War and socialism: why eastern Europe fell behind between 1950 and 1989[†]

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This article reconsiders the relative growth performance of centrally planned economies in the broader context of postwar growth in Europe. It reports a new dataset of revised estimates for investment rates in eastern European countries between 1950 and 1989. Complemented with data on other growth determinants, this evidence is used to re-evaluate the socialist growth record in a conditional convergence framework with a panel of 24 European countries. After controlling for relative backwardness, investment rates, and improvements in human capital, the findings show that centrally planned economies underperformed due to their relative inefficiency only after the postwar golden age. In the 1950s and 1960s, eastern Europe was falling behind mainly due to relatively low levels of investment and weak reconstruction dynamics. Both are explained, in part, by the lack of labour-supply flexibility that, in turn, resulted from the comparatively much larger negative impact of the war on population growth in eastern Europe.

Why do some countries grow faster than others? Diverging development has long been of interest to economists and historians alike, and both attribute a key role to institutions. Perhaps nowhere has this consensus been demonstrated more convincingly than for post-1945 Europe, where two fundamentally different economic systems had developed, one of which has since failed. The falling behind of eastern Europe in income per head and productivity under state socialism has been subject to myriad studies. Most blamed it on the inefficiencies of central command and the shortage economy.[1]

Particular emphasis was devoted to the growing technological lag vis-à-vis advanced western nations and to the lack of technological adaptability. Planned economies, it was argued, achieved 'a satisfactory productivity performance in the era of mass production, but could not adapt to the requirements of flexible production technology during the 1980s'.[2] Socialist countries grew relatively fast as long as growth could be achieved through factor accumulation and the

[1] Among others, see Eichengreen, *European economy*, ch. 5; Kornai, *Socialist system*; Osiatyński, ed., *Socialism*.

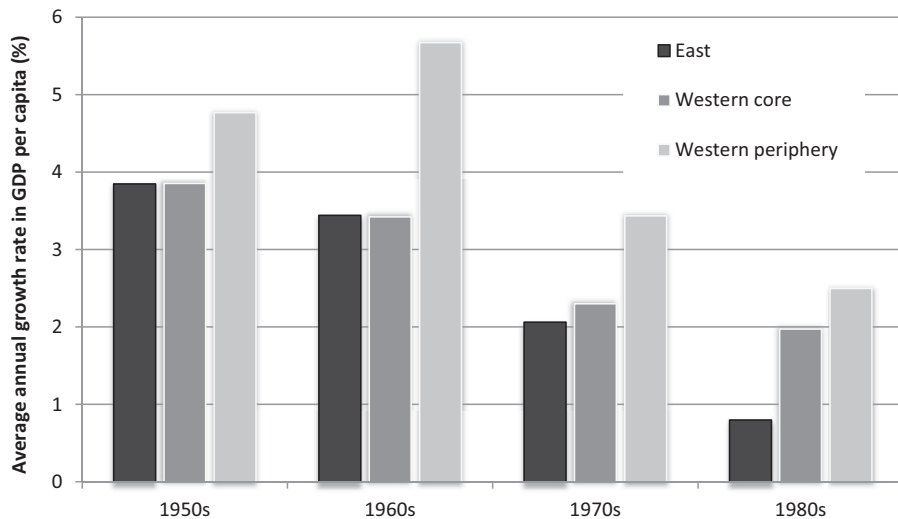[2] Broadberry and Klein, 'When and why', p. 37.

Figure 1.   *Economic growth in Europe, 1950–89*

Notes: East: Bulgaria, Czechoslovakia, Germany (East), Hungary, Poland, Romania, the USSR, and Yugoslavia; western core: Austria, Belgium, Denmark, France, Germany (West), the Netherlands, Norway, Sweden, Switzerland, and the UK; western periphery: Finland, Ireland, Greece, Italy, Portugal, and Spain.
Source: Own calculations. Data from Conference Board, *Total Economy Database* (GDP in 1990 Geary–Khamis dollars).

shifting of resources towards an expanding industrial sector. Once this potential for extensive growth had been exhausted, they 'lacked the instruments to improve the quality of products and services and failed to put in motion a process of transforming the structure of output, demand and trade'.[3] Economic growth in eastern Europe indeed slowed down sharply from the mid-1970s, and the relative underperformance of the region compared to western market economies became increasingly difficult to refute.

As shown in figure 1, the growth of real GDP per capita was especially modest in contrast with the record achieved by western countries that had started from a similar level of development after the Second World War. In this comparison, eastern Europe performed poorly as early as the 1960s, and stayed behind the western periphery in the pace of economic growth until the fall of communism. During the 1980s, growth came close to a standstill and, in several countries, turned into prolonged recessions. Comparative studies on the proximate sources of growth in both eastern and western Europe agree that the falling behind of centrally planned economies was due mainly to poor efficiency and, from the 1970s onward, insufficient improvement in human capital.[4]

This article reconsiders the relative growth performance of eastern Europe in the context of the broader literature on postwar growth. The simple eyeballing of national-income estimates, or of growth rates derived from them, ignores the substantial variation in initial conditions that influenced the growth potential of different countries after the Second World War. A demonstration of why eastern

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[3] van Ark, 'Convergence', p. 302.
[4] Balassa and Bertrand, 'Growth performance'; Bergson, 'Comparative productivity'; van Ark, 'Convergence'; Sleifer, *Planning ahead*.

Europe fell behind between 1950 and 1989 requires an analytical approach that captures these conditioning factors and properly identifies the impact of socialism. Such a framework, in turn, enables us to provide a better explanation for the growth trajectory of planned economies in the postwar era.

The empirical results confirm much of what we know about postwar growth in Europe and socialist economic development, but also offer novel insights. Relative growth performance in the period reflected both relative underdevelopment and the temporary impact of wartime dislocation on output levels. The potential for catch-up growth was conditional upon the rate of investment. This well-documented convergence process slowed down after the end of the golden age, and in eastern Europe was even reversed during the 1980s. The results provide some evidence for the relative inefficiency of investment in planned economies, but only from the late 1970s onward. During the golden age, socialist countries were falling behind mainly because of relatively low levels of investment and a weaker reconstruction dynamic. Both are explained, at least in part, by the absence of labour-supply flexibility that, in turn, resulted from the comparatively much larger negative impact of the war on population growth in eastern Europe.

Sluggish growth in the 1980s also owed much to exogenous circumstances. Rising import prices following the oil shocks, compounded by the austerity measures introduced to tackle the sovereign debt crises, depressed investment levels once again and brought structural modernization to a halt. For most of the postwar era, socialist countries in eastern Europe did not fall behind despite the vast resources they had devoted to factor accumulation, but mainly because these resources were inferior to those at the disposal of western market economies.

The article is structured as follows. Section I reviews the existing literature on the determinants of postwar growth in Europe. Section II discusses the available data on these determinants and explains the necessary revisions. It reports a new dataset on investment rates in eastern Europe, more comprehensive and consistent than the existing alternative sources. Section III develops the analytical framework. Section IV presents the econometric results. Section V turns to the reasons behind the surprisingly low investment levels observed in the early postwar period. Section VI concludes.

I

There is a rich literature on economic growth in postwar Europe, both on the rapid rise of continental economies during the golden age and their sudden slowdown thereafter. Conditional convergence is the core component of most interpretations. The vast transatlantic productivity gap at the end of the Second World War together with trade liberalization and domestic market reforms allowed European economies to achieve rapid growth by adopting modern mass-production technology.[5] Abramovitz argued that technological catch-up was conditional upon the presence of adequate 'social capabilities for growth' and 'technological congruence' between converging economies. Both concepts relate to the capacity of societies to accumulate sufficient stocks of physical and human capital and to

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[5] Baumol, 'Productivity'; Abramovitz, 'Catching up'; Nelson and Wright, 'Rise and fall'; Crafts, 'Golden age'.

use these endowments efficiently. According to Abramovitz, western European nations had reached this developmental stage by the early postwar period and thus could begin to close the productivity gap with the US that had emerged since the nineteenth century.[6]

Denison was among the first to interpret postwar growth in Europe as the product of structural modernization, which shifted resources from agriculture to more productive use in manufacturing and services.[7] Kaldor argued that modern growth was driven by industrial expansion and thus the growth potential of different economies depended on their capacity to boost industrial employment. Industrial investment enjoyed increasing returns to scale, and, therefore, labour expansion caused faster growth in productivity and output.[8] Kindleberger developed a similar thesis, in which labour-supply flexibility, stemming from underemployment in agriculture, rising labour participation, or immigration, limited the growth of real wages, making investment more profitable. Investment in new technology, in turn, enhanced labour productivity, which further increased the profitability of investment.[9]

Institutional explanations have also stressed the contribution of high investment to postwar growth. Pent-up demand for consumer products and booming exports following the liberalization of international trade gave a strong boost to investment and through that advances in productivity. In the unique context of the postwar settlement, it combined with wage moderation to facilitate full employment and sustained growth.[10] In several countries, the radical reform of domestic institutions made pre-existing distributive coalitions weaker and/or more encompassing, thereby giving stronger incentives for investment and allowing markets to allocate resources more efficiently.[11]

Investment-led growth and structural modernization are both relevant to the history of centrally planned economies. The Solow model and extensions thereof suggest that, conditional upon the rate of investment and population growth, countries with initially lower capital–labour ratios can achieve faster growth in labour productivity.[12] That diminishing returns eventually cause economic growth to slow down was also recognized in the socialist context.[13] The transfer of inefficiently employed labour from agriculture to manufacturing was also critical for underdeveloped countries.[14] Allen showed that labour reallocation from the farming sector to heavy industry contributed significantly to fast income growth in the USSR both prior to and after the Second World War. Investment-led growth could be sustained as long as the rural labour surplus was not absorbed.[15]

The success or failure of eastern European economies to exploit the growth potential stemming from their relative backwardness can be measured within the context of conditional convergence. The canonical article of Hall and Jones

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[6] Abramovitz, 'Catching up', pp. 386–90, 395–6; idem, 'Origins'.

[7] Denison, *Why growth rates differ*, pp. 201–24.

[8] Kaldor, *Causes*.

[9] Kindleberger, *Europe's postwar growth*, pp. 1–5.

[10] Lamfalussy, *United Kingdom*; Eichengreen, 'Institutions', pp. 45–58; idem, *European economy*, pp. 31–40.

[11] Olson, *Rise and decline*, pp. 74–5.

[12] Among others, see Mankiw, Romer, and Weil, 'Contribution'.

[13] Horvat, *Towards a theory*.

[14] Nurkse, *Problems*; Lewis, 'Development'.

[15] Allen, 'Capital accumulation', pp. 19–22; idem, *Farm to factory*, pp. 191–3.

argued that the 'social infrastructure' of different countries determines the rate of accumulation in both physical and human capital, as well as technological efficiency. These factors, in turn, account for the striking variance in levels of labour productivity across countries.[16] The inability of the least developed economies to catch up has been commonly explained by poverty traps that prevent countries from accumulating adequate savings for investment and human-capital formation and thus from adopting technologies that would facilitate higher levels of productivity.[17] Physical and human-capital accumulation is especially critical for potential growth in models of biased or directed technical change.[18] Such theories, which correspond well with Abramovitz's concept of technological congruence, found strong evidence in empirical work showing that capital deepening is a prerequisite for, even if not the sole driver of, fast productivity growth.[19]

The role of the labour supply in postwar growth has featured less prominently in empirical work on eastern Europe. The established notion that rapid growth after 1945 was a reconstruction phenomenon has also been neglected in studies of socialist economic development. Although the earliest advocate of this hypothesis, Ferenc Jánossy, witnessed postwar recovery east of the Iron Curtain, his theory was applied mainly in the western literature, foremost to explain the German *Wirtschaftswunder*.[20] By contrast, his views, radically at odds with Marxist orthodoxy, were swiftly rejected by economists in his native Hungary, and were only acknowledged recently as relevant in the socialist context.[21]

Since the seminal article of Dumke, cliometricians have confirmed the significance of reconstruction dynamics for postwar growth, predominantly in western Europe.[22] Most investigations accounted for the reconstruction effect in a convergence framework, defining it as a potential source of growth alternative to relative backwardness. The intuition behind this line of research is that relative growth performance during the golden age can be explained by relative underdevelopment at the start of the period and, alternatively, by the differential and gradually diminishing impact of wartime destruction and dislocation on postwar output levels. Since these conditions also affected the growth of centrally planned economies, accounting for them is necessary to isolate the impact of socialism on the divergent growth outcomes in postwar Europe.

II

The Maddison Project provides data on GDP and population for most countries analysed in this article.[23] The Conference Board Total Economy Database (TED)

[16] Hall and Jones, 'Some countries', pp. 86, 94–7.

[17] Among others, see Ben-David, 'Convergence clubs'; Quah, 'Empirics'.

[18] See especially Acemoglu, 'Directed technical change'; Acemoglu and Zilibotti, 'Productivity differences'.

[19] Kumar and Russell, 'Technological change', pp. 535–40.

[20] Jánossy, *End of the economic miracle*. Initially introduced in Manz, *Stagnation und Aufschwung*, and Abelshauser, *Wirtschaft in Westdeutschland*. For details, see Abelshauser, *Wirtschaftsgeschichte*, pp. 12–13; Borchardt, *Perspectives*, pp. 90–3; Eichengreen and Ritschl, 'Understanding', p. 206.

[21] See Vonyó, 'Socialist industrialisation'. The *Hungarian Economic Review* (*Közgazdasági Szemle*) published three influential articles by Tibor Erdős, Zoltán Román, and Ferenc Molnár in its 1967 volume that all laid a barrage of criticism on the Jánossy thesis; Erdős, 'Gazdasági csoda', Molnár, 'Munkaerő', Román, 'Trendvonalak'.

[22] Dumke, 'Reassessing'; Wolf, 'Post-war Germany'; Temin, 'Golden age'; Vonyó, 'Post-war reconstruction'.

[23] Bolt and van Zanden, 'Maddison Project'.

includes figures consistent with the Maddison data for East and West Germany separately.[24] FAOSTAT and statistical compendia of the International Labour Office (ILO) report estimates for the total economically active population and its occupational structure.[25]

Any study of centrally planned economies must treat official data on national income with more than a modicum of suspicion. Physical output indicators are considered comparatively trustworthy, but aggregates expressed in values are distorted by unrealistic producer prices, incorrect weighting inasmuch as industry was assigned a higher than actual share in net material product, and inappropriate index-number methods.[26] Western research on eastern European economies offered alternative estimates on national income based on independently established benchmarks, and using official data on physical output indicators only in the construction of time series.

The most substantial work was carried out in research commissioned by the CIA and the US Congress Joint Economic Committee, for the Soviet Union, and by the Research Project on National Income in East Central Europe (hereafter Research Project). In a long sequence of publications, the Research Project reported GNP estimates for Poland, Czechoslovakia, Hungary, Bulgaria, Romania, and Yugoslavia, which constitute the foundation of the Maddison data, besides earlier work published in the *Income and Wealth* series edited by Kuznets.[27] Although these alternative estimates have not been accepted without controversy, they remain widely acknowledged as the best available. The most heated debate surrounded the Soviet national accounts. After the seminal paper of Khanin and Seliunin, CIA figures were often claimed to have overstated Soviet growth.[28] However, serious doubts were cast on these re-revisions. The lack of clarity concerning sources and methodology made some of the results non-replicable. In addition, Khanin and Seliunin seem to have neglected serious index-number problems when estimating hidden inflation that formed the foundation of their arguments.[29] Therefore, subsequent research continued to adhere to the CIA estimates, which have been repeatedly refined over the 1980s and early 1990s.[30]

Albania had undoubtedly the weakest output data in eastern Europe. National accounts were poorly constructed, and there is hardly any statistical evidence prior to 1950. Albania remained the only developing country in Europe, recording exceptionally low income per capita and rapid population growth by western standards. The autarchic Stalinist regime that ruled the country until the late 1980s showed more resemblance to North Korea than to eastern European communism. For these reasons, Albania is excluded from the analysis that follows.

Output data for East Germany are also not unproblematic. TED estimates were derived from the work of Sleifer. A benchmark constructed by the Federal Statistical

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[24] Conference Board, *Total Economy Database*.

[25] FAOSTAT, 'FAOSTAT classic'; ILO, *Labour force estimates*; idem, *Economically active population estimates*.

[26] Net material product was the national accounting concept used by CMEA (Council for Mutual Economic Assistance) countries. It is conceptually similar to GDP, but excludes services deemed unproductive, especially housing and the government.

[27] For details, see Maddison, *World economy*, pp. 469–71.

[28] Åslund, 'Soviet national income', pp. 49–50; Ericson, 'Soviet statistical debate', pp. 63–5.

[29] Harrison, 'Soviet growth', p. 159.

[30] For detailed discussions on the debate about alternative estimates, see Ellman and Kontorovich, 'Overview'; Khanin, 'Economic growth'. For the most detailed estimates, see CIA, *Measures*.

Office after reunification estimated GDP per capita in the former GDR at 31 per cent of the West German level. Sleifer computed an index of East German GDP for 1950–90, building on sectoral data reported by both the Research Project and the German Institute of Economic Research (DIW), complemented by other West German publications.[31] The index numbers can be considered reliable from 1960, after which they closely correspond, in terms of growth rates, with more conservative alternative estimates.[32] Between 1950 and 1960, Sleifer suggests much higher growth rates than those we can derive from the GDP levels computed by Ritschl and Spoerer.[33] Furthermore, both series report levels of GDP per capita for 1950 that are far too low to be acceptable, if one trusts the comparative literature on East and West German growth across the Second World War and the immediate postwar years.

Grünig put East German GDP per capita in 1936 at 103 per cent of West Germany.[34] Contemporary official data on regional income levels support this figure.[35] If we extrapolate from the 1991 benchmark using TED for West Germany and Sleifer for East Germany, then GDP per capita in the GDR in 1950 comes out to only 52 per cent of the corresponding Western level. This would imply a much larger decline in East German national income between 1936 and 1950 than the most widely accepted estimate of Barthel.[36] Another highly implausible implication is that economic growth between 1950 and 1989 appears only moderately slower in East than in West Germany. Thus, the productivity divergence between the two German states would be almost entirely the result of the transition shock that came with reunification.[37]

To avoid having to use weak output data for the 1950s, it was necessary to compute an East–West benchmark for 1950 based on the 1936 benchmark of Grünig and the estimated growth rate of net national income for 1936–50 by Barthel. This approach brings East German GDP per capita to 65 per cent of the Western level in 1950 and, with that, yields more reasonable growth rates for the 1950s. This benchmark matches closely existing estimates of comparative industrial labour productivity.[38] Growth between 1936 and 1939 is assumed to be identical for Germany and its successor states. Levels of East German GDP per capita between 1960 and 1989 are determined by backward projection from the 1991 benchmark, using the index of Sleifer and official population statistics.[39]

Controlling for relative backwardness makes the underperformance of socialist economies even more difficult to refute. As shown in figure 2, eastern Europe could not join the western convergence club in the postwar era. The growth performance of Poland and Romania was the most disappointing. GDP per capita declined in both countries during the 1980s under severe austerity imposed by the repressive dictatorships of General Jaruzelski and Nicolae Ceaușescu respectively. Income

[31] For details, see Sleifer, *Planning ahead*, pp. 17, 176–8.
[32] See Merkel and Wahl, *Das geplünderte Deutschland*, tabs. 6–7, pp. 44–9.
[33] Sleifer, *Planning ahead*, p. 176; Ritschl and Spoerer, *Bruttosozialprodukt*, p. 53.
[34] Grünig, 'Volkswirtschaftliche Bilanzen', p. 49.
[35] Länderrat des Amerikanischen Besatzungsgebiets, *Statistisches Handbuch*, pp. 600–1. I divided Berlin between the eastern and western sectors based on population data from the 1939 census.
[36] Barthel, *Die wirtschaftlichen Ausgangsbedingungen*, tab. 61, p. 144.
[37] Conference Board, *Total Economy Database*.
[38] For details, see Ritschl and Vonyó, 'Roots of economic failure', app. tab. A3.
[39] Statistisches Bundesamt, *Bevölkerungsstatistische Übersichten*, p. 24.
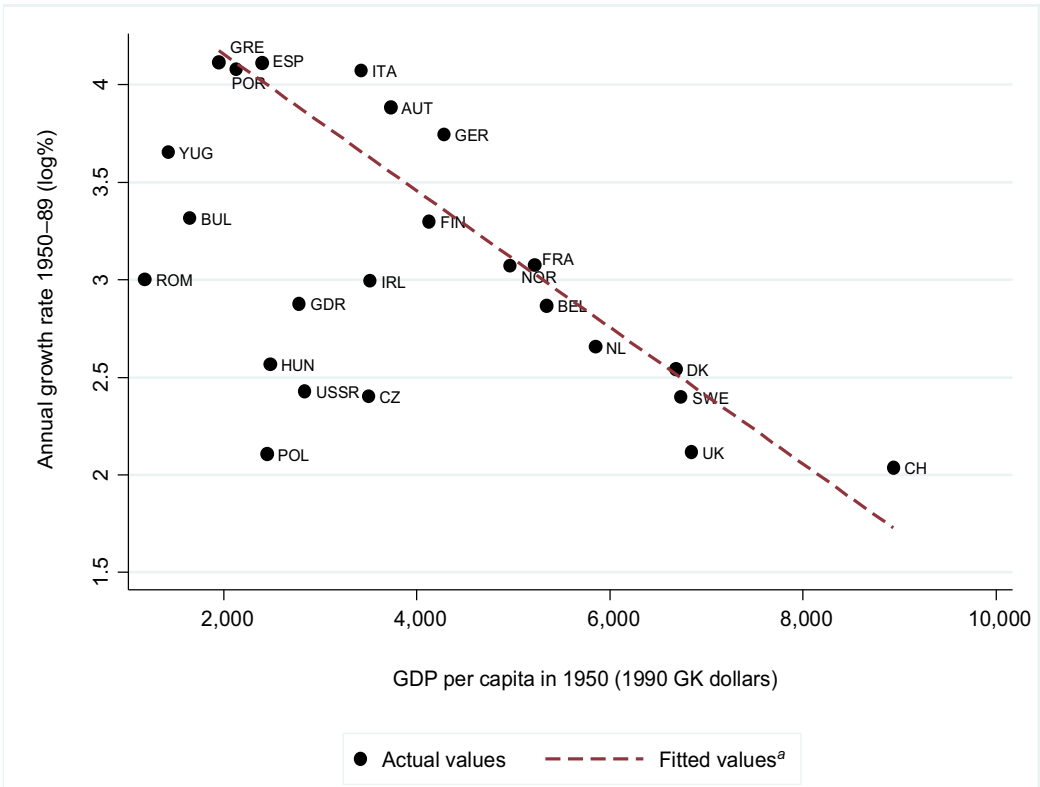
Figure 2.   *Economic growth and convergence in Europe, 1950–89*
Note: [a]The regression line is fitted to the actual values of 16 west European countries.
Source: Own calculations. Data from Conference Board, *Total Economy Database*.

levels also stagnated in Bulgaria and Yugoslavia after 1980, but both nations recorded some of the highest growth rates in Europe until the mid-1970s.

Figure 3 demonstrates a close link between structural modernization and economic growth in postwar Europe. The statistical evidence indicates a very strong correlation between levels of income per capita and agricultural employment shares, both across countries and over time. Moreover, this pattern was common between eastern and western Europe. Most data points representing centrally planned economies on the diagram correspond to the central tendency, and we can find socialist countries among outliers in both directions. This evidence does not support the view that planned economies began to fall behind because they had exhausted their potential for extensive growth by absorbing the agricultural labour surplus. If anything, during the golden age, eastern European countries attained relatively high income per capita given their level of structural development. On the contrary, it appears that eastern Europe remained relatively poor because it continued to lag behind western market economies in structural modernization.

This finding is confirmed after aggregating the data for eastern Europe, as well as for advanced and peripheral economies in western Europe. The western periphery includes the six countries where in 1950 more than a third of the labour force
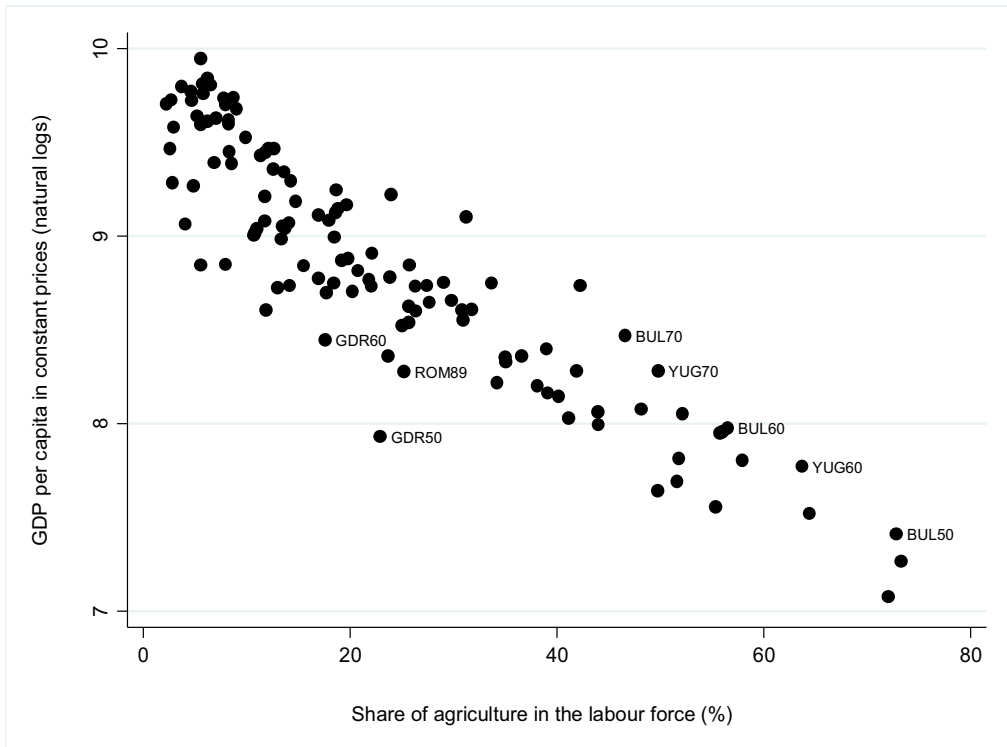
Figure 3. *Occupational structure and relative backwardness in Europe, 1950–89*

Notes: The dots on the diagram represent observations in 1950, 1960, 1970, 1980, and 1989.
Source: Own calculations. Data from Conference Board, *Total Economy Database*; ILO, *Economically active*; idem, *Labour-force estimates*.

was still employed in agriculture. Figure 4 demonstrates convergence in structural development between the core and the periphery during the golden age. After 1970, this process continued among western countries, but eastern Europe began to diverge from the western periphery. For socialist economies, the 1970s and 1980s marked a sharp slowdown in structural modernization. Until 1989, they barely managed to reduce the relative size of farm employment to the level that the western core had already attained by 1950.

Since structural modernization requires investments, the above findings raise the question of how much eastern European countries actually invested. Socialist investment data are notoriously unreliable. Under fixed prices and investment allocations, capital goods suppliers had an incentive to increase value added by degrading quality. The presence of hidden inflation was extensively discussed in the literature on the Soviet Union.[40] Gross investment was inflated by additional items, such as the training of personnel, R&D, and inventories, which were fabricated in order for the main components of national accounts to match. Additional factors distorted the investment ratios derived from official data. Comparing gross

[40] Among others, see Bergson, 'Soviet real investment growth'; Kontorovich, 'Inflation'; Wiles, 'Soviet consumption'.
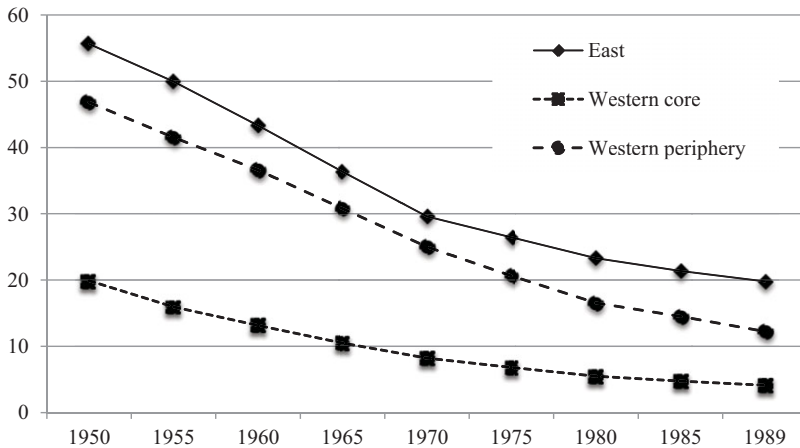
Figure 4. *The share of agriculture in the total labour force in Europe (%)*

Notes: As for fig. 1.
Source: Own calculations. Data from ILO, *Economically active*; idem, *Labour-force estimates*.

investment with net material product, instead of GDP, has been a common mistake. This implies that, for example, housing investment was included in the numerator, while value-added in the housing sector was left out of the denominator, thus magnifying the rate of investment. Finally, contemporary sources often used output and investment data in current prices, which were misleading as investment totals were typically valued at end-of-year prices, while output was not.

A perfectly consistent dataset on investment in all European countries in the postwar era is perhaps impossible to construct and certainly beyond the scope of this article. However, improvements on and extensions to the currently available cross-country evidence are necessary to evaluate the growth performance of eastern Europe in a conditional convergence framework. The standard source used in the empirical literature, the Penn World Tables (PWT), only reports consistent data for the whole period for western economies. The series for socialist countries only start in the 1960s or the 1970s. The last version that included states dissolved after 1990, Czechoslovakia, Yugoslavia, and the USSR, reported astronomical investment rates for most centrally planned economies.[41] By contrast, the estimated shares of government spending are unrealistically low. This suggests that the original data used to compute total gross investment included many residual categories not fully accounted in public consumption. Later versions of the PWT only report figures for successor states since the 1990s. For the rest of eastern Europe, most series made substantial downward revisions, but some remain consistent with the previous estimates.

This article develops a dataset on investment ratios that includes data from PWT 5.6 for western countries but derives estimates from alternative sources for eastern Europe, making adjustments to the data whenever necessary and possible. The Research Project constructed index numbers for seven countries (including East Germany) on gross product available for domestic final use. The reports

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[41] Heston, Summers, and Aten, 'Penn World Table 5.6'.

account separately for personal consumption, public consumption, and residual uses composed predominantly of gross investment. After discounting for net foreign trade and payments, all spending components are expressed as percentages of GDP in constant prices for benchmark years between 1975 and 1989.[42] Since the latest reports include estimates in 1985 or 1987 prices, the data provide some consistency with PWT 5.6, which also used 1985 as the benchmark year. We can work out gross investment from the residual uses of gross product, as the reports listed the main public-spending components left unaccounted for: defence and R&D outside higher education and the health sector. The Stockholm International Peace Research Institute (SIPRI) reports the ratio of total military expenditure to GNP for all respective countries.[43] The share of domestic R&D spending beyond the components already accounted for by the Research Project is taken from official statistics. For the years 1975, 1980, 1985, and 1989, the rate of investment to GDP is computed by subtracting these two items from the ratios of residual uses to GDP.

For earlier periods, the investment rate is estimated by backward projection from 1975, using both the index-number series for residual uses of gross product and GDP from the Research Project. All figures used in the interpolations are taken from reports that valued both output and final expenditure at prices from the same years. The contribution of residual R&D is netted out using the component series on science and research in the reports on GDP by sector of origin of product.[44] With this approach, we can project the rate of investment back to 1950 for Bulgaria, Czechoslovakia, Hungary, and Poland. For East Germany prior to 1965, Ritschl's estimates are used. These match well with the projections presented here for the late 1960s and 1970s, when the two series overlap.[45] For Romania, we do not have projected estimates before 1960.[46] For Yugoslavia, the 1975 benchmark is constructed using the same approach, but projections both forward and backward are based on revised national statistics that were not yet available to the Research Project. These continuous series reach back to the 1950s and reflect the sharp decline in investment after 1980. As the data are disaggregated into different components, they allow us to net out the contribution of residual public expenditure items.[47]

For the Soviet Union, we cannot follow the same approach, as it was not studied in the Research Project. Furthermore, cleansing gross investment from defence and R&D spending would be virtually impossible. For the 1970s and 1980s, international sources on military expenditure report only approximate or

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[42] Alton et al., *Eastern Europe: domestic final uses* (1990, 1991).

[43] SIPRI, *Yearbook*, 1980, p. 29; 1991, pp. 174–5. The robustness of the figures is assured by a strong correlation across both countries and time with estimates of the size of armed forces reported in IISS, *Military balance* (1968–90); idem, *Communist bloc*; idem, *Soviet Union and the NATO powers*. The data on the number of military personnel are also used to project defence spending for several countries back to the 1950s.

[44] Alton, 'Economic structure'; Alton, Bass, Lazarcik, Staller, and Znayenko, *Economic growth in eastern Europe*; Alton, Bass, Lazarcik, and Znayenko, *Eastern Europe*; Bass, *Bulgarian GNP*; Czirják, *Hungarian GNP*; Korbonski, Wynnyczuk, and Znayenko, *Poland*; Lazarcik, *Czechoslovak*; Lazarcik and Wynnyczuk, *Bulgaria*; Lazarcik and Znayenko, *Bulgaria and East Germany*.

[45] Ritschl, 'Exercise', pp. 515–19.

[46] In the analysis, I assume that the rate of investment grew as in Bulgaria between 1950 and 1965, when both countries had a similar level of structural development and similarly conservative planning regimes.

[47] Savezni zavod za statistiku, *Investicije u osnovna sredstva SFR Jugoslavije*, pp. 46–7; Federal Statistical Office, *Statistical Yearbook*, pp. 172, 201.

Table 1. *Estimated ratios of investment to GDP in eastern Europe, 1950–89 (%)*

	1950	1955	1960	1965	1970	1975	1980	1985	1989
Bulgaria	22.8	20.3	27.5	30.3	31.6	35.0	20.3	15.1	10.1
Czechoslovakia	15.0	18.0	20.7	20.6	21.7	23.8	23.1	16.9	19.1
East Germany	6.4	10.3	17.3	18.9	23.8	24.6	26.9	15.6	16.2
Hungary	26.1	27.8	29.1	34.2	34.5	33.5	30.0	21.3	20.8
Poland	16.2	21.5	22.1	24.2	25.3	34.3	26.9	25.0	22.3
Romania	–	–	18.9	26.5	30.3	34.7	32.1	24.1	12.8
USSR	23.0	20.0	20.1	20.5	24.1	27.1	27.5	29.2	28.3
Yugoslavia	22.2	21.3	27.3	31.2	31.5	31.0	30.9	18.7	17.3

Notes and sources: See text and footnotes in section II.

no figures for the USSR.[48] The concealment of actual spending had become so pervasive by then that Soviet officials no longer knew how large a burden was being placed upon state finances by defence outlays.[49] The recent literature has made us better informed, but, as Harrison argues, it 'throws more light on the burdens of secrecy than on the supposed burdens of military spending'.[50] For 1960 to 1989, investment rates were computed from the revised national accounts of Russia by Ponomarenko. He was the first to adapt the System of National Accounts to Soviet statistics and made use of highly disaggregated data on material balances.[51] Figures for the 1950s are taken from Ofer.[52]

Projected rates of investment for eastern Europe are reported in table 1. If anything, these are still upper-bound estimates. Minor components of public consumption not specified in the data sources are still included in the investment totals from which the ratios are derived. In addition, inventories often included items other than investment material. For several countries, revised investment data expressed in post-1990 real market prices reveal that the relative prices of investment goods were, if anything, inflated by central planners. Still, the estimates presented here are substantially lower than the investment ratios reported in the early PWT versions or used in the growth accounts for centrally planned economies discussed in the previous sections.

The evolution of investment rates in eastern Europe paints a clear trajectory: relatively low rates during the 1950s, high investment in the late 1960s and the 1970s, and sharply falling rates during the 1980s. Investment ratios were typically the lowest in the two most developed economies of the Soviet bloc, Czechoslovakia and East Germany. The figures for the GDR may seem unrealistically small for the early 1950s, but they are in line with earlier accounts.[53] Even the DIW estimates derived from official data put the rate of investment including inventories at approximately 14 per cent in both 1950 and 1955, and these did not account

[48] SIPRI, *Yearbook* (1970), pp. 266–70; (1980), pp. 20–1; (1990), pp. 191–2. See also ACDA, *World military expenditures* (1974, 1986, 1991).
[49] Hildebrandt, 'Dynamic burden', p. 332; Epstein, 'Economic cost', p. 127; Davis, 'Defence sector', pp. 155–6.
[50] Harrison, 'Secrets, lies, and half truths', abstract.
[51] Ponomarenko, *Retrospektivnye*, tab. 1.1.3, p. 151; tab. 4.1.1, p. 214.
[52] Ofer, 'Soviet economic growth', tab. 3, p. 1788. Total investment is computed by adding up gross fixed investment and inventories, but excluding R&D.
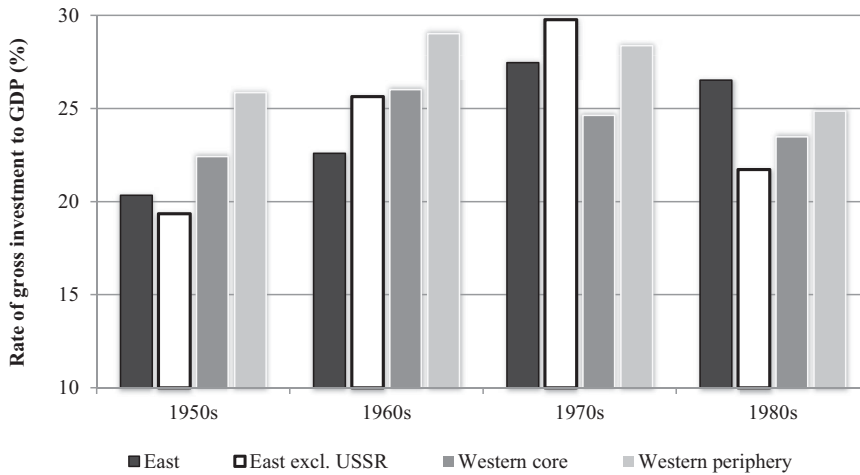[53] See Baar, 'Zur ökonomischen Strategie', p. 12.

Figure 5. *Average ratios of investment to GDP in Europe 1950–89 (%)*

Notes: As for fig. 1.
Sources: Tab. 1; Heston et al., 'Penn World Table 5.6'. Decadal regional averages computed using total GDP weights from Conference Board, *Total Economy Database*.

for disinvestment in the form of reparations.[54] In section V the causes of low investment in the early postwar decades and after 1980 are discussed, but the main reasons are worth indicating briefly. Austerity imposed after the oil shocks squeezed the resources available for investment. As a result, the Soviet Union, one of the foremost exporters of hydrocarbons, was the only country in eastern Europe to maintain high rates of investment. In East Germany, Czechoslovakia, and the western regions of Poland, large inherited stocks of capital combined with a labour shortage meant that these economies could grow into existing capacities with little additional investment for many years after the war.

As shown in figure 5, during the 1950s, investment rates in eastern Europe were substantially lower than in the west. Despite convergence in the 1960s, socialist countries were still lagging behind the western periphery. Only from the 1970s onward were investment ratios comparable across the Iron Curtain. During the 1980s, there was a substantial difference in investment activity between the Soviet Union and its satellites. Comparing these average rates of investment with the rates of economic growth reported in figure 1, as well as the labour-force statistics discussed above, suggests the following hypothesis. During the golden age, eastern Europe fell behind the western periphery mainly because of insufficient investment. By contrast, its continued relative decline from the 1970s was due, in large part, to the inefficient allocation of investment, which hindered structural modernization.

To test this hypothesis empirically, we also need to account for differences in human capital, since structural modernization often requires changes in skill endowments. Although the empirical growth literature used a variety of human-capital measures, since the publication of the Barro–Lee datasets, educational attainment has been the most commonly used.[55] Unlike enrolment rates that

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[54] Abeken, 'Volkswirtschaftliche Gesamtrechnung', p. 161.
[55] See Barro and Lee, 'New data set'.

refer to the young generations not yet employed, attainment levels are estimated for the economically active population. In addition, estimates by age cohort, including the generation whose education was completed before the period of measurement, make the data ideal for identification purposes. The most recent datasets published in 2015 also report long-term projections of enrolment rates for the adult population, consistent in sources and methodology with the attainment estimates.[56] Although these do not cover all eastern European countries, given the emphasis on the importance of secondary schooling in industrialized economies during the twentieth century, they can be used in robustness checks.[57]

III

This article draws inspiration from the existing cliometric studies on postwar growth, but deviates from previous research in the empirical model. Both Dumke and Temin employed cross-sectional regressions to explain the growth of GDP per capita by initial income to account for convergence, the share of agriculture in the labour force to measure lags in structural development, and the difference between real GDP per capita in 1938 and 1948 to reflect wartime dislocation.[58] In my previous work, I applied a more sophisticated framework with panel regressions. I also showed that including measures of structural development makes it harder to draw inference from convergence models, given the strong correlation between income levels and sectoral employment shares.[59]

Two inherently linked indicators of relative backwardness in the same model generate biased estimates in the presence of multi-collinearity. As shown in figure 3, sectoral labour shares correlate very strongly with GDP per capita. In addition, postwar income levels were strongly affected by wartime destruction and dislocation, making it difficult to isolate the role of reconstruction dynamics from convergence in postwar growth.

This article develops a different model. GDP per capita growth is explained by the initial share of agriculture in the labour force and the gradually diminishing impact of the postwar output gap, controlling for investment rates and improvement in educational attainment. This approach isolates the two main sources of postwar growth better than the aforementioned specifications. First, the inclusion of convergence controls allows for different steady states across countries. Second, sectoral labour shares were much more resistant than income levels to war-induced shocks. Even in the most severely affected economies, the relative size of farm employment increased only by a few percentage points from the 1930s and most of these effects vanished by 1950.[60] The following model is estimated for a panel of 24 countries with eight non-overlapping five-year periods from 1950 to 1989.[61]

$$Growth_{it} = \alpha + \beta_1 Backwardness_{it} + \beta_2 Invest_{it} + \beta_3 Education_{it}$$
$$+ \delta GAP_i^* \boldsymbol{\lambda}_t + u_i + \varepsilon_{it}$$

[56] See Barro and Lee, *Education matters*.
[57] Among others, see Mankiw et al., 'Contribution', pp. 419–21; Goldin, 'Human-capital century', pp. 273–8.
[58] Dumke, 'Reassessing', pp. 478–80; Temin, 'Golden age', pp. 12–13.
[59] Vonyó, 'Post-war reconstruction', pp. 226–8.
[60] See Flora, Kraus, and Pfennig, *State*, p. 443 onwards.
[61] Estimating the regressions for a panel of four decadal periods yields very similar results.

The dependent variable is the logarithmic growth rate of real GDP per capita. *Backwardness* denotes the initial share of agriculture in the total economically active population. Investment rates are averaged over every period t. Education is the period-average logarithmic growth rate in years of formal schooling for the population aged 15–64. The log ratio of real GDP per capita between 1938 and 1950 measures the postwar output gap.[62] Thus we expect a positive correlation between the size of the output gap and postwar growth. Since *GAP* has time-constant values, its effect is estimated by a set of interaction terms using a vector of period dummies (λ_t), taking 1985–9 as the reference period. Since, by the late 1980s, the impact of wartime dislocation must have vanished completely, the interaction terms should pick up the full effect in every previous five-year period.

A battery of indicators measure educational attainment. The analysis discussed in the main text accounts for the growth in average years of schooling for the total working-age population. To assure proper identification, robustness checks reported in appendix I apply attainment growth for the population aged 25 to 64 instead. The assumption is that changes in levels of schooling for members of the labour force aged 15 to 25 are affected by current economic conditions, whereas the education of those aged 25 and above has already been completed. A further robustness check uses secondary enrolment rates instead of average years of schooling for a sample of 20 countries for which consistent data exist, checking for both current and past (previous decade) changes in enrolment.

Time dummies for the post-1975 and post-1980 periods are included and interacted with another dummy for socialist countries to test for any divergence in growth rates after the golden age, or any effect specific to the 1980s, that is not explained by the convergence controls alone. The socialist dummy is interacted with the rate of investment to capture the relative inefficiency of investment under central planning. To avoid having to use over-complicated interaction terms, it is possible to check for intertemporal changes in this relative inefficiency by re-estimating the model for different time intervals. This is accomplished in two ways. First, the panel is built up gradually from 1950–75, to capture the dynamics that prevailed during the golden age, to 1950–89, showing how these dynamics began to differ thereafter. Second, sub-period analysis is conducted to estimate the effect of growth determinants for each five-year period separately. This provides for a more direct representation of changing dynamics, but its results should be treated as indicative only, given the limitations of cross-sectional regressions run on a very small sample. Finally, sub-sample analysis demonstrates how the role of postwar reconstruction differed between eastern and western European countries.

IV

Table 2 reports the main results. The table reports coefficients estimated for six different specifications, staring from a simple conditional convergence framework (columns I–II) and ending with the fully specified model (columns V–VI). Column I confirms the strong correlation between income growth and the scope for

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[62] The specification used in Vonyó, 'Post-war reconstruction', to account for lost growth during the 1940s cannot be applied to this extended country sample. GDP data for eastern Europe between the wars are scarce and often of poor quality. Also due to data scarcity, the output gap cannot be measured for any year before 1950.

Table 2.　*Regressions explaining economic growth in 24 European countries, 1950–89*

	I	II	III	IV	V	VI
Backwardness	0.1139***	0.0769***	0.0882***	0.0893***	0.0768***	0.0776***
	(11.53)	(5.08)	(5.56)	(5.88)	(5.02)	(5.07)
Rate of investment	0.1140***	0.0977**	0.1122***	0.1299***	0.1282***	0.1298***
	(4.17)	(2.82)	(4.72)	(3.96)	(4.08)	(4.13)
Investment*socialist				−0.0347	−0.0573	−0.0645
				(−0.71)	(−1.12)	(−1.29)
Education	0.0704	0.0485	−0.0454	−0.0470	−0.0698	−0.0651
	(1.44)	(0.89)	(−0.74)	(−0.78)	(−1.24)	(−1.08)
Gap * 50–5			0.0753***	0.0743***	0.0707***	0.0712***
			(4.09)	(4.32)	(5.00)	(4.98)
Gap * 55–60			0.0424***	0.0444***	0.0416***	0.0421***
			(2.80)	(2.84)	(3.24)	(3.18)
Gap * 60–5			0.0246**	0.0263**	0.0244**	0.0262***
			(2.56)	(2.59)	(2.62)	(2.82)
Gap * 65–70			0.0239**	0.0254**	0.0236**	0.0242**
			(2.12)	(2.13)	(2.24)	(2.28)
Gap * 70–5			0.0145*	0.0161*	0.0142*	0.0148*
			(1.83)	(1.88)	(1.83)	(1.91)
Gap * 75–80			0.0116	0.0130	0.0121	0.0117
			(1.04)	(1.06)	(1.16)	(1.19)
Gap * 80–5			0.0070	0.0074	0.0078	0.0080
			(0.55)	(0.57)	(0.60)	(0.61)
Dummy 1975+		−1.1857***	−1.2101***	−1.1883***	−1.1908***	−1.2801***
		(−4.70)	(−4.54)	(−4.62)	(−4.40)	(−4.83)
Dummy 1980s		0.2823	0.2947	0.2843	0.4399**	0.5243**
		(1.13)	(1.71)	(1.61)	(2.53)	(2.73)
Socialist * 75+					−0.2960	
					(−0.64)	
Socialist * 80s					−0.7966*	−1.0522***
					(−1.83)	(−3.38)
(constant)	−2.7293***	−0.9904	−1.3544	−1.5399*	−0.9152	−0.9258
	(−4.05)	(−0.81)	(−1.66)	(−1.90)	(−1.27)	(−1.29)
N	192	192	192	192	192	192
F	60.40	36.58	34.63	32.16	48.55	49.17
R^2	0.55	0.60	0.68	0.68	0.70	0.70

Notes: The dependent variable is the logarithmic annual growth rate in real GDP per capita averaged over non-overlapping five-year periods. The superscripts *, **, and *** indicate significance at the 10, 5, and 1% levels respectively. The regressions are estimated with country-fixed effects and cluster-robust standard errors (clustered by country); *t*-statistics are reported in parentheses below the coefficients.
Sources: For sources and methods used to compute values for the regression variables, see section II.

structural modernization. On average, a 10 percentage point higher share of agricultural employment entailed more than 1 percentage point faster growth per annum. This represents a large impact for the early postwar period, considering that these labour shares in 1950 ranged from 5.5 per cent in the UK to 73 per cent in Yugoslavia. Convergence in structural modernization was conditional upon the rate of investment. While the coefficient for the investment rate is highly significant, the partial impact of improved educational attainment appears negligible. These results remain unchanged in all specifications.[63]

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[63] I also included an interaction term to capture any difference in the speed of convergence between socialist and market economies, but after the inclusion of the standard controls, the coefficient is insignificant.

As expected, we find that growth rates after 1975 were, on average, more than 1 percentage point smaller than the forces of convergence would predict.[64] This result remains robust in all specifications. In the general specification, the difference between the size of the negative coefficients accounting for the late 1970s and the 1980s respectively is statistically insignificant. The coefficients on convergence controls are consistent even after the inclusion of the interaction terms with the output gap, which confirms the robustness of the model. As expected, the reconstruction effect was strongest during the 1950s, but is still significant at the 10 per cent level for the early 1970s. This finding supports my earlier work, which showed that differential growth rates among OECD countries can be explained by reconstruction dynamics until the end of the golden age; Dumke and Temin, on the other hand, only found the effect significant for the 1950s.[65] The results remain consistent after additional dummies for socialist countries post-1975 are included. The falling behind of eastern Europe following the oil shocks cannot be explained by diverging values in the convergence controls alone. Conditional upon other growth determinants, the growth record of western countries improved during the 1980s relative to the late 1970s, whereas the performance of eastern Europe continued to worsen significantly.

The results suggest that improvements in human capital did not make a substantial impact on differential growth rates in postwar Europe. As shown in appendix I, the coefficient on education remains insignificant in all robustness checks and the empirical model is not sensitive to the specification of this variable.[66] Table 3 shows this result to be consistent even if we apply different time horizons or different sub-samples of countries. From this finding alone we cannot definitely conclude that expansion in formal schooling made no contribution to postwar growth. Instead, the results might reflect similar experience across countries in the growth of educational attainment, which, therefore, cannot explain the large variation in rates of economic growth over time and across countries. In addition, the standard measures for which cross-country data are available might not fully capture improvements in human capital. Years spent in formal schooling do not account for the quality of education, while enrolment rates disregard considerable differences in types of schooling across countries. Qualitative measures, such as spending per pupil or student/faculty ratios, are not without deficiencies either, and it is difficult to find reliable data on these variables for socialist countries.

In table 2, after controlling for relative backwardness and postwar reconstruction, the negative impact of socialism on the efficiency of investment is not found to be statistically significant. However, the size of the effect is not negligible, which may reflect changing dynamics over time, supporting the hypothesis that the inefficient allocation of resources was responsible for the poor growth performance of socialist countries after the golden age, in particular. These changes are tracked by re-estimating the model for different periods, starting with 1950–75 and gradually building up the panel to 1950–89. The results are reported in table 3.

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[64] An alternative specification that includes period dummies for all pre-1985 periods reveals that periods pre-1975 did not differ substantially and significantly in convergence dynamics and only over-specify the model.
[65] See Dumke, 'Reassessing', pp. 484–6; Temin, 'Golden age', p. 14.
[66] We can observe changes in the size of the coefficients on period dummies when using enrolment rates instead of attainment levels (columns V–VII), but these regressions are estimated for a smaller country sample.

Table 3. *Regressions explaining economic growth in 24 European countries (changing panels)*

	I	II	III	IV	V	VI	VII
	Full sample of 24 countries				Sub-samples, 1950–89		
	1950–75	1950–80	1950–85	1950–89	West (16)	East (8)	East excl. GDR
Backwardness	0.1152***	0.0933***	0.0882***	0.0776***	0.0549***	0.0899***	0.0945***
	(3.63)	(4.00)	(5.04)	(5.07)	(2.87)	(5.60)	(4.54)
Rate of investment	0.2092***	0.1803***	0.1587***	0.1298***	0.1116***	0.0960***	0.0949***
	(4.22)	(4.08)	(4.26)	(4.13)	(3.21)	(3.40)	(2.94)
Investment*socialist	−0.0225	−0.0835	−0.0971*	−0.0645			
	(−0.26)	(−1.36)	(−1.77)	(−1.29)			
Education	−0.0953	−0.0569	−0.0720	−0.0651	−0.0417	−0.1435	−0.0282
	(−1.03)	(−0.76)	(−1.01)	(−1.08)	(−0.46)	(−0.67)	(−0.12)
Gap * 50–5	0.0581**	0.0637***	0.0744***	0.0712***	0.0645***	0.0776***	0.0628
	(2.60)	(4.22)	(6.25)	(4.98)	(3.23)	(3.83)	(1.67)
Gap * 55–60	0.0263*	0.0342***	0.0448***	0.0421***	0.0522**	0.0349*	−0.0138
	(1.73)	(3.33)	(4.62)	(3.18)	(2.70)	(1.74)	(−0.37)
Gap * 60–5	0.0087	0.0151	0.0258**	0.0262***	0.0386**	0.0173	0.0106
	(0.98)	(1.50)	(2.58)	(2.84)	(2.14)	(0.87)	(0.29)
Gap * 65–70	0.0050	0.0136	0.0250**	0.0242**	0.0340*	0.0169	−0.0228
	(0.50)	(1.20)	(2.08)	(2.28)	(1.75)	(0.88)	(−0.62)
Gap * 70–5		0.0043	0.0153*	0.0148*	0.0310	0.0151	−0.0176
		(0.35)	(1.86)	(1.91)	(1.56)	(0.76)	(−0.46)
Gap * 75–80			0.0122	0.0117	0.0157	0.0126	0.0084
			(1.12)	(1.19)	(0.84)	(0.66)	(0.25)
Gap * 80–5				0.0080	0.0027	0.0015	0.0123
				(0.61)	(0.14)	(0.07)	(0.37)
Dummy 1975+		−1.1887***	−1.1889***	−1.2801***	−1.2484***	−1.4680***	−1.2351**
		(−3.91)	(−4.36)	(−4.83)	(−3.86)	(−3.76)	(−2.16)
Dummy 1980s			−0.0559	0.5243**			
			(−0.29)	(2.73)			
Socialist * 80s			−0.3569	−1.0522***			
			(−1.11)	(−3.38)			
(constant)	−4.4803**	−2.5870*	−1.7744*	−0.9258	0.0991	−2.0973*	−2.7391**
	(−2.25)	(−1.84)	(−1.76)	(−1.29)	(0.08)	(−1.98)	(−2.05)
N	120	144	168	192	128	64	56
F	5.88	30.31	75.15	49.17	11.64	20.90	16.77
R^2	0.32	0.54	0.69	0.70	0.55	0.84	0.83

Notes: As for tab. 2. Models I to IV are estimated with country-fixed effects and cluster-robust standard errors (clustered by country), *t*-statistics are reported in parentheses below the coefficients. Models V to VII cannot be estimated with cluster-robust standard errors as the number of clusters is insufficient.
Sources: For sources and methods used to compute values for the regression variables, see section II.

The coefficients on relative backwardness and the postwar output gap remain large and highly significant. That the interaction terms with the output gap become less significant as we shorten the time horizon simply reflects the fact that we move the reference period closer to the war, which makes the reconstruction effect more difficult to capture fully. The most important result is that the impact of socialism on the efficiency of investment becomes much larger and more significant as we extend the panel beyond 1975. During the golden age, eastern European economies achieved comparatively modest growth because of comparatively low levels, not the relatively poor efficiency, of investment. Investment allocation became much less efficient under central planning relative to western market economies during the 1970s and early 1980s. This finding accords with views about overinvestment in

Table 4. *Regressions explaining economic growth in 24 European countries
(sub-period analysis)*

	I	II	III	IV	V	VI	VII	VIII
	1950–5	*1955–60*	*1960–5*	*1965–70*	*1970–5*	*1975–80*	*1980–5*	*1985–9*
Backwardness	0.0076	0.0336*	0.0441**	0.0707***	0.0765***	0.0229	0.0123	−0.0248**
	(0.39)	(2.01)	(2.69)	(5.84)	(6.11)	(0.95)	(0.33)	(−2.38)
Rate of	0.1174*	0.0705	0.0227	0.0231	−0.0214	0.0602	0.0284	0.0321
investment	(1.95)	(1.51)	(1.24)	(0.70)	(−0.70)	(1.54)	(0.45)	(0.94)
Investment∗	−0.0123	0.0212	−0.0232	−0.0652***	−0.0804***	−0.0343**	−0.1135**	−0.0284***
socialist	(−0.30)	(0.70)	(−1.53)	(−3.38)	(−6.31)	(−2.74)	(−2.79)	(−4.33)
Education	0.0464	−0.3661	−0.2266	0.0949	0.1334	0.0152	0.0640	−0.0518
	(0.23)	(−0.83)	(−1.16)	(0.72)	(0.85)	(0.08)	(0.23)	(−0.30)
Gap	0.0623***	0.0256**	0.0165*	0.0114*	0.0096	0.0057	−0.0110	−0.0067*
	(4.10)	(2.81)	(1.82)	(1.92)	(1.14)	(0.70)	(−0.91)	(−1.80)
(constant)	1.5850	1.3816	1.8746**	3.3481***	1.6921*	0.2586	1.1562	1.6006
	(1.65)	(1.08)	(2.23)	(3.54)	(1.14)	(0.29)	(1.54)	(1.15)
N	24	24	24	24	24	24	24	24
F	5.34	4.21	5.67	11.54	13.93	2.91	4.70	6.48
R^2	0.52	0.48	0.55	0.71	0.77	0.23	0.56	0.60

Notes: The dependent variable is the annual average logarithmic growth rate of real GDP per capita; *t*-statistics reported in parentheses below the coefficients. The regressions are estimated with robust standard errors.
Sources: For sources and methods used to compute values for the regression variables, see section II.

outdated technologies in the late socialist period.[67] During the late 1980s, after investment levels in eastern Europe had plummeted, the presence of such waste was less significant. The results also show that the east–west divergence in relative growth performance after 1980 was not driven mainly by the differential impact of the oil shocks in the short run, but emerged because advanced market economies recovered much stronger from the mid-1980s than their socialist counterparts.

The sub-period analysis reported in table 4 confirms these results, even though it is important to be careful with conclusions drawn from cross-sectional regressions estimated with only 24 observations. We must treat the coefficients with caution particularly for the post-1975 period when the differential impact of the oil shocks must have correlated with unobserved country-specific factors. Three findings stand out. First, relative growth performance in the early postwar years was completely driven by reconstruction dynamics, which remained significant in the 1960s. Second, the relative inefficiency of investment in socialist economies became the primary source of their underperformance only from the late 1960s. Third, the (until then powerful) convergence process weakened even among western economies from the late 1970s, which has been documented in previous research.[68]

Returning to table 3, columns V to VII report the results from re-estimating the specification in column III of table 2 for different sub-samples of countries: western Europe (V), eastern Europe (VI), and the same excluding the GDR (VII). The last regression reveals that the reconstruction effect estimated for socialist countries is driven by the exceptionally large East German output gap in 1950. The two

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[67] See Allen, *Farm to factory*, pp. 198–202; Bergson, 'Comparative productivity', p. 355; van Ark, 'Convergence', pp. 233–4.
[68] Among others, see Timmer, Inklaar, O'Mahony, and van Ark, *Economic growth*, ch. 2, pp. 19–22; Vonyó, 'Post-war reconstruction', pp. 233–4.

regions of Europe do not significantly differ in the role of convergence controls, although there is some evidence suggesting that human capital was employed less efficiently under socialism. By contrast, after 1955, the reconstruction effect appears much larger in western than in eastern Europe, even if we include East Germany, where postwar recovery started from an unusually depressed level of output. The differential impact of the war-induced output gap on postwar growth rates was not only relatively weak east of the Iron Curtain, it was also much less persistent than in the west.

<p style="text-align:center">V</p>

Explanations of the growth retardation in eastern Europe during the 1980s are well established in contemporary and retrospective accounts. Analogous to the experience of developing regions, this was a period of deep structural crisis for planned economies. The oil shocks and the development of flexible production technology in advanced countries rendered their industries uncompetitive and generated large balance-of-trade deficits.[69] High interest rates introduced to combat inflation in western creditor nations increased the cost of refinancing the debt overhang from the 1970s. With limited export opportunities, the only way to avert crushing balance-of-payments crises was to limit imports and avoid additional borrowing, leading to austerity and the contraction of aggregate demand. This, in turn, depressed capacity utilization in manufacturing and investment in new equipment. The reports of the Research Project show that personal consumption stagnated or declined in all countries except Czechoslovakia from the late 1970s, whereas investment, particularly in the early 1980s, plummeted everywhere.[70] Poland was the first country to declare insolvency following the second oil shock before the avalanche of Latin American defaults began.[71] Romania would have followed shortly had its government not imposed brutal austerity. Countries that retained positive growth rates after 1980 were exceptions to this pattern. The USSR benefited from rising oil prices and thus could maintain high levels of investment. Czechoslovakia did not borrow extensively in the 1970s and, therefore, did not need to tighten the belts. Hungary would have had to, but it joined the International Monetary Fund in 1982, which improved its position as a debtor.[72]

   The low investment rates in eastern Europe during the 1950s and the early 1960s require a more nuanced explanation. Marxian and neoclassical growth theories all predict returns to investment to be the highest at the early stages of industrialization, when capital intensity is relatively low. The massive scale of wartime destruction and dislocation in eastern Europe should have raised potential returns to investment further in the reconstruction period. However, the results reported in the previous section suggest that reconstruction dynamics were relatively weak in socialist economies. This is a puzzle. Five of the eight eastern European countries had

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[69] See, on the topic, Broadberry and Klein, 'When and why', pp. 49–50.
[70] Alton et al., *Eastern Europe: domestic final uses* (1990, 1991).
[71] The 'lost decade' of Latin American growth has also been linked to poor investment in physical and human capital, which was the consequence of the debt overhang and the payments crises of the 1980s. Among others, see Ocampo, 'Latin America's growth', pp. 77–8; Astorga, 'Century', p. 239; Astorga, Bergés, and Fitzgerald, 'Productivity growth', pp. 215–16, 220.
[72] For a more detailed narrative, see Berend, *Central and eastern Europe*, p. 195 onwards.

grown by less than 1 per cent annually between 1938 and 1950, while only a quarter of western countries in the present sample fell into this category.

Theories about the role of labour supply can help solve this puzzle. As explained earlier, both Kaldor and Kindleberger saw labour-supply flexibility as the main driver of high investment and thereby fast growth in postwar Europe.[73] According to Jánossy, reconstruction growth was also conditional upon the size and the quality of the labour force. Without sufficient labour reserves, it was difficult to rebuild and reorganize war-shattered economies.[74] In western Europe, the Second World War was mostly a theatre of destruction and dislocation. Along the eastern front, it was pursued from the onset as a war of extermination, resulting in comparatively much larger population losses. Besides the colossal war casualties, both military and civilian, the Holocaust also had the most severe effect on eastern Europe, where the greatest part of European Jewry had lived before 1939. The expulsion of minority Germans from eastern and central European states (including the former eastern provinces of Germany ceded to Poland and the USSR) after 1945, in accordance with the Potsdam Agreement, aggravated an already catastrophic demographic shock.

While this last point featured prominently in the literature on the West German economy, it has been overlooked in the economic history of eastern Europe.[75] As a means of collective punishment for Nazi war crimes, approximately 15 million Germans were uprooted between 1944 and 1951 in eastern and central Europe: 1.7 million were deported to the Soviet Union and 13.3 million were forcefully re-settled to Germany and Austria. Of these expellees, almost two million were killed or went missing during the deportations. The largest German minorities lived in postwar Poland and Czechoslovakia which, as a result (also strongly affected by the Holocaust), saw their populations decline between 1939 and 1950. By contrast, the population of East Germany increased by 10 per cent over the same period, due solely to the influx of German expellees.[76]

Given the large variation across countries in population growth during the 1940s, the war and its aftermath had a lasting, albeit gradually diminishing, differential impact on labour-supply flexibility in postwar Europe. In several countries, strong labour-force growth after 1950 could only moderate the inherited labour shortage. Thus their potential for investment-led growth was limited during the reconstruction period. Bulgaria and the GDR represent exceptions, but only partly. The East German economy rebounded strongly after 1950, but the continued mass exodus of East German dissidents to West Germany until 1961 halted this revival.[77] The outflow of technical personnel was especially damaging. While the universities and polytechnics of the GDR actually trained more engineers proportional to population size than their West German counterparts, the share of engineers in the total population was substantially higher in West Germany by the late 1950s.[78] In Bulgaria, the emigration of ethnic Turks slowed down the growth of the labour force

[73] Kaldor, *Causes*; Kindleberger, *Europe's postwar growth*.
[74] Jánossy, *End of the economic miracle*, pp. 233–4.
[75] Among others, see Ambrosius, 'Der Beitrag'; Vonyó, 'Bombing'; Braun and Mahmoud, 'Employment effects'.
[76] Reichling, *Die deutschen Vertriebenen*, pp. 24–31.
[77] Between 1945 and 1961, 3.6 million people emigrated to West Germany and West Berlin, while less than half a million crossed the border in the opposite direction; Steinert, 'Die große Flucht', p. 570.
[78] Abelshauser, *Wirtschaftsgeschichte*, pp. 96–7.

that had expanded during the 1940s, as the country remained largely unscathed by the horrors of the war. By contrast, in the late 1980s, a renewed exodus considerably reduced the labour force.[79]

In principle, the negative impact of slow population growth or decline during the 1940s on postwar investment levels could have operated through different channels. First, with a relative glut of capital, war-shattered economies could grow into existing capacities for a long period after 1945. Surplus capital has been discussed mostly in connection with the East German economy, which was severely dislocated by the consequences of war and peace.[80] Temporarily, Czechoslovakia and Poland also had to face labour shortages following the expulsion of ethnic Germans from the Sudetenland and the erstwhile eastern provinces of Germany respectively. Second, slower or negative population growth also acted to depress consumer demand, and thus the need for investing in new production capacity, which was otherwise very high in the early postwar period, due to delayed consumption. However, in socialist economies, this could have even increased the rate of investment, as central planners could allocate fewer resources to satisfy the needs of households. Third, if the German minorities and the Jews were better educated than the ethnic majorities of eastern Europe, their expulsion and extermination may have negatively affected the quality, not only the size, of the labour force. This hypothesis is difficult to test empirically, but in any case recently published historical data on educational attainment do not support it.[81]

This leaves large surplus capital due to the scarcity and misallocation of labour as the most likely reason for the low investment rates that the countries most severely affected by the war and the postwar settlement recorded in the reconstruction phase. The opportunity to grow into existing capacities, in turn, explains why many socialist economies in eastern Europe could grow relatively quickly in periods during which they invested relatively small shares of their national income in productive capital.

VI

The falling behind of socialist economies in eastern Europe has inspired economists and historians alike and has featured prominently in the literature on comparative economic development. Much effort has been invested in defining the causes of this relative underperformance, with most interpretations arguing that it reflected the growing relative inefficiency of resource allocation under central planning. This article revisited socialist economic growth in a comparative framework that, overall, supports earlier research on the topic but also offers novel contributions. These include both revisions of and extensions to the previously available quantitative evidence, as well as new analytical insights.

A new dataset of revised investment rates in eastern Europe between 1950 and 1989, more comprehensive and more consistent than any existing and

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[79] The years 1950 and 1951 witnessed the historic peak in Turkish emigration from Bulgaria after a settlement agreed between the two countries in 1949; Mahon, 'Turkish minority', p. 155.

[80] See Ritschl and Vonyó, 'Roots of economic failure', pp. 174–81.

[81] See Barro and Lee, *Education matters*. Pre-1939 data include Bulgaria, Hungary, Poland, and Russia. In all four cases, average educational attainment increased significantly between 1940 and 1950. This result is confirmed for Hungary by Földvári and van Leeuwen, 'A magyar', p. 1003.

comparable source, reveals that investment levels in centrally planned economies were comparatively low in the early postwar period, increased substantially relative to national income until the late 1970s, and plummeted in most countries during the 1980s. Econometric results confirm that during the postwar golden age, eastern Europe was falling behind mainly because of relatively low levels of investment and weak reconstruction dynamics. Inefficient investment allocation only became instrumental in the further deterioration of the socialist growth record as it hindered structural modernization.

Eastern Europe had vast growth potential after 1950 given its relative backwardness and the scope for postwar reconstruction, but the ability of socialist economies to mobilize this potential was often limited by severe labour scarcity in the early postwar period. This, in turn, resulted from the comparatively much larger population losses suffered by eastern Europe during the Second World War and as a consequence of the postwar settlement. The revelation of these general patterns does not imply that we should ignore substantial differences between individual countries. While the growth performance of East Germany and Poland was particularly disappointing, Bulgaria and Yugoslavia belonged to the fastest-growing nations in Europe until the 1970s. While this article has hinted at some of these aspects, the role of country-specific conditions in socialist economic development merits further research.

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Appendix I: Regressions using alternative specifications for educational attainment (baseline table 2)

	I	II	III	IV	V	VI	VII
	Baseline	*Modified*	*Baseline*	*Modified*	*Attainment*	*Enrolment*	*Enrolment*
Backwardness	0.1139***	0.1150***	0.0769***	0.0778***	0.0750***	0.0732***	0.0762***
	(11.53)	(11.87)	(5.08)	(5.09)	(4.88)	(4.68)	(4.85)
Rate of investment	0.1140***	0.1167***	0.0977**	0.0995***	0.1180***	0.1201***	0.1142***
	(4.17)	(4.27)	(2.82)	(2.86)	(5.50)	(5.26)	(5.97)
Education[a]	0.0704	0.0582	0.0485	0.0489	0.0735	0.0036	0.0093
	(1.44)	(1.03)	(0.89)	(0.76)	(1.42)	(0.38)	(1.44)
Dummy 1975+			−1.1857***	−1.1913***	−1.2075***	−1.2090***	−1.1827***
			(−4.70)	(−4.79)	(−4.52)	(−4.50)	(−4.15)
Dummy 1980s			0.2823	0.2887	0.5596***	0.5364***	0.5590***
			(1.13)	(1.13)	(3.44)	(3.26)	(3.53)
(constant)	−2.7293***	−2.8129***	−0.9904	−1.0632	−1.4213	−1.3498	−1.4076*
	(−4.05)	(−4.13)	(−0.81)	(−0.86)	(−1.70)	(−1.54)	(−1.74)
N	192	192	192	192	160	160	160
F	60.40	63.55	36.58	40.37	28.64	32.57	34.06
R^2	0.55	0.55	0.60	0.60	0.59	0.59	0.60

Notes: The dependent variable is the logarithmic annual growth rate in real GDP per capita averaged over non-overlapping five-year periods. The superscripts *, **, and *** indicate significance at the 10, 5, and 1% levels respectively. The regressions are estimated with country-fixed effects and cluster-robust standard errors (clustered by country), *t*-statistics are reported in brackets below the coefficients.

[a]Baseline specifications (I, III): growth of educational attainment among the working population aged 15–64. Modified specifications (II, IV): growth of educational attainment in the cohort 25–64. (V): as in (III). (VI): percentage-point increase in secondary-school enrolment. (VII): lagged enrolment growth; that is, the same as in (VI) but over the previous decade. (V–VII): data only available for 20 out of 24 countries.

Sources: For sources and methods used to compute values for the regression variables, see section II.