Socialist Industrialisation or Post-War Reconstruction? Understanding Hungarian Economic Growth, 1949-1967[*]

Tamás Vonyó
University of Groningen

This article reviews the existing literature on Hungarian economic growth between the communist takeover in 1949 and the launching of the New Economic Mechanism in 1968. Based on data derived from independent western estimates, I challenge mainstream theories of socialist industrialisation and historical accounts and argue that, in the early post-war period, the growth of national income and industrial production was driven by a reconstruction dynamic. In a standard growth-accounting exercise, I compute growth rates of TFP for the economy as a whole and for industrial branches. In the process, I apply both official statistics and independent western data, and present new estimates on the gross value of capital stock in the Hungarian economy and on capital accumulation in industrial branches. Finally, shift-share analysis helps to determine the importance of structural shifts within industry in facilitating labour-productivity growth.

1. Introduction

The 1950s and 1960s are commonly referred to as the Golden Age of economic growth for western industrialised nations. Neither before nor since have world production and international trade expanded so rapidly

* The following abbreviations will be applied in footnotes: AER=American Economic Review, EREH=European Review of Economic History, JEcH=Journal of Economic History, JME=Journal of Monetary Economics, KSH=Central Statistical Office, KS=Közgazdasági Szemle, QJE=Quarterly Journal of Economics. In references, the place of publication is only indicated when it is not Budapest. Full bibliographical details are listed at the end of the paper, including translations for Hungarian titles.

and for so long without a major recession. The countries of Eastern Europe also enjoyed an era of unprecedented economic success following their transition to state socialism and central planning.[1] Hungary was no exception to this pattern. From the communist takeover in 1949 to the late 1960s, even according to independent western estimates, national income grew faster than ever before, and the share of industry in total employment increased from 20% to almost 34%.[2] Economic growth was particularly rapid until 1951, but remained on a high plateau for over a decade, and only started to lose momentum after 1967, when the Hungarian government began to relax authoritarian controls and launched a pioneering reform programme oriented towards market socialism.

Contemporary accounts offered alternative explanations for this commendable growth performance, but all agreed that public ownership of the means of production, combined with central planning, provided an effective mechanism for rapid industrialisation. In this paper, I will argue that traditional interpretations misread the development of the Hungarian economy during the first two decades of state socialism. Official data on national income and capital formation were hugely inflated, while the economists of the day had little detailed knowledge on wartime expansion and restructuring. Therefore, they did not recognise the historical continuities that socialist industrialisation disguised. Contemporaries were also unable to foresee that the post-war Golden Age represented a unique era of economic expansion, which would come to an inevitable end. In my view, it constituted an extended period of post-war reconstruction, during which the Hungarian economy recovered to its long-run productive potential and, therefore, the subsequent growth deceleration was unavoidable.

This argument has two important implications. First, state socialism was not exceptionally effective in facilitating industrialisation in a

[1] I.T. Berend, *Central and Eastern Europe 1944-1993: Detour from the Periphery to the Periphery*, (Cambridge 1997), pp. 182-186.
[2] Own calculations based on data from L. Czirják, *Hungarian GNP by Sectors of Origin of Product and End Uses, 1938 and 1946-1967*, (New York 1973), p. 30, and A. Maddison, *The World Economy,* (Paris 2006), Vol. II: *Historical Statistics*, pp. 478-479.

relatively backward economy. Second, the post-1967 reforms cannot be justified on the ground of diminishing growth rates of national income and joint factor productivity – contrary to what Hungarian and western literature has claimed.

From the 1970s onward, the focus of international research on the Hungarian economy has turned to the reform process launched in 1968 that marked the dawning of a new era in socialist development. While a vast literature has been produced on the New Economic Mechanism and its ultimate failure to eliminate the intrinsic inconsistencies of the shortage economy, the expansion of the 1950s and the 1960s has been undeservedly neglected.[3] As a consequence, previously inaccessible western statistical sources have not found their way to Hungarian economists, nor have economic historians attempted to reinvestigate traditional interpretations on socialist industrialisation by the use of more sophisticated quantitative analytical methods. These are the shortcomings I intend to correct in this paper.

In Section 2, I review the existing literature with its contemporary theoretical and statistical foundations. Section 3 outlines the growth-accounting framework used to test the main alternative interpretations. In Section 4, I discuss data available to us at present on GDP and factor inputs, and I report new estimates on capital accumulation. Section 5 demonstrates that economic growth in the period 1949-67 reflected a gradual convergence to the country's human-capital-determined long-run productive potential. The productivity malaise of the 1970s and 1980s was, in turn, the outcome of the misallocation of investment between physical and human capital, leading to over-accumulation of

[3] The most important international publications are B. Balassa, 'The economic reform in Hungary', *Economica*, New Series, 37.145 (1970), pp. 1-22; T. Nagy, 'The Hungarian economic reform: past and future', *AER*, 61.2 (1971), pp. 430-435; R.D. Portes, 'Economic reforms in Hungary', *AER*, 60.2 (1971), pp. 307-313; P.J. Hare and P.T. Wanless, 'Polish and Hungarian economic reforms: a comparison', *Soviet Studies*, 33.4 (1981), pp. 491-517; and J. Kornai, 'The Hungarian reform process: visions, hopes and reality', *Journal of Economic Literature*, 24.4 (1986), pp. 1687-1737. The last growth-accounting paper on early post-war Hungary was B. Balassa and T.J. Bertrand, 'Growth performance of Eastern European economies and comparable Western European countries', *AER*, 60.2 (1970), pp. 314-320, and the authors accounted for manufacturing only.

and sharply diminishing returns to the former. In Section 6, I analyse the dynamics of industrial expansion at a disaggregated level with 18 sectors. I show that, in the early 1950s, rapid productivity growth stemmed from improved capacity utilisation, which produced sharply increasing returns to capital. Finally, I recapitulate on my findings and draw attention to the theoretical implications.

2. Literature review and contemporary evidence

Hungarian economists at the time regarded their country's commendable growth record as evidence for the success of the socialist road to industrialisation, paved by accelerated capital accumulation and the preferential treatment of heavy industry in investment allocations. They followed the Marxian concept of extended reproduction, according to which positive net investment is essential for economic growth, and is only conceivable with a sufficiently high proportion of output generated in the production-goods sector. Assuming a long enough time horizon and a closed economy, the rate of growth is the function of the share of national product concentrated in the industries that produce the means of production.

This theory was formalised by Soviet economists. According to Feldman, the growth of output in a closed economy is constrained by the available capacities to produce capital goods. The greater the proportion of the latter reinvested into existing production capacities, the faster subsequent growth is going to be.[4] Additionally, Preobrazhensky argued that the more economically backward a country, the more dominant the role of the state is in accumulating and allocating resources for investment in the face of insufficient domestic savings and liquid capital markets.[5] Therefore, nationalisation of finance and industry and

[4] G.A. Feldman, "On the Theory of Growth Rates of National Income", in N. Spulber (ed.), *Foundations of the Soviet Strategy of Economic Growth*: Selected Essays, 1924-1930, (Bloomington, IN 1964), p. 312.
[5] E.A. Preobrazhensky, "On Primary Socialist Accumulation", in N. Spulber (ed.), *op. cit.* (1964), p. 235.

the introduction of central planning were believed to provide for a more effective coordinating mechanism than free markets in countries willing to catch up.

Although the above notions were advocated by Marxists, they were also echoed by prominent western scholars. According to Rostow, a sudden spurt in the investment rate is a necessary precondition for modern economic growth.[6] Gerschenkron justified the need for state intervention in relatively backward countries to provide for what he called 'substitutes for lacking prerequisites'.[7] More recently, De Long and Summers have found a strong and statistically significant association between the rate of equipment investment and economic growth.[8] The work of Allen on Stalinist industrialisation in the USSR confirmed the effectiveness of centralised resource allocation in favour of heavy industry with the joint application of output – rather than profit – maximisation and soft budget constraints.[9] He has built on an extended version of the Feldnam model, developed by Nurkse, which postulates that capital accumulation in underdeveloped countries generates rapid growth by facilitating the reallocation of inefficiently employed workers from agriculture to industry. High rates of growth can be sustained as long as the labour surplus is not absorbed.[10]

Official Hungarian statistics offered ample evidence to support this view. In 1938, only 7% of national income was invested in fixed capital. During the first half of the 1950s the investment rate averaged 22%, dropped to 19% between 1956 and 1961, and was propelled to a record 27% in the period 1961-67.[11] The share of industrial projects in all productive

[6] W.W. Rostow, *The Stages of Economic Growth*: *A Non-Communist Manifesto*, (Cambridge 1960).
[7] A. Gerschenkron, *Economic Backwardness in Historical Perspective*, (London 1962).
[8] J.B. De Long and L.H. Summers, 'Equipment investment and economic growth', *QJE*, 106.2 (1991), pp. 445-502.
[9] R.C. Allen, 'Capital accumulation, the soft budget constraint and Soviet industrialisation', *EREH*, 2.1 (1998), 1-24. *Idem*, *Farm to Factory: A Reinterpretation of the Soviet Industrial Revolution*, (Princeton 2003).
[10] R. Nurkse, *Problems of Capital Formation in Underdeveloped Countries*, (Oxford 1953).
[11] F. Nyitrai, *A magyar ipar fejlődése és távlatai*, (1971), p. 97.

investment never fell below 34% and, within the secondary sector, over 80% of all allocations went to heavy industry, above all coal mining, metallurgy, and machine building.[12] The concentration of investment in the high value-added sectors of the economy was also assumed to have made a strong contribution to labour-productivity growth.[13] Finally, in line with the strategy of primitive socialist accumulation, increased capital formation was financed predominantly through unequal exchange between agriculture and industry and through the depression of private purchasing power by means of centrally-fixed wages and prices.

More modern theories of socialist industrialisation also realised that it could not sustain extraordinary levels of economic growth for ever. As capital deepening and structural change in favour of the manufacturing sector were driving aggregate productivity growth, the further industrialisation progressed, the slower the growth the economy was subsequently expected to achieve. In 1967, the contribution of Hungarian industry to net material product at factor cost reached 45%, which was unlikely to increase further.[14] Horvat recognised that the marginal productivity of investment is a diminishing function of the investment rate. Each economy has a maximum absorptive capacity that is determined by the available stock of complementary factors of production – labour in particular.[15] This argument is in line with the standard neoclassical growth model, which shows that, in the absence of technological change, a persistent increase in the capital-labour ratio inevitably runs into diminishing returns.[16]

At first glance, these models appear to offer a powerful explanation not only for the rapid growth of the Hungarian economy during the

[12] I.T. Berend and T. Csató, *Evolution of the Hungarian Economy, 1848-1998*, (New York 2001), pp. 324-325.
[13] A. Berei, 'Negyedszázados népgazdasági növekedésünk fő tényezői', *Társadalmi Szemle*, 20.4 (1970), p. 63.
[14] I.T. Berend, *A szocialista gazdaság fejlődése Magyarországon, 1945-1968*, (1974), p. 125.
[15] B. Horvat, *Towards a Theory of a Planned Economy*, (Belgrade 1964).
[16] R.M. Solow, 'A contribution to the theory of economic growth', *QJE*, 70.1 (1956), pp. 72-73.

pre-1968 period, but also for the sharp slowdown that followed. The unsatisfactory growth performance of socialist countries in the 1970s and 1980s has often been blamed on the neglect of technological progress and the inefficiency of investment. According to Kalecki, the long construction periods required to launch large-scale plants in the face of recurrent material shortages entailed a persistently growing technological lag *vis-à-vis* more advanced nations. Furthermore, it accounted for the high share of uncompleted projects, which in turn depressed capital productivity.[17] Kornai argued that, in a shortage economy, industrial enterprises with soft budget constraints were interested in maximising their investment and input allocations regardless of the potential returns on them, which made production increasingly capital and resource intensive.[18] Finally, technological progress was hampered by the extensive nature of socialist industrialisation, which devoted excessive resources to new plant and, consequently, left little for the acquisition of new machinery and for essential repairs. It only made conditions for technical modernisation worse that the Hungarian government spent a mere 3% of its R&D expenditure on foreign licences, as opposed to over 10% achieved even in other socialist countries.[19] Thus, as the economy approached the limits of extensive growth, it appeared to be increasingly difficult to maintain previous rates of growth in output and productivity.

The most important alternative to mainstream Marxist theory at the time was an inspiring model developed by Jánossy, who argued that all post-war economic miracles were reconstruction periods. The reconstruction thesis, as it is referred to in the western literature, rests on the assumption that, over the long run, the productive potential of an economy is determined by the size and qualification structure of the labour force. In the short run, in line with Feldman, actual output

[17] M. Kalecki, *Socialism: Economic Growth and Efficiency of Investment*, (Oxford 1993).
[18] J. Kornai, *The Socialist System: The Political Economy of Communism*, (Oxford 1992), pp. 140-145.
[19] I.T. Berend, *op. cit.*, (1974), pp. 140-144.

is limited by the workplace structure of the economy, i.e. the capital stock and its technological composition. In crisis-free economic development, the complementary factors of production tend to accumulate in harmony, so that the employment structure of the economy corresponds to the qualification structure of the labour force. However, in the aftermath of a war or a major depression, a large gap can open up between actual and potential output, due to a distortion in factor proportions. This phenomenon is termed 'structural incongruence' and is assumed to result from the depletion of physical capital, especially machinery, as an outcome of wartime destruction and/or depressed investment activity.[20]

In the reconstruction thesis, structural incongruence constitutes a unique growth potential. Due to the temporarily depressed ratio of capital to skilled labour, the marginal productivity of physical capital is very high and, therefore, reconstruction growth is driven by exceptional rates of investment. In other words, during a reconstruction period, there are no human-resource constraints on capital accumulation. When the economy recovers to its long-run productive potential, further expansion must solely depend upon the size and qualification structure of the labour force, since the complementary workplace structure of the economy can no longer develop faster. Technically speaking, the slope of a country's long-run growth path is determined by the rate of accumulation in labour qualifications and is thus unaffected by the investment rate – contrary to Marxian dogma.

The reconstruction thesis has been brought into the economic history literature as a revisionist reinterpretation of the West German *Wirtschaftswunder*.[21] More recently, cliometric investigations highlighted

[20] F. Jánossy, *The End of the Economic Miracle: Appearance and Reality in Economic Development*, (New York 1969), pp. 233-234.

[21] M. Manz, *Stagnation und Aufschwung in der französischen Besatzungszone von 1945 bis 1948*, Doctoral dissertation, (Mannheim 1968); W. Abelshauser, *Wirtschaft in Westdeutschland 1945-1948: Rekonstruktion und Wachstumsbedingungen in der amerikanischen und britischen Zone*, (Stuttgart 1975); *Idem*, *Wirtschaftsgeschichte der Bundesrepublik Deutschland 1945-1980*, (Frankfurt 1983); K. Borchardt, *Perspectives on Modern German Economic History and Policy*, (Cambridge 1991).

the central role of post-war reconstruction in the Golden Age of economic growth.[22] The first, and theoretically still most grounded, academic debate on Jánossy's work, however, has taken place within the realms of the Hungarian economics profession, which not surprisingly reacted with vociferous criticism to a theory quite at odds with Marxist orthodoxy. Román pointed to the absence of mathematical derivations and statistical-empirical proofs in the model, while Molnár restated the mainstream view that economic growth in the long run cannot be independent of the investment rate.[23] The most constructive comments came from Erdős, who accepted that labour qualifications impose constraints on capital formation and technological progress, but also emphasised the impact of the latter on the accumulation of working skills and technical know-how in the first place.[24]

This learning-by-doing approach may seem compelling in theory, but it did not have much relevance to Hungarian economic growth in a period marked by sluggish technical progress even in comparison with other socialist countries. Until the mid-1960s, machinery imports also constituted a miniscule share of equipment investment, implying that embodied technical change is unlikely to have improved working skills. Moreover, the effective application of new production techniques is unfeasible without appropriate labour qualifications, which has often been a crucial problem for underdeveloped economies. This argument has later been accepted by Erdős himself and was echoed by

[22] R. Dumke, 'Reassessing the *Wirtschaftswunder*: reconstruction and postwar growth in West Germany in an international context', *Oxford Bulletin of Economics and Statistics*, 52.2 (1990), pp. 451-491; C.H. Wolf, "Post-War Germany in the European Context: Domestic and External Determinants of Growth", in B. Eichengreen (ed.), *Europe's Post-War Recovery*, (Cambridge 1995), pp. 323-352; T. Vonyó, 'Post-war reconstruction and the Golden Age of economic growth', *EREH*, 12.2 (2008), pp. 221-241; B. Eichengreen and A.O. Ritschl, 'Understanding West German economic growth in the 1950s', *Cliometrica*, 3.3 (2009), pp. 191-219.

[23] Z. Román, 'A trendvonalak csodája?: Néhány megjegyzés Jánossy Ferenc könyvéhez', *KS*, 14.3 (1967), pp. 349-360; F. Molnár 'Munkaerő versus beruházás? Néhány ellenvetés Jánossy Ferenc növekedéselméletével szemben', *KS*, 14.7-8 (1967), pp. 927-937.

[24] T. Erdős, 'A "gazdasági csoda" és a helyreállítási periódusok', *KS*, 14.1 (1967), pp. 97-107.

Abramovitz, who claimed that a country's capacity to catch up is conditional upon its "social capabilities".[25]

Although Jánossy has developed his thesis in isolation from western influences, there are strong parallels. Economists at the time already stressed the importance of improvements in labour qualifications for increased productivity.[26] Arrow argued that technical innovation and technological adaptation firmly depend upon the expansion and 'qualitative increase' of the labour force.[27] However, the reconstruction thesis can also be linked to new growth theory. Human-capital models built on learning-by-doing predict growth rates to differ across countries according to their rates of human-capital accumulation, while production patterns are determined by comparative advantages based on country-specific human-capital endowments.[28] The Jánossy model fits particularly well into an augmented Solow framework, which includes human capital that is exogenously determined but country-specific. It suggests that increased investment in education can raise the economy's long-run capacity for growth.[29]

This prediction, in particular, was central to the view Jánossy developed on Hungary's post-war growth performance. As economic expansion slowed down after 1951 and official statistics indicated that national income significantly surpassed its pre-war peak, the trend growth rate achieved during the period 1952-64 was assumed to represent the slope of a new long-run growth path. Jánossy argued that socialist ownership of the means of production and central planning granted the Hungarian economy a growth potential vastly superior to its historical performance. State intervention was said to have allowed

[25] T. Erdős, *A termelés korszerűsödése és a gazdasági növekedés*, (1974), p. 140; M. Abramovitz, 'Catching up, forging ahead and falling behind', *JEcH*, 46.2 (1986), p. 390.
[26] T.W. Schulz, 'Investment in human capital', *AER*, 51.1 (1961), pp. 1-17.
[27] K. Arrow, 'The economic implications of learning by doing', *The Review of Economic Studies*, 29.3 (1962), p. 156.
[28] R.E. Lucas Jr., 'On the mechanics of economic development', *JME*, 22.1 (1988), p. 33.
[29] G.N. Mankiw *et al.*, 'A contribution to the empirics of growth', *QJE*, 107.2 (1992), pp. 407-437. For a detailed discussion see T. Tarján, 'Jánossy elmélete az új növekedési elmélet tükrében', *KS*, 47.4 (2000), pp. 457-472.

for the accelerated accumulation of labour qualifications, and hence the absorptive capacity of the economy was able to expand at a higher rate. Furthermore, centralised resource allocation made it possible to cover the investment needs of faster growth in the long run.[30] In a way, Marxist interpretations and Jánossy offered strikingly similar explanations for the growth of the Hungarian economy until the mid-1960s. Although from different angles, both underlined the superiority of state socialism over the free market in their capacity to facilitate sustained growth. In particular, they were in accord over the notion that the long time-horizons applied by central planners enabled socialist countries to allocate substantial resources to investment in human capital, deemed unproductive under short-term profit considerations.

There is of no doubt that post-war Hungary saw an unprecedented expansion in public education and vocational training. Until the late 1930s, educational attainment did not even reach levels comparable with those recorded in Western Europe during the last third of the nineteenth century. In 1930, 78% of the labour force had less than 6 years of elementary schooling and only 3% completed secondary education.[31] After 1949, the introduction of the eight-year compulsory primary school and the increased weight assigned to natural sciences in the curriculum were the most pronounced improvements. The average number of pupils per classroom and teaching personnel declined significantly, allowing for substantial improvement in the quality of teaching as well. Secondary enrolment also increased from 11% prior to the war to one-third by the late 1960s.[32] Vocational schools showed the most vigorous expansion, with enrolment increasing by a factor of ten between 1938 and 1967. In higher education, the number of students almost quadrupled in the period 1946-66, and the share of those reading for natural science and engineering degrees increased sharply.[33]

[30] F. Jánossy, *op. cit.*, (1969), pp. 76-80.
[31] I.T. Berend, 'A termelőerők fejlődése: növekedés és struktúraváltozás Magyarországon a szocialista átalakulás negyedszázadában', *Századok*, 104.4 (1970), p. 829.
[32] I. T. Berend, *op. cit.*, (1974), pp. 119-120.
[33] KSH, *Művelődésstatisztikai Adattár*, (1968), p. 53, 161.

3. The analytical framework

The explanatory power of alternative interpretations on socialist industrialisation in post-war Hungary can be tested in a standard growth-accounting framework. It models the economy by the Cobb-Douglas production function applied in the neoclassical growth model.[34]

$$Y_t = A_t(K_t)^{\alpha}(L_t)^{1-\alpha} \quad \textbf{[1]}$$

Output (Y) at a given time (t) is determined as a function of the available capital stock (K_t), the size of the labour input (L_t) and Total Factor Productivity (A_t), which reflects the level of technological progress and the overall efficiency of factor use. The coefficients α and 1-α represent the elasticities of output with respect to capital and labour. In a dynamic framework, output growth can arise only from the expansion of factor inputs or the growth of TFP, which accounts for technological change and improvements in the efficiency of factor utilisation.

$$\Delta \ln Y = \alpha\Delta \ln K + (1-\alpha)\Delta \ln L + \Delta \ln A \quad \textbf{[2]}$$

The terms α and 1-α stand for the respective shares of capital and labour in national income, while TFP growth represents the growth-accounting residual. Equation (2) can be rewritten in a way to express this residual as the proportion of labour-productivity growth unexplained by capital deepening, i.e. the increase in the capital-labour ratio.

$$\Delta \ln A = \ln (Y / L) - \alpha [\Delta \ln (K / L)] \quad \textbf{[3]}$$

As long as α is smaller than 1, the model predicts diminishing returns to capital, if other factors are held constant. This is perfectly

[34] See R.E. Solow, 'Technical change and the aggregate production function', *Review of Economics and Statistics*, 39.3 (1957), pp. 312-313.

in line with the mainstream interpretation of rapid growth under socialist industrialisation, which states that investment-driven expansion is set to slow down as the economy approaches its absorptive capacity. As surplus labour is being mobilised through accelerated capital accumulation in heavy industry, at constantly increasing levels of capital intensity, capital productivity is gradually declining. Furthermore, as existing labour reserves are increasingly better utilised and as high-productivity sectors enhance their share in national income, the growth of TFP is also bound to slow down, except if there is an exogenous surge in technological progress. This implies that, at a constant rate of net capital formation, we would also expect to observe a gradual deceleration in the growth of national income.

The reconstruction thesis, as discussed in the previous section, is based on different assumptions. As long as optimal factor proportions are not restored in the economy, i.e. until production is not reorganised to match the qualification structure of the labour force, the accumulation of physical capital does not run into diminishing returns. This means that, at a constant rate of net capital formation, we would expect to observe no slowdown in the growth of either national income or TFP. Furthermore, a reconstruction dynamic does not need to rest *per se* on the reallocation of labour from agriculture to industry, since wartime dislocation may induce a mismatch between complementary factors of production in several sectors of the economy at the same time. Jánossy clearly distinguished between two subsequent phases of post-war reconstruction. As long as the infrastructural bottlenecks to efficient factor allocation are not eliminated, output can expand within the constraints of already available production capacities. In the actual reconstruction period that follows, growth is driven by capital deepening.[35] Thus, in the early phase of post-war recovery, we even expect to observe increasing returns to capital, which reflect improvements in capacity utilisation.

Once post-war reconstruction is completed, the economy returns to its long-run growth path. This implies that capital productivity

[35] F. Jánossy, *op. cit.*, (1969), p. 18.

plummets, if the rate of capital deepening remains higher than the rate of growth in human capital per worker. This leads to a similarly sudden fall in TFP. Therefore, the Jánossy model predicts an abrupt, instead of a gradual, slowdown in the growth of national income. The continued deterioration of the productivity performance of the Hungarian economy in the 1980s can only be explained within this framework by two factors: (1) an exogenous decline in the long-run growth rate, which in turn depends upon the rate of accumulation in human capital, or (2) the underutilisation of the available human resource endowments.

To test these assumptions, we need a growth-accounting framework that includes human capital as a labour-augmenting factor, i.e. which adjusts for changes in the quality of labour input. This was first achieved by Dennison, who developed an explicit measurement for the contribution of labour quality through the effect of education on earnings.[36] Following his approach, Hall and Jones specified a production function that includes human-capital augmented labour (H_t), which in turn is the product of total labour input (L_t) and the stock of human-capital per unit of effective labour, i.e. the standard skill level.[37]

$$Y_t = A_t (K_t)^{\alpha} (H)^{1-\alpha} \qquad \textbf{[4]}$$

The latter is determined as a function of the average number of years spent in formal education by the working age population. On the basis of empirical evidence, Hall and Jones assumed the effect of educational attainment on labour productivity, i.e. $\Phi(E)$, to be piecewise linear. This means that, for example at the lower secondary school level, one additional year spent in formal education enhances value-added per worker by approximately 10%.

$$H_t = e^{(\varnothing)Et} L_t \qquad \textbf{[5]}$$

[36] E.F. Denison, *The Sources of Economic Growth in the United States and the Alternatives before Us*, (New York 1962).
[37] R.I. Hall and C.I. Jones, 'Why do some countries produce so much more output per worker than others?', *QJE*, 114.1 (1999), pp. 87-89.

Following the standard approach, the growth of TFP can be expressed as the proportion of labour-productivity growth unexplained by capital deepening and skill intensification.

$$\Delta \ln A = \Delta \ln (Y/L) - \alpha[\Delta \ln (K/L)] - (1-\alpha)[\Delta \ln (H/L)] \qquad \textbf{[6]}$$

By estimating this equation, we get a smaller residual than in the neoclassical model, which leaves returns to human capital included in TFP. By comparing the respective rates of capital deepening and skill intensification, we can measure how the employment structure of the economy developed in relation to the qualification structure of the labour force, which, according to Jánossy, need to be compatible in the long run.

4. Data on output and factor accumulation

The reinvestigation of Hungarian economic growth in the period of socialist industrialisation within a growth-accounting framework requires reliable data on national income and factor inputs. Official statistics were distorted to a large but non-quantifiable extent through several factors. Whereas physical output series are considered comparatively trustworthy, aggregates expressed in value terms were distorted by unrealistic producer prices, incorrect weighting inasmuch as industry was always attributed a higher than actual share in net material product, and inappropriate methods employed in the computation of index numbers.[38] Estimates for the 1950s were especially poor because the Politburo frequently required an upward correction of figures to support official propaganda. However, despite mounting criticism in subsequent years', state statisticians have not revised their calculations ever since.[39]

[38] A. Bródy, 'Gazdaságunk az ezredfordulón: Előrejelzés az 1992-2004 évekre', *KS*, 39.10 (1992), p. 956.
[39] *Idem*, 'A GDP mérése proxyk segítségével', *KS*, 41.11 (1994), pp. 962-963.

Thankfully, independent western research on Hungarian economic growth established alternative national income series of superior quality.[40] They relied on physical output indicators published in official sources, computed index numbers by extrapolation from an independently constructed benchmark for 1955, and consistently applied western national accounting standards. On GNP, we now have access to territorially-adjusted data covering the entire twentieth century with relatively few missing years.[41] Border changes were of particular significance. National income estimates for pre-1920 Hungary cannot be directly applied to the analysis of subsequent periods as the Treaty of Trianon deprived the country of more than two thirds of its territory and over one half of its population.[42]

For 1938 and 1946-67, index numbers are available on GNP according to sectors of origin of product and end uses, and on factor inputs and industrial production at a disaggregated level.[43] These detailed accounts, compiled under the Research Project on National Income in East Central Europe at the Riverside Research Institute in New York, are especially valuable because they have remained largely unknown to Hungarian academia until the present day. Contemporary economists also made little use of existing data on the pre-1945 period[44]. Even the single attempt to link them with official figures for the post-

[40] T.P. Alton *et al.*, *Hungarian National Income and Product in 1955*, (New York 1963); L. Czirják, *op. cit.,* (1973); T.P. Alton, *Selected Charts of Economic Performance in Eastern Europe,* (New York 1990).
[41] A. Maddison, *op. cit.*, (2006), pp. 474-479.
[42] For estimates on Hungarian national income in the period 1870-1914, see M.S Schulze, 'Patterns of growth and stagnation in the late nineteenth century Habsburg economy', *EREH*, 4.3 (2000), p. 338. Maddison also relied on this source, but for the years after 1900 used data from A. Eckstein, "National Income and Capital Formation in Hungary, 1900-1950", in S. Kuznets (ed.), *Income and Wealth Series*, vol. V., (London 1955), pp. 152-223, instead, which reported figures for post-1920 Hungarian territory.
[43] L. Czirják, *op. cit.*, (1973); *Idem*, *Hungarian Industrial Development as Revealed by Production Indexes, 1938 and 1946-1960*, (New York 1965); *Idem*, *Indexes of Hungarian Industrial Production, 1938 and 1945-65*, (New York 1968b); F. Bandor *et al.*, *Hungary: Extension of Growth Indexes to 1967*, (New York 1970).
[44] M. Matolcsy and I. Varga, *The National Income of Hungary, 1924/25–1934/35*, (London 1938); A. Eckstein, *op. cit.*, (1955).

war years was blurred by inappropriate price adjustments and the neglect of differences in national accounting standards.[45]

After 1968, official data on all important economic indicators were greatly improved in both qualitative and quantitative terms: a fact widely acknowledged by western scholars as well. Finally, in a recent contribution, Földvári and Van Leeuwen constructed a series with annual estimates on the average number of years spent in formal education by the adult population between 1920 and 2006.[46] This is the most commonly used proxy for the stock of human-capital per member of the labour force, and it is specifically applied in the model of Hall and Jones, as discussed in the previous section.

The one variable for which we have no reliable estimates for the years up to 1967 is the stock of fixed capital. The only existing series that covers this period was constructed on the basis of official investment data.[47] In a shortage economy, investment reports are consistently exaggerated by enterprise managers, in order to maximise future allocations. Inflated investment figures, in turn, yield excessively high rates of accumulation in fixed capital, and thus also overestimate the rate of capital deepening. In other studies, Czirják computed index numbers on investment in both machinery and buildings for the total economy, following an approach that relied on physical output indicators exclusively.[48] Based on the rightful assumption that, under central planning, public enterprises tend to maximise their investment allocations, actual investment must be determined by the availability of capital goods. Czirják used growth rates of output in construction materials and several metal-processing industries as proxies for the growth of investment in structures and equipment respectively, adjusting

[45] A. Bródy, 'Gazdasági növekedésünk üteme 1924-től 1965-ig', KSZ, 14.4 (1967), pp. 417-431.

[46] P. Földvári and B. Van Leeuwen, 'A Magyar lakosság átlagos iskolázottságának becslése, 1920-2006', *Statisztikai Szemle*, 86.10-11 (2008), pp. 995-1005.

[47] L. Czirják, *op. cit.*, (1973), p. 30.

[48] *Idem*, *Hungarian Investment, 1938 and 1949-1965: Trends in Fixed Capital, Inventories and Net Foreign Investment*, (New York 1968a), pp. 8-14; F. Bandor *et al.*, *op. cit.*, (1970), pp. 46-48.

for net machinery imports. Machine tools available for instalment were listed in 1958 prices, and relative weights for structures and equipment in gross investment were computed for 1955. Therefore, I first converted the original index numbers into actual values at 1958 prices.

To support the economic reforms of 1968, the Central Statistical Office undertook a comprehensive revaluation of the capital stock held by state enterprises and cooperatives on 1 January 1968.[49] Subsequently published official data on fixed capital are reported in 1968 prices.[50] I converted the 1968 capital stock into 1958 prices by using the price index for machinery items constructed by Czirják and official data on construction expressed both at current prices and in volume indexes.[51] With the investment data derived from the index numbers of Czirják, I determined the value of fixed capital for years prior to 1968 by backward projection with the above formula, which is based on the perpetual inventory method.

$$K_t = K_{t+1} - I_t + A_t \qquad \textbf{[7]}$$

The subscript t denotes the year for which the capital stock (K) is calculated, whereas I_t stands for investment in fixed capital and (At) for capital retirement in the same year. The latter is, in turn, the product of the retirement rate (a) and the capital stock in the particular year. In the absence of trustworthy data on capital retirement, I assumed constant retirement rates of 2% and 4% for structures and equipment respectively, which have been used in the historical growth-accounting literature for economies at a similar level of technological development.[52]

$$K_t = K_{t+1} - I_t + aK_t \qquad \textbf{[8]}$$

[49] KSH, *A vállalatok és szövetkezetek újraértékelt állóeszköz-állománya*, (1970).
[50] KSH, *Beruházási Adattár 1950-1977*, (1979), p. 21.
[51] L. Czirják, *op. cit.*, (1968a), p. 7; F. Bandor *et al.*, *op. cit.*, (1970), p. 45; KSH, *Statisztikai Évkönyv*, (1964), p. 37; *Ibid*, (1970), p. 67, 74.
[52] See R. Krengel, *Anlagevermögen, Produktion und Beschäftigung der Industrie im Gebiet der Bundesrepublik von 1924 bis 1956*, (Berlin 1958).

The results summarised in *Table 1* constitute the best currently available estimates on gross investment and the stock of fixed capital in the Hungarian economy between 1949 and 1967. Therefore, they provide a valuable source for further research on the subject. I report significantly more modest growth in investment and, as a consequence, slower capital accumulation than official sources and western estimates built on them.

More moderate rates of net capital formation also imply higher returns on capital, as I will demonstrate in Section 5. However, the downscaling of public investment in 1954 and the impact of the revolution in 1956 remain discernible from my figures. From 1957 onward, my estimates present a smooth accumulation process with practically stable shares for structures and equipment. In the period as a whole, net capital formation was somewhat faster in machinery, which clearly fails to substantiate the consensus view among Hungarian historians that excessive resources were wasted on new plant and, therefore, insufficient means were allocated for equipment investment.

Figure 1 compares official series with my estimates for investment in equipment (E) and structures (S) separately. The diagram demonstrates that most of the distortion in official data was due to the inexplicable jump in machinery investment of over 150% between 1957 and 1958, which the metal-processing industries did certainly not facilitate. To a lesser extent, growth in investment after 1961 also appears to be exaggerated. By contrast, state statisticians underestimated the fluctuations of the early 1950s, especially growth up to 1952. The alternative figures are much closer to one another for structures, although my estimates yield a smoother curve than the official series. Furthermore, the growth of building activity seems to be slightly overstated by existing sources for the late 1950s and the mid-1960s.

As shown in *Table 2,* more moderate growth rates in investment yield significantly slower accumulation in fixed capital than Czirják managed to demonstrate on the basis of official data, especially for the 1960s. This finding, in turn, implies that capital deepening was not as fast after the 1956 revolution as it was traditionally assumed.

Finally, to apply growth-accounting to investigate Hungarian growth performance in the early post-war period, we need to determine relative factor shares. These are commonly computed on the basis of factor costs, since the neoclassical model assumes that factors are paid their marginal product. On the basis of aggregate wage data and capital-stock figures for 1968, I estimated the share of capital and labour in national income at 43.7% and 56.3% respectively.[53] These proportions closely correspond to the factor-cost weights determined by Czirják for 1955 under the assumption that average returns to labour in private farming equalled 80% of the standard wage in socialist agriculture.[54] This indicates that factor shares were stable over the period under investigation. Both estimates are largely in accordance with previous work on the USSR and developing countries in the second half of the XXth century.[55] The application of factor-cost weights to estimate relative factor shares in planned economies can be criticised on the ground that socialist accumulation is typically facilitated by the depression of real wages through centrally-fixed wages and prices. To the extent that this strategy was implemented in Hungary after 1949, the analysis conducted in the following section overestimates the relative factor share of capital and, through that, the contribution of capital deepening to the growth of labour productivity. Therefore, the rates of TFP growth that I report in the following section are lower-bound estimates.

[53] Labour cost is computed as a product of total employment and average wages in the socialist sector reported in KSH, *Statisztikai Évkönyv*, (1968), pp. 78-81. The cost of capital input is determined by the formula $K(r + \delta)$, where r stands for the rental rate on fixed assets and δ for the rate of depreciation. As an element of the 1968 reforms, producer prices were designed to approximate factor costs. Enterprises were required to pay a fixed 5% rental charge and were allowed to write down, on average, another 5% for depreciation. The value of fixed assets in 1968 is reported in KSH, *Beruházási Adattár, 1950-1977*, (1979), p. 20.

[54] L. Czirják, *op. cit.*, (1973), pp. 18-20.

[55] W. Easterly and S. Fischer, 'The Soviet economic decline', *The World Bank Economic Review,* 9.3 (1995), pp. 341-371; J. Benhabib and M.M. Spiegel, 'The role of human capital in economic development: evidence from aggregate cross-country data', *JME*, 34.10 (1994), pp. 143-173.

5. The dynamics of post-war growth

The standard growth-accounting model confirms mainstream theories of socialist development, if applied to official data.[56] Government sources did not report GDP or GNP until the late 1960s. National accounts in socialist countries were based on the net-material-product (NMP) concept, which only accounted for the productive sectors of the economy. It did not include services until 1958, and continued to exclude government services even thereafter.

To demonstrate inter-temporal changes in the factor dynamics of Hungarian economic growth, I computed growth rates of TFP for three consecutive sub-periods. Although centrally-planned economies did not exhibit a clear cyclical periodicity, the years of 1949, 1955, 1961, and 1967 all recorded strong growth, with better than average agricultural harvests. This allows us to conveniently break up the period of socialist industrialisation in Hungary into three phases of equal length, while adjusting for possible cyclical distortions.

Contemporaries could observe a gradual slowdown in labour-productivity growth between 1949 and 1967, despite a continued acceleration in the growth of capital intensity. As shown in *Table 3*, by the early 1960s, capital productivity was diminishing at an annual rate of close to 2% and, thus, the rate of TFP growth was less than half of what it had been in the early 1950s. This sharp deterioration in the efficiency of investment was a prime concern of central planners and appears to have constituted a sufficient cause for reform in 1968.

However, as shown in *Table 4*, the same analytical framework generates fundamentally different results, if we use the more reliable estimates for GNP and factor inputs discussed in Section 4. Although capital deepening still appears to have accelerated over time, so does the growth of labour productivity, meaning that investment in fixed capital did not run into diminishing returns prior to 1968. Consequently, the rate of TFP growth

[56] Data on NMP are reported in L. Czirják, *op cit.*, (1973), pp. 7-8. Figures on factor inputs from *Ibid*, p. 20, 30, accounting only for the sectors included in NMP.

remained stable. Capital productivity only started to decline moderately from the late 1950s, which was most likely the product of over-accumulation in the mining sector, as power generation began to switch from domestically extracted coal to imported hydrocarbons.[57] My findings diverge from the estimates derived from official data mainly because the latter grossly overstated the growth of national income in the early 1950s and the rate of capital deepening in the 1960s.

Based on the results reported in *Table 4*, the period under investigation shows the characteristics of an extended reconstruction phase in the Jánossy sense. All the more so, as capital accumulation was not accommodated by continued labour expansion or by the shifting of labour from agriculture to industry, contrary to mainstream theories of socialist industrialisation. *Figure 2* shows that after a sharp increase between 1949 and 1951, total employment in the economy grew at an average rate of scarcely over half a percent per year. Even the early surge was not the product of industrialisation. The bulk of new employment in the first years of state socialism went into construction and government services. The war scare invoked by the deteriorating relations with Yugoslavia was translated into a rapid build-up of the armed forces and of an indepth defence infrastructure along the southern border.

During the 1950s, industry did not expand through the mobilisation of a rural labour surplus. Collectivisation in Hungary was a two-stage process. Until 1952, only one-fifth of the peasantry had joined the collective farms. The roughly 10% decline in agricultural employment between 1950 and 1952 and the brutality of state procurement had disastrous consequences, which included a 25% fall in farm output and the mass slaughtering of livestock. After 1953, the government was forced to temporarily moderate the pace of capital accumulation and to relax the burdens on the land. Collectivisation did not only come to a halt; it was even reversed as tens of thousands left the collectives they had just been persuaded to join.[58]

[57] F. Nyitrai, *Ipari struktúránk: változások, hatékonyság*, (1977), pp. 130-132.
[58] I.T. Berend and T Csató, *op. cit.*, (2001), pp. 345-346.

This episode demonstrates that agriculture had very limited capacity to release labour without the increased application of farm machinery. The latter was only feasible following the reconstruction and expansion of the engineering industries, which made it possible to reallocate resources from industrial to agricultural investment. This is why it was only the second phase of collectivisation after 1959 that managed to syphon half a million workers out of the farming sector without depressing the growth of farm output. In the 1950s, new industrial jobs were filled by new entrants into the labour market, especially women. The rate of female labour participation increased from 29% in 1950 to 52% in 1960, and to 69% in 1970.[59] By the early 1970s, women provided 44% of total employment in the Hungarian economy.[60]

Returning to *Table 4*, we can observe increasing returns to capital before 1955, which suggests that, at the start of socialist industrialisation, post-war recovery was still constrained by a suboptimal allocation of complementary factors of production.[61] This finding is in line with the Jánossy model, which distinguished between two different phases of post-war reconstruction, as mentioned in Section 3. However, Jánossy still misread the development of the Hungarian economy. Official data indicated that the first reconstruction phase had been completed by the end of 1948, when national income surpassed the 1938 level, and the second phase did not last beyond the early 1950s.[62] This chronological classification is in accordance with the historical literature, which argued that forced industrialisation had built on the early years of stabilisation and reorganisation, but had lost impetus by 1953, at the latest, with a marked slowdown in growth rates.[63]

[59] *Ibid*, p. 285.
[60] KSH, *Magyarország társadalmi-gazdasági fejlődésének 30 éve*, (1975), 13.
[61] This result is in accordance with previous findings. See B. Végső, *Állóeszköz-igényesség az iparban: Változások, hatások, tervezés és befolyásolás*, (1980), pp. 55-56; I.T. Berend, *Capital Intensity and Development Policy*, (1985), pp. 63-67
[62] A. Bródy, *op. cit.*, (1967), p. 430.
[63] See A. Berei, *op. cit.*, (1970), p. 56, and I.T. Berend, *op. cit.*, (1974), pp. 65-67, among other sources.

Official statistics, however, presented an overly optimistic view on the recovery of the immediate post-war years. Currently available data demonstrate a sharp deterioration in TFP during the 1940s. GNP in 1949 was still 11.8% below the 1938 level, although total employment was practically the same in both years.[64] By contrast, official estimates indicated an approximately 18% increase in the capital stock over the same period, which means that labour productivity declined in the face of substantial capital deepening.[65] In my view, negative TFP growth resulted from a serious war-induced dislocation of complementary factors of production, which imposed severe constraints on capacity utilisation and, therefore, on capital productivity in the early post-war years. Unfortunately, there is no data available on capacity utilisation in the late 1940s and early 1950s, but we have some information on factor accumulation during the years of World War II.

Under the impetus of rearmament and wartime procurement, industrial production increased by 37.3% between 1938 and 1943. To facilitate this remarkable growth, the stock of machinery and equipment was expanded by over 40%.[66] While total employment remained constant, the labour force in manufacturing grew from 330,000 to 451,000.[67] Hungarian industry suffered a catastrophic level of destruction in 1944 and 1945, as Soviet military advance met stiff resistance and the retreating German forces inflicted heavy damage on machinery and equipment. Yet, in 1949, the stock of industrial fixed capital was still far greater than what it had been ten years earlier. In large-scale industry, the number of machine tools powered by electric motors increased from 68,000 to 115,000 between 1938 and 1943, still stood at 89,000 in 1945, and reached the wartime peak again by 1948.[68]

[64] L. Czirják, *op. cit.*, (1973), p. 4, 30.
[65] KSH, *Beruházási Adattár 1950-1977*, (1979), p. 17.
[66] I.T. Berend and G. Ránki, *The Development of the Manufacturing Industry in Hungary, 1900-1944*, Studia Historica 19, Hungarian Academy of Sciences, (1960), p. 140, 162.
[67] G. Ránki, 'Problems of the development of Hungarian industry, 1900-1944', *JEcH*, 24.2 (1964), p. 225.
[68] KSH, *Ipari Adattár*, Vol. I., (1966), p. 409.

By contrast, industrial employment suffered a severe setback and remained well below its 1943 level even in 1949.[69] Due to miserable living conditions in devastated urban centres and a popular land reform, families drawn into industrial jobs during the war had – if not perished – returned to the countryside and their original occupations. Consequently, in the early post-war years, urban industry faced a serious labour shortage. Through increasing female participation and re-urbanisation, industrial employment expanded rapidly in the early 1950s, which allowed for higher levels of capacity utilisation and, through that, high rates of TFP growth. Of course, this dynamic must have been most strongly manifested within the industrial sector, which I will analyse in more depth in Section 6.

Even after the mid-1950s, Hungarian economic growth largely continued to follow the path wartime developments had carved out. The most strongly favoured branches of the war economy, metallurgy, machine-building, chemicals and the engineering industries, received top priority under the aegis of state socialism. A push towards high levels of industrial concentration and the depression of working wages were also characteristic of both periods.[70] Although nationalisation and central planning may seem to be obvious cases for institutional discontinuity, by 1943 the government had already overseen investment and material allocations, while public-sector expenditure had risen to 67.4% of national income.[71]

The investigation of long historical national-income series also underlines the relevance of the reconstruction thesis. As shown in *Table 5*, the disappointing growth performance of the last two decades of state socialism was, in fact, satisfactory when put into historical perspective. From 1968 until 1988, arguably the last year unaffected by the democratic transition and the collapse of the Soviet bloc, GNP *per capita* grew at practically the same annual rate as in the period 1900-

[69] KSH, *A magyar ipar statisztikai adatgyűjteménye*, (1961), p. 117.
[70] I.T. Berend and G. Ránki, *op. cit.*, (1960), pp. 111-112, 148-150.
[71] G. Ránki, *op. cit.*, (1964), p. 218.

13, which is conventionally characterised as a golden era of Hungarian economic development. In common with the experience of several other nations, the extraordinary growth record of the 1950s and 1960s represented a recovery to the historical trend following what Temin famously called the Second Thirty-Years War.[72]

The figures reported in *Table 5* become even more compelling when illustrated in a diagram, as in *Figure 3*. During the tormented interwar years, the Hungarian economy was producing below its long-run growth potential, represented by the extrapolation of the pre-1914 trend, since recurrent major crises prematurely ended all recovery periods. After wartime dislocation had thrown back the country to where it had stood in 1900, subsequent growth was driven by economic reconstruction which – this time around – was unhindered by external conditions. The 1939 or 1943 peaks in GNP *per capita* were attained by 1955, but national income remained below potential until the late 1960s. The sharp deceleration in economic growth that followed signalled the end of post-war reconstruction, and was thus inevitable. Until the mid-1980s, Hungary developed according to her long-run growth potential and only thereafter began to show some genuine underperformance.

This exercise can only be justified in the framework of the Jánossy model, if the prime determinant of long-run growth, namely the rate at which the qualification structure of the labour force develops, remains roughly constant over time. However, if we accept growth in the average number of years spent in formal schooling by the adult population to be a valid proxy for human-capital accumulation, then the rate of the latter, indeed, appears to have been remarkably stable over the turbulent twentieth century. As shown in *Figure 4*, educational attainment followed a linear trend between 1920 and 2006. There was a noticeable setback during the early 1940s, due to heavy casualties among young males, but this was swiftly reversed in the early post-war years. By contrast, the poor productivity performance of the late 1980s was paralleled by a slowdown in the rate of human-capital accumulation.

[72] P. Temin, 'The Golden Age of European growth reconsidered', *EREH*, 6.1 (2002), p. 10.

As discussed earlier, we can use the data on formal schooling to estimate the Hall and Jones model in the context of Hungarian economic growth between 1949 and 1967. The results reported in *Table 6* confirm that the period preceding the introduction of the New Economic Mechanism constituted an extended phase of post-war reconstruction, inasmuch as capital deepening did not run into diminishing returns, despite significantly more modest rates of skill intensification. In other words, the level of capital intensity was inadequate to match the qualification structure of the labour force in the early stages of socialist industrialisation. In turn, this is exactly the principal source of reconstruction growth in the Jánossy model.

The reinvestigation of Hungarian growth performance in the last two decades of state socialism also confirms the postulations of the Jánossy model against mainstream theories of the socialist economic system.[73] First, as shown in *Table 7*, it is important to note that the sharp slowdown in the expansion of the economy during the 1980s resulted primarily from employment contraction, while the rate of labour-productivity growth remained satisfactory by the modest standards of the time. It is especially true, as the standard working week was shortened, which reduced the number of annual working hours.

The factor that caused first the cessation of TFP growth in the 1970s and then the deterioration of productivity in the 1980s was neither technological regress, as suggested by Kalecki, nor a sudden and marked demise in the efficiency of investment allocations. It resulted from the over-accumulation of capital that depressed capital productivity in the absence of adequately skilled labour reserves. The problem was not the system, nor was it the incompatibility of the 1968 reforms with the centrally-planned economy. The real tragedy was that central planners and the leading reformers failed to recognise a fundamental shift in the underlying factor dynamics of economic

[73] For the period 1968-88, statistical yearbooks report reliable data on factor inputs for the economy as a whole. KSH, *Statisztikai Évkönyv*, (1988), pp. 2-4. GDP figures from A. Maddison, *op cit*., (2006), p. 479.

growth, namely that after an extended phase of post-war reconstruction the size and the qualification structure of the labour force imposed hard constraints on capital accumulation.

In brief, mainstream economists at the time did not listen to Jánossy, although his provocative thesis was published at just about the right time and it sparked one of the most heated debates in the Hungarian economics profession. The main critics of the reconstruction thesis continued to insist on the dependence of economic growth on the rate of investment in fixed capital. It was this false conviction that forced the country to miss the only real chance of generating faster productivity growth, namely the acceleration of human-capital formation facilitated by the reallocation of investment in favour of education. Instead, the Hungarian government maintained an excessive rate of net capital formation and imposed a *numerus clausus* on upper-secondary and higher education to preserve the size and the qualification structure of the industrial workforce. As a result, the rate of human-capital accumulation even declined from the mid-1970s onwards, as shown in *Table 7*, when western nations pushed towards a universal high-school system and mass higher education.

6. The dynamics of industrial expansion

To apply the standard growth-accounting model to the analysis of industrial development at a more disaggregated level, we need reliable data on value-added and factor inputs. Indexes of net industrial production have been constructed by Czirják for branches of socialist industry, i.e. state enterprises and cooperatives that accounted for over 96% of industrial value-added by the mid-1950s.[74] Data on total hours worked for the period 1949-67 and on fixed capital from 1960 onwards are reported in official industrial statistics.[75] These detailed statistical collections have been compiled in the late 1960s and the early 1970s

[74] L. Czirják, *op. cit.*, (1968b), pp. 30-44; F. Bandor *et al.*, *op. cit.*, (1968), pp. 34-37.
[75] KSH, *Ipari Adattár*, (1966), pp. 301-303; *Ibid*, (1972), Vol. I, pp. 156-159, 352-353.

with the aim to support improved planning and policy making, and, therefore, provide much more reliable evidence on the period under investigation than previously published official sources. The statistics also report the number and aggregate horsepower of machine-tools driven by fossil fuels and electrical motors in state industry from 1949, which I applied as a proxy for the growth in the stock of machinery and equipment for years prior to 1960.[76] Since capital-stock figures for the 1960s are reported separately for equipment and structures, the ratio of the two in their respective rates of expansion between 1960 and 1967 can be used to estimate the rate of capital accumulation during the 1950s, with the help of the above proxy.

As part of the 1968 reforms, producer prices were designed to reflect factor costs, which included a fixed interest rate charged on the gross value of the capital stock and an allowance for depreciation costs. Official industry statistics first reported disaggregated data on the cost-structure of production on this basis for 1970.[77] Thus, the factor shares applied in my analysis are determined by the ratio of the total wage fund to capital costs in 1970.

The results of my computations are presented in *Table 9*. At the aggregate level, there was no gradual slowdown in either the growth of value-added or of TFP, only a sudden drop following the early 1950s. Labour-productivity growth even accelerated throughout the period under investigation. Average returns to capital increased prior to 1955, despite extraordinary rates of accumulation. This finding confirms my characterisation of the early 1950s, discussed in the previous section. The growth of industrial production was, indeed, fuelled, to a large extent, by labour expansion, leading to a fall in the capital-labour ratio. After 1955, as the potential to expand within the limits of available capacities had been fully exhausted, capital deepening increased the rate of labour-productivity growth at the expense of diminishing returns to capital. However, as industry was allocated

[76] *Ibid*, (1966), pp. 406-411; *Ibid*, (1972), Vol. II, pp. 106-109.
[77] *Ibid*, (1978), p. 469.

decreasing proportions of gross investment, and full capacity-utilisation had already been achieved, the need for labour expansion also subsided.

At a more disaggregated level, we obtain a more varied picture, but one that also supports my hypotheses. The highest growth rates in labour productivity were initially attained in those branches which had benefited most from wartime expansion and, therefore, had the greatest potential for reconstruction growth: machine tools, electrical and precision engineering, chemicals, the paper and printing industries. The production of motor vehicles constitutes an important exception from this pattern, but it should not be surprising. Firstly, this industry grew exceptionally fast during the early 1940s due to the development of aircraft manufacturing on German military orders. After the war, production has been shut down and part of the machinery was dismantled on reparation demands. Secondly, this branch included several of the defence industries, the expansion of which received top priority during the early years of socialism, with absolutely no consideration for factor or material efficiency.

Almost all branches recorded increasing returns to capital up to 1955 and increasing rates of capital deepening thereafter, which entailed higher rates of labour-productivity growth. Where state socialism attempted to accelerate industrial expansion beyond the limits of the potential inherent in post-war reconstruction, it failed miserably. This is demonstrated by modest labour-productivity growth and declining TFP in mining, metallurgy, motor vehicles and fabricated metal products (which also incorporated parts of the armaments sector) from the early 1950s onward. Over-accumulation in these branches accounted for most of the diminishing returns to capital in Hungarian industry after 1955. The only exceptions, where socialist planning proved successful in establishing comparative advantages that persisted until the present day, are chemicals and food products. Rapid growth in both branches during the 1960s was strongly connected to the modernisation of collectivised agriculture and made substantial contributions to increasing exports in both COMECON and western markets.

I conclude my investigation by conducting shift-share analysis to determine the contribution of labour reallocation made to aggregate

labour-productivity growth in Hungarian industry. In other words, I aim to show how successful centralised resource allocation was in fostering industrial efficiency. Shift-share analysis has been developed to distinguish between sector-(or region) specific and inter-sectoral (or inter-regional) effects in accounting for aggregate growth patterns.

$$LP^T - LP^O = \sum_{i-t}^{n}(LP_i^T - LP_i^O)S_i^O + \sum_{i-t}^{n}(S_i^T - S_i^O)LP + \sum_{i-t}^{n}(S_i^T - S_i^O)\,(LP_i^T - LP_i^O) \qquad \textbf{[9]}$$

The above equation, in which the term S_i represents the share of a particular sector in total labour input, breaks down the growth of aggregate labour productivity (*LP*) into three components: (1) an intra-sector effect which accounts for productivity improvements within individual branches as if their respective employment shares had not changed, (2) a static shift effect which measures the contribution of structural change under the assumption of constant branch-specific levels of labour productivity, and (3) a dynamic shift effect accounting for the increase in aggregate labour productivity that results from labour reallocation in favour of branches with the highest rates of productivity growth.

The static shift effect is expected to be higher in market economies with flexible labour supplies, as high-productivity branches can pay higher wages and, therefore, attract labour from other spheres of economic activity. A strong dynamic shift effect is, in turn, more characteristic of centrally-planned economies, where labour is reallocated in favour of the high-priority sectors, which are able to attain high rates of growth in labour productivity, due to rapid capital accumulation facilitated by generous investment allocations.[78] In terms of analysing centrally planned economies, a strong positive dynamic shift effect confirms the effectiveness of the priority system of centralised resource allocation.

In Hungarian industry, the bulk of labour-productivity growth was generated within the individual industries and not by structural shifts,

[78] See J. Sleifer, *Planning Ahead and Falling Behind: The East German Economy in Comparison with West Germany, 1936-2002*, (Berlin 2006).

as shown in *Table 8*. In the early 1950s, the static shift effect made a significant positive contribution to overall productivity improvements, while the dynamic shift effect was negative. The high-priority branches of mining, metallurgy, motor vehicles, and fabricated metal products produced higher, than, average value-added per unit of labour already in 1949, but the over-accumulation of labour led to very modest rates of labour-productivity growth prior to 1955. The concentration of investment in heavy industry also produced strong crowding-out effects in light manufacturing, which resulted in declining capital intensity and labour productivity in the leather and footwear industry, as well as in lumber and woodworking.

From the late 1950s onwards, the priority system became significantly more effective. This was especially true after 1961, when the expansion of employment in the chemical industry, which recorded extraordinary rates of growth in value-added per hour worked, accounted for over half of all improvements in industrial-labour productivity. In other words, the system of centralised resource allocation was just beginning to prove effective in fostering industrial productivity when the Hungarian government decided to reform it fundamentally.

7. Conclusions

From 1949 to 1967, Hungary enjoyed a period of unprecedented economic expansion. Data derived from independent western estimates provide a picture at substantial variance with official statistics and historical accounts built on them. The growth of national income and TFP remained stable throughout the period, while the acceleration of capital deepening yielded increased rates of growth in labour productivity. Until the mid-1950s, post-war recovery was constrained by a war-induced labour shortage in urban industry, which was temporarily allowed to expand within the limits of available capacities. Capital deepening began to function as the principal source of economic growth after 1955, and optimal factor shares at the macro level had probably not been restored before 1967.

During the 1950s, industrial expansion was driven by a reconstruction dynamic and largely followed wartime patterns.

Employment growth was fuelled by increasing female participation, not by shifting labour out of agriculture. It was only in the early 1960s that centralised resource allocation began to make a notable contribution to industrial development by mobilising the labour reserves released from an increasingly mechanised farming sector. Based on the quantitative evidence, the reconstruction thesis, as developed by Jánossy, appears to provide a better explanation for Hungary's growth experience during the early post-war period than mainstream theories of socialist industrialisation.

ACKNOWLEDGEMENTS

I am profoundly grateful to Iván Berend, Oliver Grant, János Kornai, and for an anonymous referee for their insightful comments on earlier versions of this paper. I must thank seminar and conference participants in Oxford, Utrecht and Budapest for their suggestions. I am beholden to Collegium Budapest, where I carried out part of my research between January and April 2010, and to the Dutch Research Council (NWO). I am responsible for all remaining errors.

REFERENCES

Official Statistics

Központi Statisztikai Hivatal [Central Statistical Office], *A magyar ipar statisztikai adatgyűjteménye* [Statistical Collection on Hungarian Industry], (Budapest 1961).

———, *A vállalatok és szövetkezetek újraértékelt állóeszköz-állománya* [The Revaluated Capital Stock of Enterprises and Cooperatives], (Budapest, 1970).

———, *Beruházási adattár, 1950-1977* [Investment Statistics, 1950-1977], (Budapest, 1979).

———, *Ipari adattár* [Industrial Statistics], (Budapest 1966), Vol. I: *Ipar, szocialista ipar, állami ipar, szövetkezeti ipar, magánkisipar* [Industry, Socialist Industry, State Industry, Cooperative Industry, Private Handicraft Industry].

———, *Ipari adattár* [Industrial Statistics], (Budapest 1972), Vol. I: *Ipar, szocialista ipar* [Industry, Socialist Industry].

———, *Ipari adattár* [Industrial Statistics], (Budapest 1972), Vol. II: *Állami ipar, szövetkezeti ipar, magánkisipar* [State Industry, Cooperative Industry, Private Handicraft Industry].

———, *Ipari adattár* [Industrial Statistics], (Budapest 1978), Vol. I: *Ipar, szocialista ipar* [Industry, Socialist Industry].

———, *Magyarország társadalmi-gazdasági fejlődésének 30 éve* [30 Years of Socio-Economic Development in Hungary], (Budapest 1975).

———, *Művelődésstatisztikai Adattár* [Repository of Cultural Statistics], (Budapest 1968).

———, *Statisztikai Évkönyv* [Statistical Yearbook], (Budapest different years).

Secondary Works

Abelshauser W., *Wirtschaft in Westdeutschland 1945-1948: Rekonstruktion und Wachstums-bedingungen in der amerikanischen und britischen Zone*, (Stuttgart 1975).

———,*Wirtschaftsgeschichte der Bundesrepublik Deutschland 1945-1980*, (Frankfurt 1983).

Abramovitz M., 'Catching up, forging ahead and falling behind', *Journal of Economic History*, 46.2 (1986), p. 390.

Allen R.C., *Farm to Factory: A Reinterpretation of the Soviet Industrial Revolution*', (Princeton 2003).

———, 'Capital accumulation, the soft budget constraint and Soviet industrialisation', *European Review of Economic History*, 2.1 (1998), pp. 1-24.

Alton T.P., *Selected Charts of Economic Performance in Eastern Europe*, Occasional Papers, No. 114, Research Project on National Income in East Central Europe, Economic Studies, Riverside Research Institute, (New York 1990).

———, Czirják L., Pall G. and Smolinski L., *Hungarian National Income and Product in 1955*, (New York 1963).

Arrow K.J., 'The economic implications of learning by doing', *Review of Economic Studies*, 29.3 (1962), pp. 155-173.

Balassa B., 'The economic reform in Hungary', *Economica*, New Series, 37.145 (1970), pp. 1-22.

———, and BERTRAND T.J., 'Growth performance of Eastern European economies and comparable Western European countries', *American Economic Review*, 60.2 (1970), pp. 314-320.

BANDOR F., CZIRJÁK L. and PALL G., *Hungary: Extension of Growth Indexes to 1967*, Occasional Papers, No. 33, Research Project on National Income in East Central Europe, Economic Studies, Riverside Research Institute, (New York 1970).

BENHABIB J. and SPIEGEL M.M., 'The role of human capital in economic development: evidence from aggregate cross-country data', *Journal of Monetary Economics*, 34.10 (1994), pp. 143-173.

BEREI A., 'Negyedszázados népgazdasági növekedésünk fő tényezői' [The main factors in a quarter century of economic growth], *Társadalmi Szemle*, 25.4 (1970), pp. 56-64.

BEREND I.T., *Central and Eastern Europe 1944-1993: Detour from the Periphery to the Periphery*, (Cambridge 1997), Chapter 5: "Economic and Social Performance of State Socialism, 1950-89", pp. 182-221.

———, *Capital Intensity and Development Policy*, (Budapest 1985).

———, *A szocialista gazdaság fejlődése Magyarországon, 1945-1968* [Socialist Economic Development in Hungary, 1945-1968], (Budapest 1974).

———, 'A termelőerők fejlődése: növekedés és struktúraváltozás Magyarországon a szocialista átalakulás negyedszázadában' [The development of production factors: growth and structural change in Hungary in the quarter century of socialist transformation], *Századok*, 104.4 (1970), pp. 827-868.

——— and CSATÓ T., *Evolution of the Hungarian Economy, 1848-1998*, (New York 2001), Vol. I: *One-and-a-Half Centuries of Semi-Successful Modernisation, 1848-1989*. Chapter 3: "The State-Socialist Attempt at Modernization, 1945-1989", pp. 253-384.

——— and RÁNKI G., *The Development of Manufacturing Industry in Hungary*, 1900-1944, Studia Historica, No. 19, Hungarian Academy of Sciences, (Budapest 1960).

BORCHARDT K., *Perspectives on Modern German Economic History and Policy*, (Cambridge 1991).

BRÓDY A., 'A GDP mérése proxyk segítségével' [Measuring GDP by proxies], *Közgazdasági Szemle*, 41.11 (1994), pp. 949-966.

———, 'Gazdaságunk az ezredfordulón: Előrejelzés az 1992-2004 évekre' [Our economy at the turn of the millennium: forecast for the years 1992-2004], *Közgazdasági Szemle*, 39.10 (1992), pp. 954-970.

———, 'Gazdasági növekedésünk üteme 1924-től 1965-ig' [The pace of our economic growth, 1924-1965], *Közgazdasági Szemle*, 14.4 (1967), pp. 417-431.

Czirják L., *Hungarian GNP by Sectors of Origin of Product and End Uses, 1938 and 1946-1967*, Occasional Papers, No. 43, Research Project on National Income in East Central Europe, Economic Studies, Riverside Research Institute, (New York 1973).

———, *Hungarian Investment, 1938 and 1949-1965: Trends in Fixed Capital, Inventories and Net Foreign Investment*, Occasional Papers, No. 17, Research Project on National Income in East Central Europe, Economic Studies, Riverside Research Institute, (New York 1968a).

———, *Indexes of Hungarian Industrial Production, 1938 and 1945-65*, Occasional Papers, No. 16, Research Project on National Income in East Central Europe, Economic Studies, Riverside Research Institute, (New York 1968b).

De Long J.B. and Summers L.H., 'Equipment investment and economic growth', *The Quarterly Journal of Economics*, 106.2 (1991), pp. 445-502.

Denison, E.F., *The Sources of Economic Growth in the United States and the Alternatives before Us*, (New York 1962)

Dumke R.H., 'Reassessing the *Wirtschaftswunder*: reconstruction and postwar growth in West Germany in an international context', *Oxford Bulletin of Economics and Statistics*, 52.2 (1990), pp. 451-491.

Easterly W. and Fischer S., 'The Soviet economic decline', *World Bank Economic Review*, 9.3 (1995), pp. 341-371.

Eckstein A., "National Income and Capital Formation in Hungary, 1900-1950", in J.B. Jeffreys and S. Kuznets (eds.), *Income and Wealth*, Series 5, (London 1955).

Eichengreen B. and Ritschl A.O., 'Understanding West German economic growth in the 1950s', *Cliometrica*, 3.3 (2009), pp. 191-219.

Erdös T., *A termelés korszerűsödése és a gazdasági növekedés* [The Modernisation of Production and Economic Growth], (Budapest 1974).

———, 'A "gazdasági csoda" és a helyreállítási periódusok' [The economic miracle and the reconstruction periods], *Közgazdasági Szemle*, 14.1 (1967), pp. 97-107.

Feldman G.A., "On the Theory of Growth Rates of National Income", in N. Spulber (ed.), *Foundations of the Soviet Strategy of Economic Growth: Selected Essays, 1924-1930*, (Bloomington, IN 1964), pp. 174-199, 304-331.

Földvári, P. and Van Leeuwen, B., 'A Magyar lakosság átlagos iskolázottságának becslése, 1920-2006' [Estimating average educational attainment in Hungary, 1920-2006], *Statisztikai Szemle*, 86.10-11 (2008), pp. 995-1005.

Gerschenkron A., *Economic Backwardness in Historical Perspective*, (London 1962).

HALL, R.I. and JONES, C.I., 'Why do some countries produce so much more output per worker than others?', *Quarterly Journal of Economics*, 114.1 (1999), pp. 83-116.

HARE P.J. and WANLESS P.T., 'Polish and Hungarian economic reforms: a comparison', *Soviet Studies*, 33.4 (1981), pp. 491-517.

HORVAT B., *Towards a Theory of a Planned Economy*, (Belgrade 1964).

JÁNOSSY F., *The End of the Economic Miracle: Appearance and Reality in Economic Development*, (New York 1969).

KALECKI M., *Socialism: Economic Growth and Efficiency of Investment*, (Oxford 1993).

KORNAI J., *The Socialist System: The Political Economy of Communism*, (Oxford 1992).

———, 'The Hungarian reform process: visions, hopes and reality', *Journal of Economic Literature*, 24.4 (1986), pp. 1687-1737.

KRENGEL R., *Anlagevermögen, Produktion und Beschäftigung der Industrie im Gebiet der Bundesrepublik von 1924 bis 1956*, (Berlin 1958).

LUCAS R.E. Jr., 'On the mechanics of economic development', *Journal of Monetary Economics*, 22.1 (1988), pp. 3-42.

MADDISON A., *The World Economy* (Paris 2006), Vol. II: *Historical Statistics*.

MANKIW G.N., ROMER P. and WEIL D.N., 'A contribution to the empirics of growth', *Quarterly Journal of Economics*, 107.2 (1992), pp. 407-437.

MANZ M., *Stagnation und Aufschwung in der französischen Besatzungszone von 1945 bis 1948*, Doctoral dissertation, (Mannheim 1968).

MATOLCSY M. and VARGA I., *The National Income of Hungary, 1924/25–1934/35*, (London 1938).

MOLNÁR F., 'Munkaerő versus beruházás? Néhány ellenvetés Jánossy Ferenc növekedéselméletével szemben' [Labour versus investment? A few objections to the growth theory of Ferenc Jánossy], *Közgazdasági Szemle*, 14.7-8 (1967), pp. 927-937.

NAGY T., 'The Hungarian economic reform: past and future', *The American Economic Review*, 61.2 (1971), pp. 430-435.

NYITRAI F., *Ipari struktúránk: változások, hatékonyság* [The Structure of our Industry: Changes, Efficiency], (Budapest 1977).

———, *A magyar ipar fejlődése és távlatai* [The Development and Prospects of Hungarian Industry], (Budapest 1971).

NURKSE R., *Problems of Capital Formation in Underdeveloped Countries*, (Oxford 1953).

PORTES R.D., 'Economic reforms in Hungary', *American Economic Review*, 60.2 (1971), pp. 307-313.

PREOBRAZHENSKY E.A.., "On Primary Socialist Accumulation", in N. Spulber (ed.), *Foundations of the Soviet Strategy of Economic Growth: Selected Essays, 1924-1930,* (Bloomington, IN 1964), pp. 235-256.

RÁNKI G., 'Problems of the development of Hungarian industry, 1900-1944', *Journal of Economic History*, 24.2 (1964), pp. 204-228.

ROMÁN Z., 'A trendvonalak csodája? Néhány megjegyzés Jánossy Ferenc könyvéhez' [The wonder of trend lines? Comments on the book of Ferenc Janossy], *Közgazdasági Szemle*, 14.3 (1967), 349-360.

ROSTOW W.W., *The Stages of Economic Growth: A Non-Communist Manifesto*, (Cambridge 1960).

SCHULTZ T.W., 'Investment in human capital', *American Economic Review*, 51.1 (1961), pp. 1-17.

SCHULZE M.S., 'Patterns of growth and stagnation in the late nineteenth century Habsburg economy', *European Review of Economic History*, 4.3 (2000), pp. 311-340.

SLEIFER J., *Planning Ahead and Falling Behind: The East German Economy in Comparison with West Germany, 1936-2002*, (Berlin 2006).

SOLOW R.M., 'A contribution to the theory of economic growth', *Quarterly Journal of Economics*, 70.1 (1956), pp. 65-94.

———, 'Technical change and the aggregate production function', *Review of Economics and Statistics*, 39.3 (1957), pp. 312-320.

TARJÁN T., 'Jánossy elmélete az új növekedési elmélet tükrében' [Jánossy's theory from a new growth theory perspective], *Közgazdasági Szemle*, 47.4 (2000), pp. 457-472.

TEMIN P., 'The Golden Age of European growth reconsidered', *European Review of Economic History*, 6.1 (2002), pp. 3-22.

VÉGSÖ B., *Állóeszköz-igényesség az iparban: változások, hatások, tervezés és befolyásolás* [Capital Intensity in Industry: Changes, Effects, Planning and Incentives], (Budapest 1980).

VONYÓ T., 'Post-war reconstruction and the Golden Age of economic growth', *European Review of Economic History*, 12.2 (2008), pp. 221-241.

WOLF H.C., "Post-War Germany in the European Context: Domestic and External Determinants of Growth", in B. Eichengreen (ed.), *Europe's Post-War Recovery*, (Cambridge 1995), pp. 323-352.

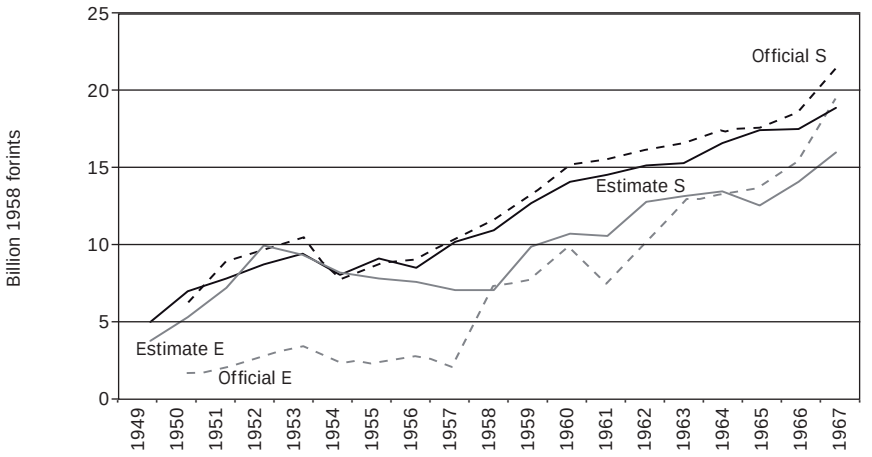
Appendix

Socialist Industrialisation or Post-War Reconstruction? Understanding Hungarian Economic Growth, 1949-1967

TABLE 1. Annual Gross Investment and Gross Capital Stock in Billion 1958 HUF

Year	Annual Gross Investment		Gross Capital Stock	
	Structures	Equipment	Structures	Equipment
1949	5.84	4.69	137.74	70.70
1950	7.71	6.11	142.60	73.86
1951	8.53	7.95	148.18	78.66
1952	9.42	10.57	154.50	85.80
1953	10.08	10.02	161.36	92.13
1954	8.77	8.92	166.79	97.17
1955	9.78	8.53	173.11	101.64
1956	9.18	8.33	178.72	105.74
1957	10.79	7.81	185.79	109.18
1958	11.52	7.77	193.44	112.46
1959	13.20	10.51	202.59	118.24
1960	14.50	11.29	212.84	124.55
1961	14.97	11.14	223.34	130.47
1962	15.51	13.26	234.17	138.20
1963	15.69	13.60	244.96	145.96
1964	16.94	13.95	256.77	153.76
1965	17.72	13.08	269.11	160.42
1966	17.81	14.53	281.30	168.22
1967	19.08	16.34	294.49	177.46

FIGURE 1. Official and estimated levels of investment in equipment and structures



Source: For official series and price indexes see footnotes 50 and 51. Estimates are drawn from Table 1.

TABLE 2. Alternative Estimates for the Rate of Capital Accumulation (%)

	1949-55	1955-61	1961-67
Czirják	31.23	31.21	46.03
New estimates	31.81	28.77	33.39

Source: L. Czirják, op. cit., (1973), p. 20. For my estimates see Table 1.

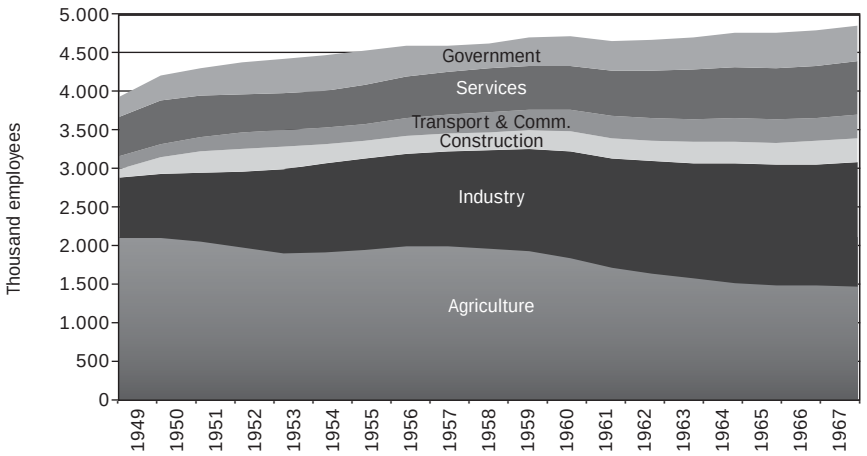
TABLE 3. Average Annual Growth Rates of Net Material Product and Productivity (%)

Variable	1949-1955	1955-1961	1961-1967
NMP	8.06	5.87	5.29
Productive employment	2.20	0.67	0.41
NMP per worker	5.73	5.17	4.86
Capital stock	5.86	5.39	7.20
NMP per unit of capital	2.08	0.46	-1.81
Capital per worker	3.58	4.69	6.76 v
s_K (K/L)/(K/L)	1.58	2.06	2.97
TFP	4.15	3.11	1.89

TABLE 4. Average Annual Growth Rates of National Income and Productivity (%)

Variable	1949-1955	1955-1961	1961-1967
GNP	5.58	4.05	4.45
Total employment	2.37	0.48	0.69
GNP per worker	3.14	3.55	3.73
Capital stock	4.71	4.31	4.92
GNP per unit of capital	0.83	-0.25	-0.45
Capital per worker	2.29	3.81	4.20
$s_K\Delta(K/L)/(K/L)$	1.01	1.68	1.85
TFP	2.13	1.87	1.88

FIGURE 2. Employment in the major sectors of the Hungarian economy



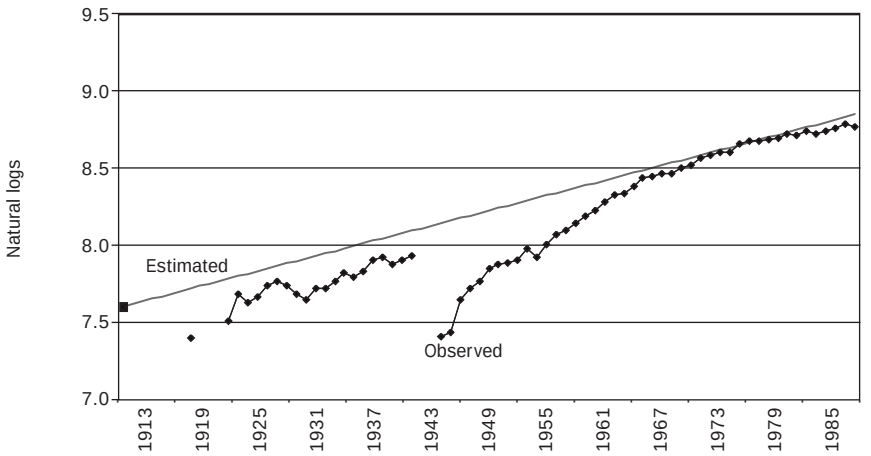
Source: Czirják, op.cit., (1973), p. 30.

TABLE 5. Annual Average Rates of Growth for 1989 Hungarian Territory (%)

Period	GNP	Population	GNP per capita
1900-13	2.46	0.75	1.71
1914-48	0.78	0.46	0.32
1949-67	4.73	0.57	4.16
1968-88	1.84	0.10	1.74

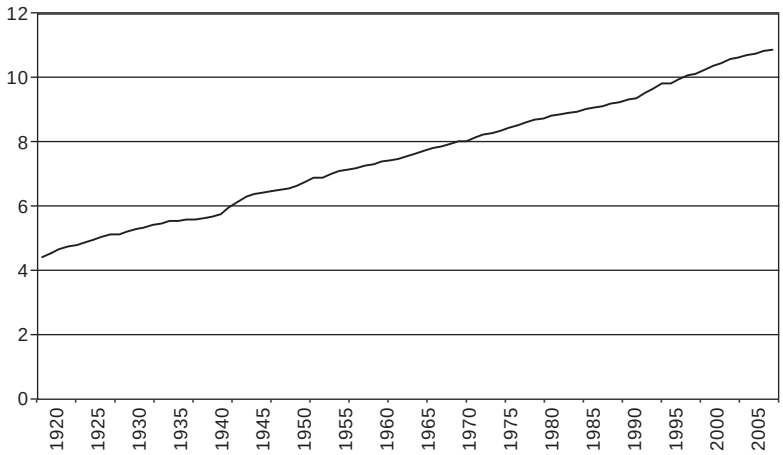
Source: Own calculation based on data from A. Maddison, op cit., (2006), pp. 474-479.

FIGURE 3. Observed and Estimated Levels of GNP Per Capita in 1990 US dollars



Source: A. Maddison, op cit., (2006), pp. 474-479. I corrected Maddison's weak estimates for the early 1940s based on official data presented in A. Bródy , op cit., (1967), p. 431.

FIGURE 4. Average years of formal schooling in the adult population of Hungary



Source: P. Földvári and B. Van Leeuwen, op cit., (2008), p. 1003.

TABLE 6. Average Annual Growth Rates of National Income and Productivity (%)

Variable	1949-1955	1955-1961	1961-1967
GNP	5.58	4.05	4.45
Total employment	2.37	0.48	0.69
GNP per worker	3.14	3.55	3.73
Capital stock	4.71	4.31	4.92
Capital per worker	2.29	3.81	4.20
s_K (K/L)/(K/L)	1.01	1.68	1.85
Human capital per worker	0.90	0.56	0.72
s_L (H/L)/(H/L)	0.51	0.31	0.40
TFP	1.62	1.56	1.48

TABLE 7. Average Annual Growth Rates of National Income and Productivity (%)

Variable	1961-1967	1968-1978	1978-1988
GNP	4.45	2.74	0.96
Total employment	0.69	0.62	-0.45
GNP per worker	3.73	2.11	1.42
Capital stock	4.92	5.48	4.23
GNP per unit of capital	-0.45	-2.60	-3.14
Capital per worker	4.20	4.83	4.70
s_K (K/L)/(K/L)	1.85	2.13	2.07
Human capital per worker	0.72	0.66	0.45
s_L (H/L)/(H/L)	0.40	0.37	0.25
TFP	1.48	-0.39	-0.90

TABLE 8. A Decomposition of Aggregate Labour-Productivity Growth in Industry (%)

Sources of growth	1949-1955	1955-1961	1961-1967
Intra-sector effect	92.7	95.7	90.1
Static shift effect	14.6	2.8	2.7
Dynamic shift effect	-7.3	1.5	7.4

TABLE 9. Annual growth rates of gross industrial value-added and productivity (%)

Industry Groups	Period	Output	Labour input	Output per unit of labour	Capital input	Output per unit of capital	Capital per unit of labour	Capital share	TFP
Mining	1949-55	9.38	9.06	0.29	12.29	-2.59	2.96	35.4	-0.75
	1955-61	3.17	1.98	1.17	16.41	-11.37	14.15		-3.84
	1961-67	-0.04	-1.33	1.31	7.95	-7.4	9.41		-2.02
Electrical power	1949-55	13.65	8.61	4.65	7.35	5.87	-1.16	75.6	5.52
	1955-61	7.51	5.21	2.19	7.2	0.28	1.9		0.75
	1961-67	6.85	0.95	5.84	6.75	0.09	5.74		1.5
Metallurgy	1949-55	10.34	8.88	1.35	11.56	-1.09	2.46	60.2	-0.14
	1955-61	6.13	1.2	4.87	9.62	-3.18	8.32		-0.14
	1961-67	4.1	0.91	3.16	7.73	-3.37	6.76		-0.91
Machine tools	1949-55	24.2	12.95	9.96	14.82	8.16	1.66	30.5	9.45
	1955-61	5.56	3.65	1.84	2.7	2.78	-0.92		2.12
	1961-67	-0.5	3.33	-3.71	6.18	-6.29	2.75		-4.45
Motor vehicles	1949-55	7.91	5.92	1.88	19.45	-9.66	12.78	42.9	-3.6
	1955-61	3.11	2.43	0.66	6.68	-3.34	4.15		-1.11
	1961-67	4.9	1.8	3.05	5.66	-0.72	3.8		1.43
Electrical engineering	1949-55	19.93	10.97	8.08	14.84	4.43	3.49	33.7	6.9
	1955-61	12.36	9.58	2.54	9.49	2.62	-0.07		2.56
	1961-67	4.81	5.15	-0.32	10.14	-4.84	4.75		-1.92
Precision engineering	1949-55	36.89	27.28	7.54	15.48	18.53	-9.27	25.4	9.9
	1955-61	8.26	4.27	3.82	13.64	-4.73	8.98		1.54
	1961-67	6.85	4.47	2.28	10.26	-3.09	5.54		0.87

continue

continued

TABLE 9. Annual growth rates of gross industrial value-added and productivity (%)

Industry Groups	Period	Output	Labour input	Output per unit of labour	Capital input	Output per unit of capital	Capital per unit of labour	Capital share	TFP
Fabricated metal products	1949-55	12.93	18.09	-4.37	9.42	3.21	-7.34	31	-2.09
	1955-61	2.85	0.14	2.71	4.88	-1.93	4.73		1.24
	1961-67	1.24	1.12	0.12	6.93	-5.32	5.75		-1.66
Construction materials	1949-55	14.97	10.89	3.68	14.07	0.79	2.86	44.9	2.39
	1955-61	6.5	0.23	6.26	7.62	-1.05	7.38		2.95
	1961-67	4.94	2.19	2.69	9.53	-4.19	7.18		-0.53
Chemical industry	1949-55	18.78	9.73	8.25	19.1	-0.27	8.54	61.8	2.97
	1955-61	15.33	7.05	7.73	10.68	4.2	3.38		5.64
	1961-67	21.79	5.43	15.53	12.33	8.42	6.55		11.48
Lumber and woodworking	1949-55	13.82	15.94	-1.83	8.25	5.14	-6.63	24.4	-0.21
	1955-61	11.74	7.25	4.18	9.53	2.01	2.13		3.66
	1961-67	6.57	4.37	2.1	9.36	-2.56	4.78		0.94
Paper industry	1949-55	7.5	3.23	4.23	5.49	1.9	2.19	57.2	2.88
	1955-61	8.57	3.2	5.2	2.56	5.86	-0.62		5.56
	1961-67	10.88	5.91	4.69	9.59	1.18	3.47		2.71
Printing industry	1949-55	5.12	-1.3	6.5	5.42	-0.28	6.8	33.4	4.23
	1955-61	9.53	4.09	5.23	5.08	4.24	0.95		4.91
	1961-67	5.52	2.42	3.02	7.2	-1.57	4.67		1.46
Textile industry	1949-55	8.18	5.42	2.61	2.88	5.15	-2.41	38.7	3.55
	1955-61	3.87	2.21	1.63	3.91	-0.04	1.67		0.98
	1961-67	4.27	2.36	1.86	7.11	-2.65	4.64		0.07

continue

continued

TABLE 9. Annual growth rates of gross industrial value-added and productivity (%)

Industry Groups	Period	Output	Labour input	Output per unit of labour	Capital input	Output per unit of capital	Capital per unit of labour	Capital share	TFP
Leather and footwear	1949-55	7.33	18.42	-9.36	2.99	4.22	-13.03	23	-6.36
	1955-61	7.6	5.92	1.58	7.73	-0.12	1.71		1.19
	1961-67	1.09	2.11	-1	5.05	-3.77	2.88		-1.66
Clothing industry	1949-55	25.58	23.51	1.67	18.73	5.77	-3.87	12.1	2.14
	1955-61	8.32	4.91	3.25	18.78	-8.81	13.23		1.66
	1961-67	4.56	2.72	1.8	8.24	-3.39	5.37		1.15
Food and Tobacco	1949-55	14.75	10.18	4.15	4.6	9.7	-5.06	44.2	6.39
	1955-61	5.31	1.02	4.24	3.6	1.65	2.25		3.12
	1961-67	9.15	2.36	6.64	4.6	4.35	2.2		5.67
Miscellaneous industry	1949-55	15.69	15.5	0.17	18.21	-2.13	2.35	17.1	-0.24
	1955-61	6.07	3.73	2.26	17.57	-9.78	13.35		-0.06
	1961-67	6.83	1.68	5.07	14.99	-7.09	13.09		2.8
Total socialist industry	**1949-55**	**13.29**	**10.3**	**2.71**	**9.18**	**3.76**	**-1.02**	**42.1**	**3.13**
	1955-61	**6.39**	**3.11**	**3.17**	**7.78**	**-1.3**	**4.53**		**1.27**
	1961-67	**6.06**	**2.25**	**3.73**	**7.7**	**-1.52**	**5.33**		**1.49**

Note: Output is measured by industrial value-added. labour input by total hours worked, and capital input by the gross value of the capital stock. For sources and methods of computation, see the text in Section 6 and footnotes 74 to 77.