GERMANY'S POSTWAR GROWTH: ECONOMIC MIRACLE OR RECONSTRUCTION BOOM?

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During the past two decades there has been a heated debate about the causes of the German so-called *Wirtschaftswunder* (economic miracle) after the Second World War. This debate came somewhat unexpectedly, as the German war generation always took it for granted that the impressive growth record in the 1950s and 60s was a consequence of economic liberalization after 15 years of tight planning and state interventionism under the Nazi dictatorship (Buchheim 1989).[1] Indeed, after the introduction of the *Soziale Marktwirtschaft* (social market economy) in 1948, Ludwig Erhard, the first federal economics minister, enjoyed a legendary reputation. Nevertheless, Erhard never saw himself as a "miracle man." He always emphasized that Germany's rapid growth was due to a sound economic policy, in particular the implementation of a free economic system (Erhard 1958).[2]

In the 1980s, this view was challenged by historians and economists who argued that Germany's postwar growth was essentially the result of a reconstruction boom after the lost war. The main German advocate of this reconstruction theory was the historian Werner Abelshauser (1983). He questioned the impact of the currency re-

[1]Ernst Dürr (1986: 153) summarized the view of liberal economists: "The high economic growth in West Germany in the 1950s was based not on coincidentally fortunate circumstances, but was the repeatable result of an economic policy which created the conditions of a dynamic development process." See also Klump (1995).

[2]The "social market economy" should not be confused with a welfare state nor with a laissez-faire economy. Its main components were a strict orientation toward price stability (tight monetary policy), a very restricted redistributive system of social transfers, an effective competition policy, a liberal trade regime, and the absence of price regulations. Erhard was convinced that a market economy is inherently social and needs only very little redistributive state activity.

form—a core ingredient of Erhard's economic policy—on economic growth. Rudi Dornbusch also questioned the conventional view. He pointed to the Japanese experience in achieving strong economic growth in the 1950s and 60s "in an environment where competition and liberalism were decidedly absent," and argued that France performed nearly as well as Germany "with a system far away from German liberalism" (Dornbusch 1993: 882). Dornbusch is wrong for two reasons. First, Japanese growth was highest in the 1960s, not in the 50s when the income gap was largest. Second, France's growth rates did not approach those in Germany, which were much higher.

Solving the Controversy

Crude theories linking exceptional growth to war devastations were originally formulated as early as in the 19th century. In 1848, John Stuart Mill (1848: 93) wrote: "An enemy lays waste a country by fire and sword, and destroys and carries away nearly all the movable wealth existing in it; all the inhabitants are ruined, and yet, in a few years after, everything is much as it was before." More than 100 years later, K.C. Kogiku (1966: 154) explained Japan's high postwar growth in terms of "Friedman's Law": "Destroy the greater part of a nation's fixed capital in war activity and dislocate the whole economic structure. Eventual recovery from this chaotic state of affairs will be rapid, giving a growth rate of 8–10 per cent annually." This is indeed the rate of growth Germany experienced in the early postwar period.[3]

Turning to formal growth theory, reconstruction booms can be easily explained with the standard neoclassical model originally proposed by Solow (1956, 1957). Assuming Harrod-neutral technical progress, the long-run growth rate of an economy is determined by its population growth rate and the rate of technological progress. Per capita income grows at the latter rate. Using this framework, a temporary destruction of a country's physical capital stock causes an immediate decline in the the capital-labor ratio to a point well below its long-run equilibrium level. This increased capital scarcity increases the productivity of capital and leads to higher productivity growth rates. Consequently, per capita income rises at above equilibrium growth rates and asymptotically approaches the long-run growth path. The growth rate itself is inversely related to the difference between the actual and the equilibrium capital-labor ratio. At the beginning of

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[3]The Marshall Plan could also have contributed to rapid growth. However, empirical analyses show that the net effect was negligible (Dluhosch and Krueger 2000).

the reconstruction phase, growth rates are highest but gradually decline as the economy moves to its long-run growth path.

Based on this theory, there have been a great number of empirical studies, particularly in a cross-section context. The standard growth equation of these studies relates income growth to initial per capita income and several other determinants, including population growth, trade orientation, and investment rates in physical and human capital (Barro 1995). If cross-country growth differences can be (at least partly) attributed to different initial income levels, "convergence" is said to occur. Convergence itself may be "unconditional" or "conditional." Unconditional convergence can be observed if there is an inverse relationship between initial income and growth without taking other variables into account. The poorer a country, the faster it grows. This simple approach does not receive much empirical support as it ignores other growth determinants that may differ from country to country. Once these determinants are included in a regression equation and the coefficient of initial income is negative and significant, there is conditional convergence. Other things (e.g., investment rates and population growth) being equal, poor countries tend to grow faster. Most empirical studies agree that there is indeed conditional convergence and that the implications of the neoclassical model are confirmed (Sala-i-Martin 1996).

Reverting to the German postwar period, there are several cross-section studies devoted to the question of whether there was a "growth miracle" or not. Dowrick and Nguyen (1989) analyzed the growth record of the OECD countries since 1950 and estimated a conditional convergence regression with initial income, the investment rate, and the growth rate of employment as independent variables. From their results, it can be concluded that German growth in the 1950s was significantly higher than expected on the basis of the regression model. Crafts (1992) confirmed their results in a later study. However, another study by Dumke (1990) revealed fundamentally different results. Dumke regressed postwar cross-country growth rates on a country-specific war-related income gap and on technological backwardness, approximating the latter by the country-specific income gap relative to the United States. With respect to Germany Dumke (1990: 485) concluded:

> If *Wirtschaftswunder* is defined as unexplained growth, . . . then our regression model eliminates that wonder. . . . [T]he unexplained residual for West German growth deviations is exceedingly small. In other words, reconstruction growth is the explanation of the German *Wirtschaftswunder*.

These conflicting results leave our basic question unanswered. Moreover, as all of the above-quoted studies were based on similar OECD country samples and used cross-country regressions, the empirical basis for drawing any firm conclusions is rather weak. Moreover, none of the above-mentioned studies used any proxy variables for the country-specific economic system, so that an omitted variable bias may have played a role.

The postwar growth record has seldom been studied in a time series context, even though there are long-term estimates of German per capita income. Angus Maddison (1995), for example, has developed a comprehensive data base for the 1870–1994 period, and his annual estimates can serve as a starting point for the construction of a still longer series. In order to solve the controversial question of whether Germany's postwar growth was due to economic liberalization or reconstruction, we follow a pure time series approach based on a very long series for German per capita income. The construction of a series as long as possible is neccessary to reliably extract a long-run growth path, as this path was repeatedly influenced by severe economic disruptions.

The paper proceeds as follows: first, I check whether German per capita income follows a "trend stationary" or a "difference stationary" process. Next, I estimate a time-dependent growth trend and calculate deviations from the trend (income gap) in order to properly capture possible reconstruction effects, as indicated by the neoclassical growth model. I then use the smoothed residuals from this regression to indicate medium-term structural shifts of the growth trend that are free from reconstruction effects. Finally, I add the overall trend growth to the structural shifts in order to determine the long-term structural growth trend.

Time Series Properties of Germany's Long-Run Income Path

As already mentioned, Maddison's series will serve as the basis for our calculations. In a first step, the years after 1994 were added to the series so that it ends in 2000.[4] Second, per capita income for the years 1840 to 1869 was reconstructed using Spree's (1977) income and population estimates. Spree's study covers the time period 1840 to 1880. It is therefore possible to cross-check the reconstruction in the overlapping period (the 1870s). As the correlation coefficient

[4]For the year 2000 value a consensus estimate was used.

FIGURE 1

GERMANY'S REAL PER CAPITA INCOME
(CONSTANT LOGGED U.S.$)
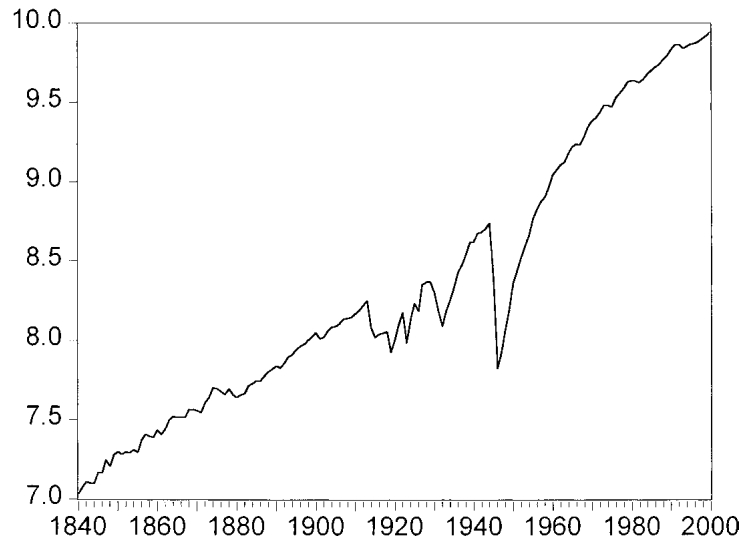
between the Spree-based series and Maddison's estimates is close to unity, the reconstruction can be considered sufficiently reliable. Figure 1 shows the entire series of per capita gross domestic product covering the early industrialization as well as the postunification period.

From a visual inspection of the series it seems to be clear that German income growth did not follow a deterministic but a stochastic time path. Distinction between a deterministic and stochastic trend is of crucial importance for interpreting deviations from the trend. The problem can be explained as follows: If a series is trend stationary (TS), it follows a deterministic trend and the long-run growth rate is constant. Fluctuations around the trend may be irregular or cyclical but they are never persistent. The residuals from a regression of a TS series against a linear (time) trend will always be stationary. Should an income series be TS the economic consequences would be the following: The trend coefficient would indicate the long-run deterministic growth rate. This implies an absolutely constant rate of technological progress, which is economically quite implausible. For example, such a model would be unable to account for technological waves as outlined in the theory of Kondratiev's long swings of innovation and economic activity. Second, it would leave no room for any

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growth-determining role of different economic systems or policies. Should there have been such regime changes (which is easy to verify empirically) and should the income pattern suggest a TS series, this would imply that these regime changes had no growth effects. On the other hand, reconstruction effects can be well captured by the TS model. An external shock will force the level series downwards and growth rates will become negative. Once the shock is over, growth rates will rise above average and the level series will converge to its old time path.[5] Should the German series be TS, it would not make any sense to test for regime switching effects apart from pure reconstruction effects.

If a series is difference stationary (DS), it does not follow a deterministic but a stochastic trend. A stochastic trend can be interpreted as a time-dependent trend, or, in other words, there are several shorter subtrends that characterize the nature of the entire series. Regressing such a series against a simple time trend would not produce stationary residuals as there would be large and persistent fluctuations around the (erroneously hypothesized) time trend. In case of a DS process, the level series has to be differenced once to obtain stationary residuals. Should the series be of a DS type, there would be room for switching technological trends as well as for a potential impact of economic policy changes. Like the TS type, the DS type is suitable for modeling reconstruction effects.

To test whether the German (logged) income series is in fact TS or DS, it is necessary to regress the series against a linear time trend and inspect the properties of the residuals. In doing so, I found that the large and persistent fluctuations in the residual pattern show slowly dampening autocorrelation coefficients that indicate the series is *not* TS. This finding was confirmed by an augmented Dickey-Fuller test on the residuals. The computed test statistic was –2.15, which is far from the critical values at standard confidence levels.[6] Therefore, the hypothesis that German per capita income followed a TS process is clearly rejected in favor of a DS process.[7] We can thus proceed with our analysis.

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[5]Whether the true nature of a series can be detected by econometric tests depends on the length of the series as well as on the magnitude and length of the shocks. Combining a relatively short series and a large shock will probably lead to the rejection of the (true) hypothesis that the series is trend stationary. For that reason an income series was constructed using all available historical data.

[6]The critical values are –3.14 (10 percent level), –3.44 (5 percent level), and –4.02 (1 percent level).

[7]Details of the regression analysis are available from the author on request.

Reconstruction Growth or Growth Miracle?

Having established that the growth path of German per capita income follows a DS process, we can now estimate the deterministic trend. As we do not have any a priori information about this time-dependent trend, we have to estimate it from the data. The procedure suggested here is the Hodrick-Prescott (HP) trend filter, which has become common in empirical time series analysis. Contrary to simpler moving-average filters, the HP procedure does not suffer from the disadvantage of missing values due to averaging. However, our HP trend model is not based on the observed series as depicted in Figure 1, but on a hypothetical income series. This artificial series rules out the shocks of the two world wars and the Great Depression of the 1930s. It uses a peak-to-peak estimate of the logged income series from 1914 to 1965, and thus describes the income path in the absence of any shocks.[8] Admittedly, the peak-to-peak approximation may be somewhat crude but it seems unreasonable that the true income series could have behaved much differently. Implicitly this HP trend estimate (A) maximizes the potential impact of reconstruction growth that can be easily seen from a comparison with a HP trend (B) on the original series. Figure 2 exhibits both trends.

It is clear that the trend based on the original series (see Figure 1) attributes the downswings of the interwar period and the Second World War to the trend and thus leaves much less potential for reconstruction growth. Consequently, additional growth variations will be covered by other nonreconstruction factors such as Erhard's policy reform. In order not to bias our estimates in favor of the latter hypothesis, we shall use trend A as the basis for the income gap calculations only. Consequently, the impact of reconstruction growth is maximized. The income gap is simply the actual per capita income minus the trend A values.

The Growth Regression Model

We can now outline the growth regression model. Actual growth (*g*) of per capita income (the first differences of the logged level series) is regressed on the income gap (*gap*) as described above and on a set of eight dummy variables for the years 1914, 1915, 1919, 1923, 1931, 1932, 1945, and 1946. The dummies are introduced in

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[8]The year 1914 was chosen because it was the last peace year. The artificial trend ends in 1965 as it is supposed that the reconstruction boom ended in the early 1960s.

FIGURE 2
HP TREND ESTIMATES A AND B
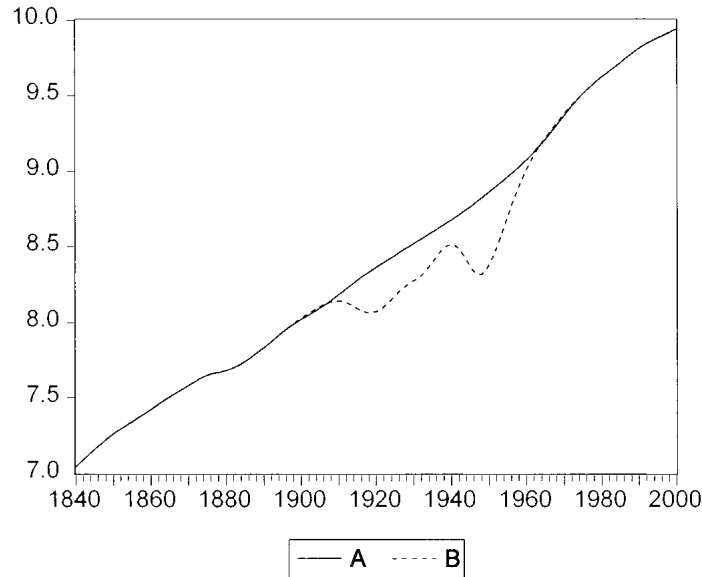
order to cover growth-retarding effects that cannot fully be attributed to the income gap. Here they represent several World War I years, the German hyperinflation peak in 1923, the Great Depression, and the years around the end of World War II. We did not introduce those years or dummies in an ad hoc fashion; we took them from the study by Metz (1998: 300), who has independently identified them. Empirically they contribute to maximizing the reconstruction effect as well as to producing less volatile residuals. Thus, we estimate the regression equation:

$$g = \alpha + \beta gap_{t-1} + \sum_{i=1}^{8} \delta_i d_i + \varepsilon_t,$$

where the δ_is are coefficients of the eight dummy variables d_i, and ε_i is the residual depicting medium-term structural deviations of the growth rate. The gap variable was included lagged once, in order to maximize the reconstruction effect.[9]

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[9]Economically it is plausible, too, that reconstruction growth in the year t depends on the gap in t-1.

FIGURE 3

UNSMOOTHED AND SMOOTHED RESIDUALS
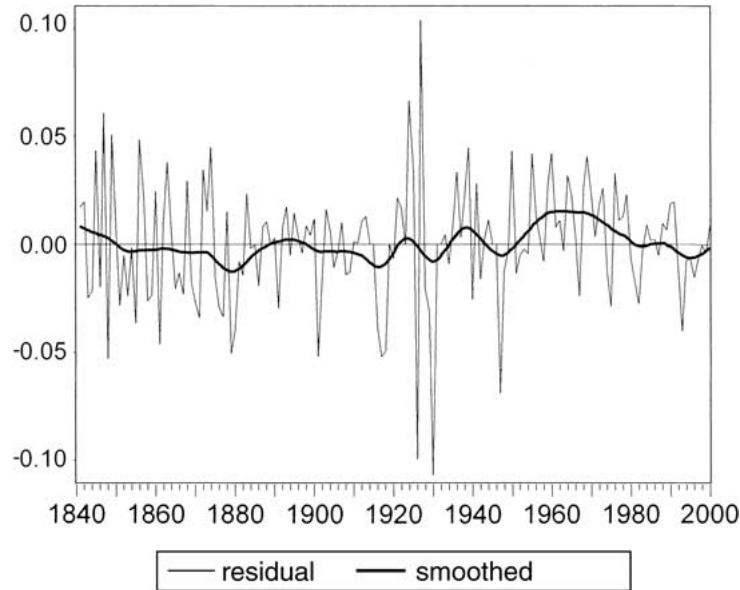
The following coefficients were estimated (t-statistics in brackets):

$$\alpha = 0.018 \ (7.36) \quad \beta = -0.156 \ (11.33).$$

Coefficients of the dummies were significant too but are not reported here. The overall fit of the equation is R^2 = 0.857. Considering the highly significant β coefficient, we can conclude that there is a strong reconstruction effect. Ceteris paribus, the larger the income gap, the larger are growth rates. The α coefficient indicates that the average growth rate is 1.8 percent per year, statistically indistinguishable from the descriptive mean of the growth series.[10] Let us now turn to the residuals that indicate medium-term deviations from the regression relationship. They are plotted in Figure 3 together with a HP smoothed variant.

[10]In order to account for technological catch-up, I also estimated a second growth equation with the income gap relative to the United States as an additional variable. The explanatory power of the equation rises to R^2 = 0.89, but the equation exhibits a considerable substitution effect between the internal income gap and the external gap relative to the United States, as both variables are highly correlated. Surprisingly, the residual pattern remains nearly unchanged. Therefore, the coefficient estimates are not reported here but are available from the author on request.

From the plot it can be seen that growth was significantly above average in the 1950s and 60s. The "growth bonus" of approximately 1.5 percentage points apparently faded in the 1970s. Thus, there is strong evidence for a second growth-enhancing effect besides intertemporal reconstruction growth. As the smoothed residuals (i.e., the structural medium-term growth component) start to rise after 1947, there is a perfect coincidence with the policy reforms beginning in 1948. Even the downswing after the late 1960s fits perfectly to the changing policy regime after Erhard's period as chancellor ended in 1966 and the social market economy began its rapid demise into a welfare state. State expenditures as a percentage of GDP virtually exploded from slightly above 30 percent in the early 1960s to roughly 50 percent by 1980; subsidies and social transfers were expanded to levels Erhard had never agreed on.[11] Inflation rose and Keynesian spending programs flourished in the 1970s. Labor market regulations increasingly hindered the proper functioning of the labor market, which later resulted in high unemployment. Wage policies became expansive and the overall level of bureaucratic regulation rose tremendously. The level of public debt, which was very low in the 1950s and 60s, also grew at unprecedented rates. It was only in the second half of the 1980s that several timid steps were taken toward a renaissance of Erhard's system. Taxes were cut and the state expenditure ratio fell slightly. But even those tiny reforms were immediately stopped in 1990 when unification required large transfer payments to the "new *bundesländer*" (see Giersch, Paqué, and Schmieding 1992).

Calculating the Overall Growth Trend

Having estimated the medium-term growth trend,[12] which covers growth rate shifts, we can complete the analysis by calculating an overall growth trend that is free from random shocks and intertemporal reconstruction growth. Therefore, the growth rate trend resulting from differencing the level trend A is added to the medium-term trend as depicted in Figure 3. The result is displayed in Figure 4.

Once again, the unprecedented growth record in the 1950s and 60s is visible. Following these results, we must conclude that there certainly was strong reconstruction growth after the Second World War, but there is also strong evidence for an additional growth-promoting effect that perfectly coincides with the economic reforms undertaken

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[11]In the 1970s, Erhard repeatedly stated that the West German economic system had nothing to do with his original concept of a social market economy (Jeske 1998).

[12]Note that the series has zero mean.

FIGURE 4

OVERALL GROWTH TREND (GROWTH RATES)
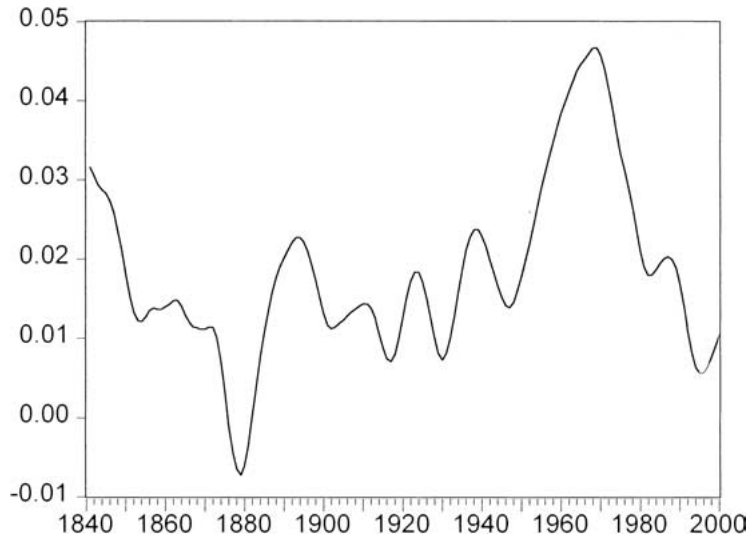
by Erhard. This is not to say that the "extra effect" was the only consequence. It can be argued that implementing a free economic system was a precondition for the exploitation of the reconstruction potential. In this case, the empirically quantified reconstruction effect must at least partly be attributed to the policy reforms. As this effect cannot be extracted from the above presented regression model, we must look for additional evidence.

Neoclassical reconstruction theory implies that growth rates are inversely related to initial income. Applying that theory to Germany, we should have observed the highest growth rate in 1947 followed by declining rates. Looking at industrial and overall growth, the empirical picture is totally different (Table 1).

Contrary to theoretical expectations, there was a marked acceleration in 1948. This pattern strongly indicates that currency reform, liberalization, and deregulation were important factors promoting growth. A more detailed examination of industrial production growth in the western occupation areas during the years 1948–49 also reveals a sudden speeding-up just after the currency reform of June 20, 1948 (Figure 5).

The nexus between industrial growth and economic reforms is evident and is reflected in each of the three series presented above. In relative terms, the capital goods industry grew fastest with a growth

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TABLE 1

GROWTH RATES OF PER CAPITA INCOME AND
INDUSTRIAL PRODUCTION

Year	Per Capita Income (%)	Industrial Production (%)
1947	9.9	14.7
1948	14.3	53.8
1949	13.3	48.3
1950	16.2	25.7

SOURCE: Author's calculations based on *Wirtschaft und Statistik*, various issues.

rate of 128.6 percent over the entire period, followed by the consumer goods industry (plus 120 percent). These figures clearly indicate that Erhard's policy change resulted in higher growth rates and that rapid reconstruction did not take place automatically, at least not at the rates observed.

FIGURE 5

INDEX OF INDUSTRIAL PRODUCTION
(JANUARY 1948–MARCH 1949)
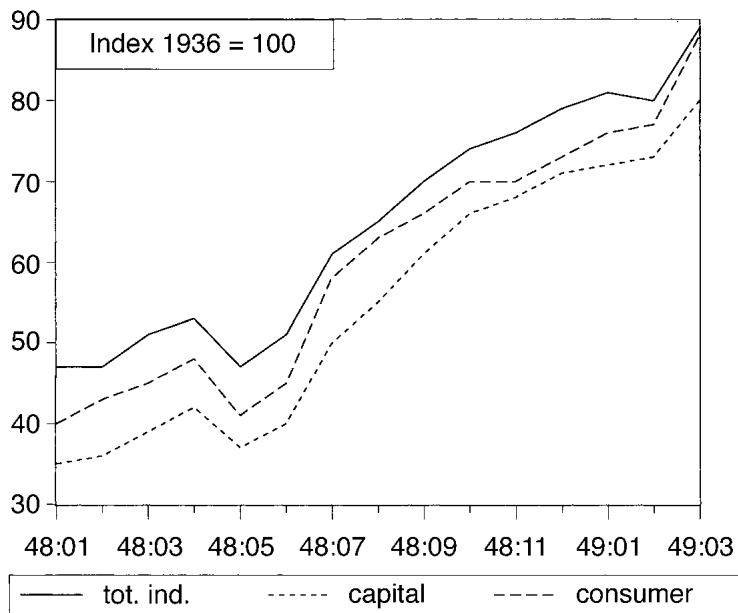
SOURCE: *Wirtschaft und Statistik* (May 1949: 88).

However, there seems to be no way of repeating a super-growth of 8 percent per year in industrialized countries today, since there is no reconstruction potential if an economy grows along a balanced growth path. But it should be possible to raise growth rates by reestablishing a freer economic system. What would be the potential impact on growth? From the calculations above we have learned that a growth bonus of approximately 1.5 percentage points could be isolated in the case of Germany. Can this result be generalized?

In an influential study, Gwartney, Lawson, and Block (1996: 109) have shown that economic freedom as measured by the "economic freedom index" (EFI) is a major determinant of growth. Their regression equation reveals a coefficient of 0.33 for the level (i.e., the long-run effect) of economic freedom. Other studies (Easton and Walker 1997; Farr, Lord, and Wolfenbarger 1998) provide convincing evidence for a positive relationship between economic freedom and the level of per capita income.

The Gwartney, Lawson, and Block study indicates that a typical interventionist country has an EFI value around 4, while an economically free country has an EFI value around 8 or 9. This difference of 4 or 5 index points multiplied by 0.33 gives a growth bonus of approximately 1.5 percent. It is highly unlikely that this result is purely accidental. Admittedly we have no detailed information about Germany's EFI before and after Erhard's reforms, but our estimate nevertheless seems to be a crude but realistic approximation. Thus, there are indications that our growth bonus can be replicated in a cross-section framework.

Lessons from East Germany

The picture of postwar growth would be incomplete without considering the reconstruction process of the former German Democratic Republic (GDR). However, construction of a reliable per capita income series in constant prices is a difficult task because of price controls and forged statistics. West German statisticians and economic historians have frequently attempted to estimate East Germany's income and productivity levels, but those estimates have proved to be biased upward, if not outright false. When East Germany's economy collapsed in 1989 it was commonly assumed that its productivity level reached approximately 70 percent of West Germany's. Careful inspection of the productive capacity in the years following Germany's reunification, however, required drastic revisions. It is now widely agreed that in 1989 East Germany's relative productivity level was a meager 25 percent (Klodt 2000: 316). A comprehensive

FIGURE 6

GROWTH RATES OF PER CAPITA INCOME: WEST AND
EAST GERMANY
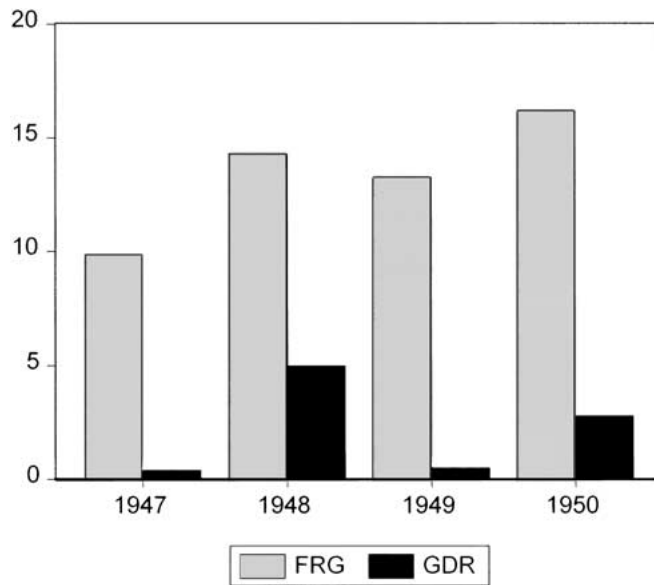
study by Schwarzer (1999) reveals still worse figures. He found that relative productivity was in the range of 14 to 20 percent, which implies that the average absolute productivity level of the GDR economy did not exceed the 1914 level (Schwarzer 1999: 217). This disastrous economic performance is rooted in very little reconstruction growth during the early postwar years as well as in disappointing growth rates thereafter. Figure 6 shows growth rates of per capita income based on Schwarzer's productivity figures.

The difference is striking. The average growth rate during the period 1947–50 was 13.4 percent in West Germany compared to 2.2 percent in East Germany. Thus, though there certainly was some reconstruction in East Germany, growth rates were far below neoclassical predictions. This result points to the enormous importance of a free economic system and supports the view that the West German economic miracle would not have occurred under a socialist regime.

Conclusion

This paper makes a contribution to the controversial debate on the sources of Germany's rapid postwar growth. It is evaluated whether

the German *Wirtschaftswunder* was triggered by reconstruction effects after the war or whether there was a genuine growth effect due to the policy reforms in and after 1948. Applying a time series approach it can be demonstrated that there was in fact strong reconstruction growth. On the other hand, reconstruction growth is unable to fully explain Germany's growth record, as growth rates in the 1950s and 60s were significantly higher than the pure reconstruction model predicts. The time pattern of this "growth bonus" perfectly coincides with the German currency reform and the inauguration of the social market economy. Besides the growth bonus there was an observable interaction with reconstruction mechanisms. It can be argued that even "pure" reconstruction would have been slower in the absence of any policy change. Taking into account the weak growth performance of the former German Democratic Republic, this hypothesis is strongly supported. In this sense, there was indeed a "growth miracle" in West Germany.

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