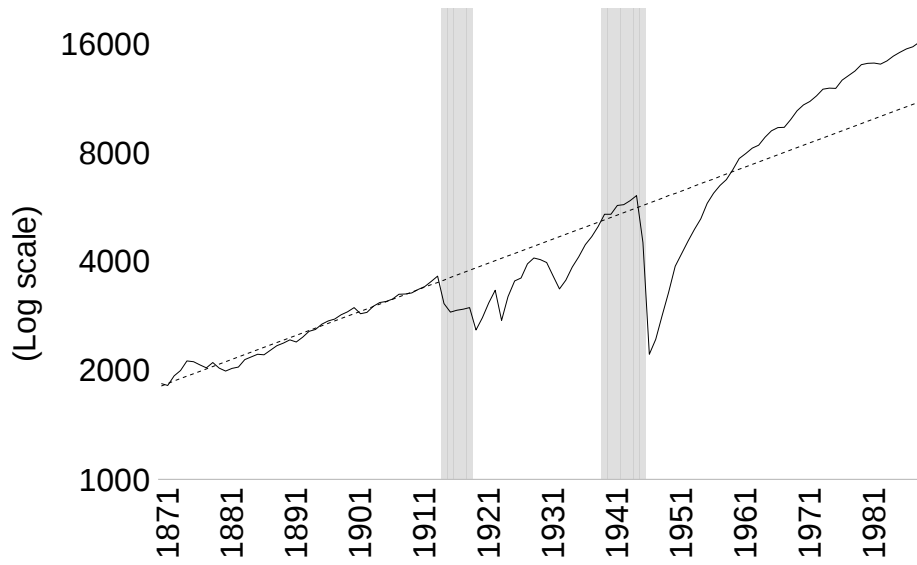
Source: Borchardt (1991).

TABLE 2: Comparison of Average
Recovery Rates in per-capita GDP

Rearmament (1933-39)	7.0
Reconstruction (1947-53, excludes years of Marshall Plan)	8.6
Marshall Plan (1948-51)	14.7

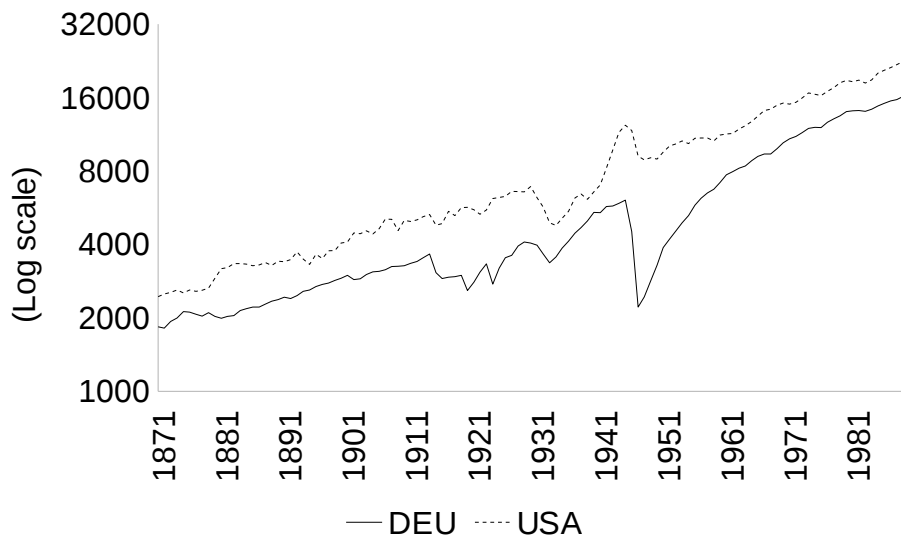
(B) FIGURES 1-4.

FIGURE 1: Per-capita GDP, Germany
(1870-1989)



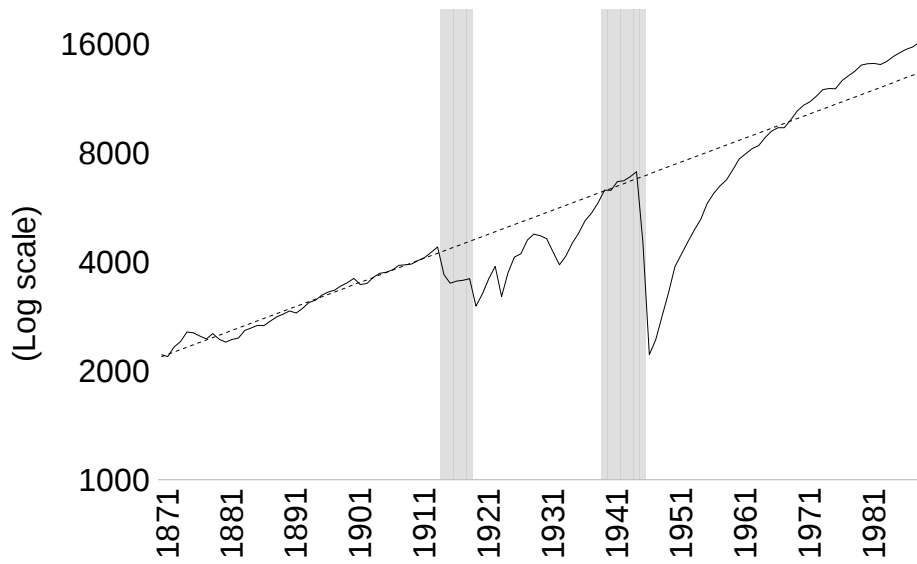
Source: Maddison (2010).

FIGURE 2: Per-capita GDP
(1870-1989)



Source: Maddison (2010).

FIGURE 3: Per-capita GDP, Germany*
(1870-1989)



* Adjustment made to estimates by excluding the Prussian provinces of East and West Prussias, Posen, and Silesia in relevant years 1870-1944.

FIGURE 4: Growth in per-capita GDP
by deviation from adjusted pre-1914 trend
(1947-89)

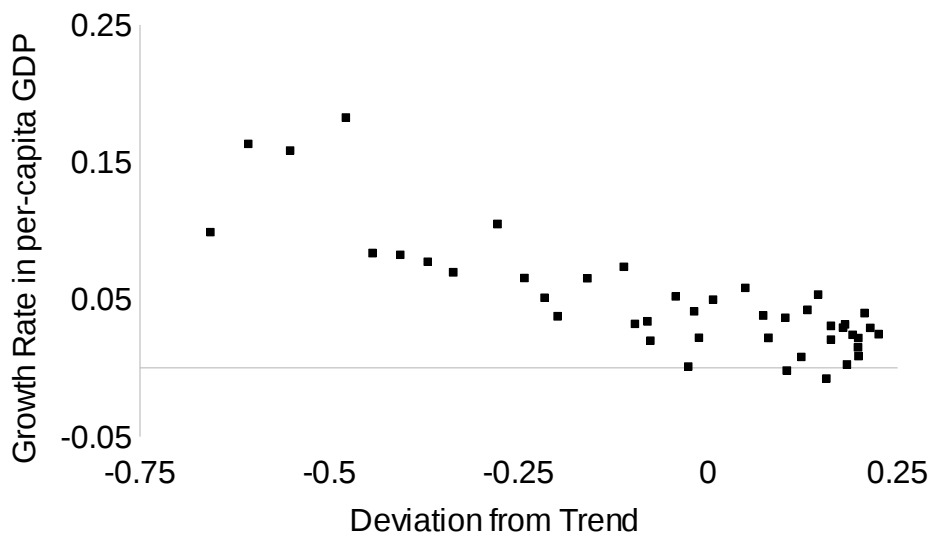
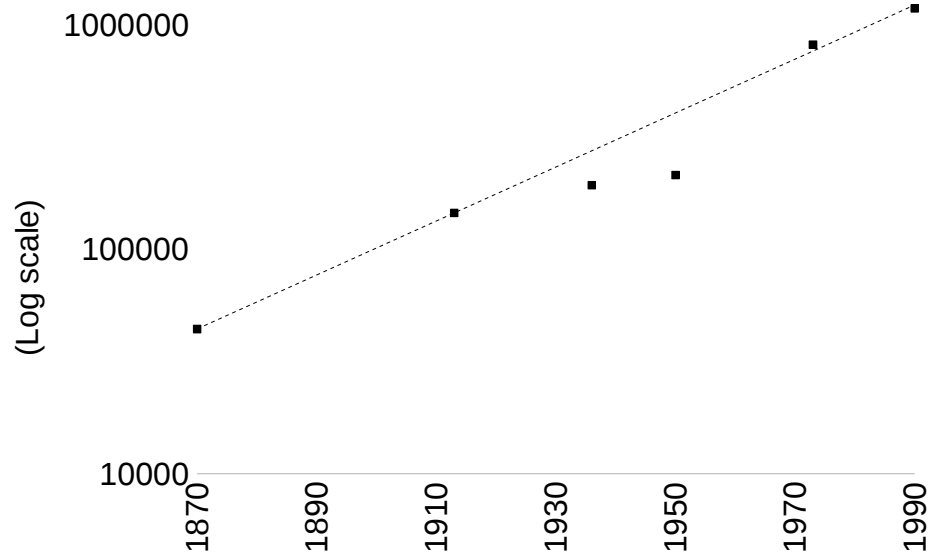


FIGURE 5: GDP, Germany **
(1870-1990)



** Estimates from Maddison (2003) for GDP (with its pre-1914 trend shown), consistent with political boundaries of West Germany during the years 1949-89.

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