

**WHEN AND WHY DID EASTERN EUROPEAN ECONOMIES BEGIN TO
FAIL?: LESSONS FROM A CZECHOSLOVAK/UK PRODUCTIVITY
COMPARISON, 1921-1991**

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Abstract: Czechoslovak industrial labour productivity fluctuated around two-thirds of the UK level under the private sector regime between the wars. Under the central planning regime of the postwar period, Czechoslovakia's comparative productivity position initially improved to around three-quarters of the UK level by the early-1960s, before falling back. During the 1980s, the deterioration of Czechoslovakia's productivity performance accelerated sharply, falling to around one third of the UK level. Central planning was able to achieve a satisfactory productivity performance during the era of mass production, but could not adapt to the requirements of flexible production technology during the 1980s.

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I. INTRODUCTION

Many studies now exist comparing industrial labour productivity amongst the advanced industrialised countries of western Europe from the early twentieth century to the present, providing a firm quantitative basis for studying the process of convergence of productivity levels at the sectoral level (Broadberry, 1997). For eastern Europe, however, there have been few attempts to quantify industrial productivity performance in an international comparative framework before the very recent past. The most ambitious study by van Ark (1996) is based on benchmarks from the late 1980s projected back with time series to 1950, and therefore does not cover the period before the introduction of central planning after World War II. This study pushes the analysis back into the interwar period, making use of a 1935 industrial census for Czechoslovakia. This can be used to check the consistency of time series projections from the 1980s, and to form the basis of time series projections over a longer period. We are thus able to obtain a complete quantitative picture of Czechoslovakia's industrial labour productivity performance compared with the United Kingdom over the entire period of the former country's existence as a separate state.

This quantitative picture of the development of Czechoslovak industry in an international perspective can be used to draw lessons concerning the relationship between institutional regimes and productivity performance, which can be applied across the wider region of eastern Europe. For the bulk of this large part of Europe, which has been relatively neglected by economic historians, experienced much the same transition between institutional regimes during the twentieth century. Following World War I, a

region which had been dominated by the German, Habsburg, Russian and Ottoman Empires fragmented into a larger number of independent states which operated as market economies. These countries were then brought within the Soviet sphere of influence after World War II and forced to operate similar systems of central planning. Following the fall of the Berlin Wall in 1989, these economies made a transition back to a market-based system. Within their 1945-1989 boundaries, the region embraced Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania and Yugoslavia, accounting for over a quarter of the population of Europe (Broadberry and Klein, 2008; Berend, 2006; Svernilson, 1954). If the Soviet Union, with its earlier experience of central planning is included, the region accounted for around half of Europe's population in the third quarter of the twentieth century.

The existing literature on the industrial performance of eastern Europe is dominated by studies of the Soviet Union, where the central debate concerns the relative contributions of the growth of factor inputs and total factor productivity to output growth (Bergson, 1973; 1983; Weitzman, 1970). The methodologies of growth accounting and production function estimation used in this debate focus on what Maddison (1988) has called the "proximate" causes of growth. Here, we delve beneath the proximate causes to focus on what Maddison calls the "ultimate" causes, involving the interaction between institutions and technology.

Czech industrial productivity fluctuated around two-thirds of the UK level during the interwar period and between the early 1950s and the 1970s. During the high period of

mass production in the early postwar period, Czechoslovakia's productivity position even improved to around three-quarters of the UK level. During the 1980s, however, Czechoslovakia fell increasingly behind. By the end of Communist rule in 1989, Czechoslovak industrial labour productivity had fallen to little more than 40 percent of the UK level. The decline continued during the early years of transition, falling below a third of the UK level by 1991.

The relationship between institutional regime and productivity performance appears to have been historically contingent. Central planning allowed Czechoslovak industry to maintain its comparative productivity position for much of the postwar period, and even to narrow the gap with Britain temporarily during the era of mass production, but could not adapt to the requirements of flexible production technology during the 1980s. The ensuing crisis contributed to the end of communist rule and was followed shortly after by the break-up of the Czechoslovak state.¹

This paper offers a nuanced view of the experience of central planning in eastern Europe, encompassing successes as well as failures. We thus extend Allen's (2003) rejection of a wholly negative assessment of the Soviet Union's period of economic growth and development transition to Czechoslovakia, and by extension, to the other centrally planned economies of eastern Europe. However, whereas Allen (2003: 211) argues that growth could have continued from the 1970s but for a failure of imagination

¹ The paper focuses on the unified Czechoslovak state as an exemplar of the wider east European industrial experience, rather than regional differences between the Czech and Slovak lands. Industrial performance was very similar in the two regions, with the Czech lands accounting for 67.3 per cent of the population in 1980, 71.4 per cent of industrial production and 73.0 per cent of industrial employment.

by the Soviet leadership, we argue that decline was inevitable given the trajectory of industrial technology.

II. BENCHMARKING INDUSTRIAL PRODUCTIVITY IN 1935

1. The Czechoslovak and UK industrial censuses of 1935

Not many countries outside the Anglo-Saxon world produced a full industrial census before World War II, providing information on both output and employment for the same sample of firms, which is essential for an accurate international comparison of productivity. Fortunately for our purposes, however, a full industrial census was taken in Czechoslovakia in 1935, which can be compared with the UK *Census of Production* for 1935 to obtain estimates of comparative labour productivity by branch (Ústřední Statistický Úřad v Praze, 1941; Board of Trade, 1938-1944). The value of net output per employee in Czechoslovakia is converted to pounds sterling using branch-specific purchasing power parities (PPPs) obtained from information on prices of major industrial products in the two countries.

The Czechoslovak industrial census provides information on the value of gross output, inputs and value added, together with data on employment at the branch level. Information was collected from all large firms, defined as employing 6 or more workers. This may at first sight seem more inclusive than the UK *Census of Production* for 1935, which collected information from all firms with at least 11 employees. However, it should be remembered that there were more small firms in Czechoslovakia, making the lower cut-off point necessary to generate a similarly high level of coverage. Furthermore,

it is straightforward to demonstrate that the higher UK cut-off could have had at best a marginal effect on the labour productivity comparison.²

The UK *Census of Production* for 1935 has been widely used in studies of comparative industrial labour productivity, starting with the pioneering study of Rostas (1948), who compared the United Kingdom with the United States and Germany. Although the publication of the Czechoslovak industrial census was disrupted by German annexation and war, sufficient material was made available to allow the reconstruction of the main magnitudes needed for a comparative study of labour productivity. In particular, the census allows the calculation of net output and employment for all industries. Furthermore, although the values and volumes of individual Czechoslovak products were never published and the original census returns have not survived, it is still possible to calculate industry-specific purchasing power parities using data on wholesale prices in Czechoslovakia and Britain.³

Table 1 sets out the basic data on Czechoslovak and UK industry in 1935 from the respective production census sources. We have organised the material on the basis of six main manufacturing branches: chemicals; metals; engineering; textiles & clothing; food,

² As noted by Fremdling et al. (2007: 372), in 1935 the proportion of UK industrial employees in firms with 1 to 10 workers was approximately 10 per cent of the total, and productivity in the smallest firm size category (11 to 24 employees) was 90 per cent of the average for industry as a whole. Supposing that the 6-10 group had as little as 80 per cent of the industrial productivity average and that the 6-10 category covered all of the workers in the less than 10 category, this would still only bias UK productivity upwards by around 2 per cent.

³ Although factory gate prices are in principle the best prices to use here, it should be noted that within a single country, wholesale, factory gate and retail prices tend to move together in both the long term trend and in short term fluctuations, while in international comparisons the ratios between the different types of price tend to be similar between countries (Feinstein, 1995: 10-11; Broadberry and Burhop, 2010: 416-417).

drink & tobacco; and miscellaneous manufacturing, as in Broadberry (1997). In addition, we have included the mining & quarrying sector, as in Broadberry and Burhop (2007).

2. Branch level shares of output and employment

Table 2 provides the shares of net output and employment by major branch in the two countries. In both Czechoslovakia and the United Kingdom, mining & quarrying accounted for a little over 10 per cent of industrial net output, with manufacturing accounting for around 90 per cent. The UK mining & quarrying industry absorbed a larger share of the labour force, resulting in the relatively low UK nominal labour productivity that can be seen in Table 1B. Within manufacturing, textiles & clothing accounted for a much larger share of industrial net output in Czechoslovakia than in the UK, although the scale of this sector looks much more similar in the two countries if attention is confined to employment. The UK had substantially larger metal manufacturing and food, drink & tobacco sectors than Czechoslovakia, while Czechoslovakia had a larger miscellaneous sector.

In Czechoslovakia, net output in industry amounted to Kč 15,047 million in 1935, while employment was 870,598, yielding net output per employee of Kč 17,284. In the United Kingdom, net output in industry in the same year was £1,319 million, while employment was 6.003 million, generating net output per employee of £219.69.

III. PRICE RATIOS AND COMPARATIVE LABOUR PRODUCTIVITY IN 1935

1. Price ratios

It is inappropriate simply to compare net output per employee in the two countries at the exchange rate, which often deviates substantially from purchasing power parity (Kravis et al., 1978). This was potentially a major problem in the period between the wars, when protectionism was rife and the trade of central and eastern Europe was dominated by a system of administered prices under German control (Neal, 1979). Furthermore, it is also widely recognised that differences in the level of development can affect the overall price level, with less developed countries often having a lower price level, as a result of the importance of low wages in the non-traded goods sector (Balassa, 1964; Samuelson, 1964). Even where the exchange rate broadly reflects overall purchasing power parity (PPP), it is necessary to construct PPPs for individual products to obtain an accurate picture of comparative productivity in different industrial branches.

Table 3 presents the PPPs for the main industrial goods, using UK wholesale prices from Board of Trade (1939) and the Editor of the Statist (1951), and Czechoslovak wholesale prices from Státní úřad statistický (1937). The exchange rate in 1935 was £1 = Kč 117.84, while PPPs for individual products ranged from 93.56 to 161.75 Kč per £. Using production value weights for the individual products taken from the UK *Census of Production* (Board of Trade, 1938-1944), produces a PPP for total manufacturing of 118.10 Kč per £, which is very close to the exchange rate.⁴ However, as can be seen in Table 4, the PPPs vary across the major industrial branches, but with a lower variance

⁴ Czechoslovak weights are not available at this level of disaggregation. However, it can easily be demonstrated that the use of the geometric mean of Czechoslovak and UK weights would make very little difference to the overall PPP and comparative labour productivity ratio. Aggregating the branch level PPPs in Table 4 using the branch value added weights yields a PPP for total manufacturing of 119.4 using UK weights, 120.6 using Czechoslovak weights and 120.0 taking the geometric mean. All figures are very close to the manufacturing PPP of 118.1 obtained using UK production value weights from Table 3.

than the PPPs for the individual products. The PPPs for the major manufacturing branches have been derived from the individual product PPPs as follows. For metals and engineering, we have used the weighted average of the 6 metal products in Table 3, while the miscellaneous PPP is based on a weighted average of bricks and rubber. For textiles and clothing, we have used cotton, while the PPP for food, drink & tobacco is based on wheat flour. For chemicals we have used the PPP for total manufacturing. The PPP for mining & quarrying is based on coal, and the PPP for total industry is derived from the PPPs for manufacturing and mining & quarrying using the geometric mean of Czechoslovak and UK net output weights from Table 2.

2. Comparative real labour productivity in industry

The estimates of comparative Czechoslovak/UK labour productivity at the branch level are provided in Table 4, by applying the branch level PPPs to nominal net output per employee in the two countries. Czechoslovak labour productivity was 64.1 per cent of the UK level in total industry and 63.1 per cent in total manufacturing. The productivity gap between the two countries was smaller than average in chemicals, metal manufacturing, textiles & clothing and mining & quarrying, but larger than average in engineering, food, drink & tobacco and miscellaneous manufacturing. The largest productivity gap was in food, drink & tobacco. It is tempting to attribute this to poor Czechoslovak performance, but it should be remembered that food, drink & tobacco was a particularly productive industry in Britain. Adding Germany to the picture, as in Table 5, reveals an even larger productivity gap between Britain and Germany in food, drink & tobacco, despite broadly equal labour productivity in industry as a whole for these two countries (Broadberry,

1997). It should be noted that a similar result would be obtained for food, drink & tobacco if we used the Czechoslovak/UK PPP for agriculture, based on the main inputs into food manufacturing, rather than the PPP for wheat flour. A weighted average of the prices of wheat, barley, oats, potatoes, beef, pork, butter and eggs yields an agricultural PPP of 129.90 Kč per £, which would make the comparative productivity level in food, drink & tobacco 46.8 rather than 51.0.⁵

IV. TIME SERIES PROJECTIONS, 1913-1935

1. Output and employment trends in Britain and Czechoslovakia

So far we have focused on establishing the comparative level of labour productivity in the single benchmark year of 1935. With time series data on output and employment in the two countries, we can establish comparative productivity levels in other years. For the United Kingdom, time series are available for industrial production and employment in all years during the interwar period. For Czechoslovakia, although we also have data on industrial production for all years, there is no continuous series for industrial employment.⁶

The British industrial production and employment data are taken from Feinstein (1972), and are uncontroversial. For Czechoslovakia, we have taken the industrial production index from Pryor et al. (1971), who correct a number of errors in the series of

⁵ UK agricultural prices are taken from Board of Trade (1939) and the Editor of the Statist (1951), while Czechoslovak prices are from Státní úřad statistický (1937). Production weights are derived from Ojala (1952: 208).

⁶ Because of Czechoslovak data constraints, in all cases we have used industrial production and employment time series based on manufacturing, mining and the utilities, although the benchmark refers to manufacturing and mining only. The utilities accounted for just 3 percent of total industrial employment in the United Kingdom in 1935 (Feinstein, 1972: Table 59).

Krejčí (1968). In fact, as Figure 1 makes clear, the two series move very closely together, so that using the Krejčí (1968) index would not have any substantial effect on the results reported below using the Pryor et al. (1971) series. Both series are also compared in Figure 1 with the earlier industrial production index from Svernilson (1954). The Svernilson (1954) index is almost identical to the Krejčí (1968) series for the period after 1926, while for the period before 1926 the Svernilson index is quite close to the Pryor et al. (1971) series. For employment, we have to take care to distinguish between estimates derived from industrial censuses, which cover only the larger industrial enterprises, and estimates based on population censuses, which cover employment in all firms. Fortunately, data are available on both bases for 1930, and data on employment in a compulsory sickness, accident and old-age insurance scheme also exist for a number of these years, which enables us to link the employment data for four years between 1921 and 1935. Detailed data sources are given in the notes to Table 6.

Figure 2 shows the very different trajectories of industrial production in Czechoslovakia and Britain between the wars. Industrial production grew more rapidly in Czechoslovakia during the 1920s. This does not appear to be simply a case of recovery from wartime disruption, since the 1913 level of industrial output had been reached already by 1923 and growth was more rapid after this date than before. In fact, the postwar collapse of industrial output was noticeably sharper and deeper in Britain than in Czechoslovakia. Whereas, industrial production fell to 79.7 per cent of its 1913 level in Britain at the trough of the 1920-21 slump, the equivalent figure for Czechoslovakia was 87.2 per cent (Feinstein, 1972: Table 51; Pryor et al., 1971: 36). This is testimony to the

financial policies pursued by the new Czechoslovak state, which not only avoided the hyperinflation suffered by the other successor states to the Austro-Hungarian Empire, but also managed to avoid the real exchange rate appreciation which made the British postwar recession of 1920-21 the most severe on record (Teichova, 1988: 67-69; Sargent, 1986: 95-97; Broadberry, 1990). Industrial production continued to grow more strongly in Czechoslovakia than in Britain during the second half of the 1920s.

After 1929, however, the Great Depression had a much more negative effect on industrial production in Czechoslovakia, so that during the 1930s output grew much more rapidly in Britain than in Czechoslovakia. Indeed, Czechoslovak industrial output had still not recovered its peak 1929 level by 1937. An influential paper by Eichengreen and Sachs (1985) linked the recovery of industrial production during the 1930s to exchange rate policy, with the United Kingdom experiencing rapid recovery as a result of leaving the gold standard in 1931. Czechoslovakia did not do as badly as the “gold bloc” group of countries which remained on the gold standard until 1936, but it did experience the slowest recovery of an intermediate group of “exchange control countries” (Feinstein et al., 1997: 172).

2. Comparative labour productivity performance

Table 6 sets out the steps in the calculation of comparative labour productivity performance trends between 1921 and 1935, the period for which we are able to calculate the path of Czechoslovak employment on a consistent basis. In Panel A, we see that Czechoslovak industrial output grew strongly during the 1920s, but then fell back to

1935, as already noted in our discussion of Figure 2. Since employment increased very little between 1921 and 1930, labour productivity grew rapidly at an annual rate of 6.2 per cent. During the first half of the 1930s, employment declined roughly in line with output, so that labour productivity remained stable.

In Panel B, we see that British industrial labour productivity grew at an annual rate of 3.5 per cent between 1921 and 1935, as a result of rapid output growth accompanied by stable employment. In Britain, the growth rate of labour productivity was slightly faster in the 1920s than in the 1930s, at annual rates of 4.2 and 2.9 per cent, respectively. In Panel C, putting together the labour productivity trends in the two countries, and connecting them to the 1935 benchmark level of comparative productivity, yields estimates of comparative Czechoslovak/UK industrial labour productivity levels for the period 1921-1935.

In panel C of Table 6, we see that during the 1920s, Czechoslovakia apparently narrowed the industrial labour productivity gap with Britain, but these gains were then reversed during the first half of the 1930s. These trends are consistent with the better management of the macroeconomic policy environment in Czechoslovakia during the 1920s and in Britain during the 1930s, as noted above. However, care must be taken in interpreting these fluctuations in comparative industrial labour productivity, because of the data limitations. In the circumstances, we would not wish to make any stronger claim than that Czechoslovak industrial labour productivity fluctuated around two-thirds of the UK level during the interwar period.

V. TIME SERIES PROJECTIONS, 1935-1991

1. Output and employment trends in Britain and Czechoslovakia

The previous section projected backwards in time from the 1935 benchmark to establish comparative industrial labour productivity levels during the period 1921-1935. In this section, we project forwards in time from the 1935 benchmark to derive comparative industrial labour productivity levels during the period 1935-1991. Since this involves crossing World War II and the transition to a planned economy in Czechoslovakia, and the data uncertainties surrounding these developments, we will then need to check the time series projections against a later benchmark.

The British industrial output and employment data are again relatively uncontroversial. For the postwar period, we use the official industrial production index while employment is taken from O'Mahony (1999). Both series are linked to 1935 using Feinstein (1972). For Czechoslovakia, there is the difficulty of distinguishing what really happened from the propaganda contained in official data. Fortunately, for our purposes, a project led by Thad Alton provides alternative western estimates of output in Eastern Europe during the planned economy era. Postwar industrial production was taken from Alton et al. (1985; 1992) and linked to 1937 by Lazarcik (1969). Postwar employment in absolute numbers was taken from official sources and linked directly to the level of employment in 1930 from the population census. Since there was full employment in Czechoslovakia throughout this period, these figures are generally seen as providing a reliable guide to the level as well as the sectoral incidence of employment.

2. Comparative labour productivity performance

Table 7 provides a basic overview of trends in industrial output, employment and labour productivity in Czechoslovakia and Britain in panels A and B, as well as comparative levels of labour productivity in panel C. Between 1935 and 1953, output and employment grew by very similar amounts in the two countries, leaving Czechoslovak labour productivity at around two-thirds of the UK level. After 1953, industrial output grew more rapidly in Czechoslovakia than in Britain, but since Czechoslovak employment also grew more rapidly, Czechoslovakia labour productivity continued to fluctuate round two-thirds of the UK level until the end of the 1970s. Measuring labour productivity by output per hour rather than output per worker would not make any substantial difference to either the trend or the level of comparative labour productivity, so we continue to work on an output per worker basis for comparability with the interwar estimates.⁷

However, taking a closer look at the annual data on comparative labour productivity in Figure 3, it would be possible to make a case for the view that Czechoslovak industry was catching-up during the late 1950s and early 1960s, rising above three-quarters of the UK labour productivity level. Furthermore, this finding of Czechoslovak catching-up on the west is not dependent on the comparison with the United Kingdom, since van Ark (1999: 230) shows that Czechoslovakia was also catching-up with West Germany at this time. To keep the Czechoslovak achievement in

⁷ The length of the working week in industry was very similar in the two countries throughout the period studied here, declining from around 48 hours in the early 1950s to around 43 hours between the early 1970s and the late 1980s (United Nations, *Statistical Yearbook*, various issues).

perspective, it helps to bear in mind that Spain and Portugal, the south European economies analysed by van Ark (1996: 287), were catching-up on the west more rapidly in terms of industrial labour productivity. Nevertheless, at the very least, we can surely say that during this period, which may be characterised as the high period of mass production, central planning did not seem to worsen industrial performance in Czechoslovakia compared to what had been achieved in the private sector between the wars.

During the 1980s, by contrast, as mass production gave way to modern flexible production methods in the West, Czechoslovakia's comparative industrial labour productivity performance deteriorated sharply. Indeed, labour productivity ceased to grow at all in Czechoslovakia, in contrast to the accelerating growth in Britain. By 1985 Czechoslovak labour productivity was around half the British level, falling to one-third of the British level by 1991. The central planning system, which had worked tolerably well during the era of mass production, seemed unable to adjust to the era of flexible production.⁸

3. Cross-checking with a 1989 benchmark

Before we turn to a fuller discussion of the relationship between institutional regimes and productivity performance, we need to demonstrate that the comparative productivity level for the late 1980s obtained from our time series projection is consistent with the cross

⁸ It should be noted that this Czechoslovak productivity failing cannot be attributed simply to labour hoarding in a socialist country unwilling to accept job losses on the scale witnessed in Britain, which was undergoing a structural transformation away from manufacturing towards services. Czechoslovakia's

sectional benchmark evidence for this period. To do this, we construct a benchmark estimate of comparative value added per employee for Czechoslovakia and the United Kingdom in 1989.⁹ Table 8 sets out the data on output and employment in 1989, distinguishing the same branches as for the 1935 benchmark. Employees include white-collar salaried employees as well as blue collar workers.

Table 9 provides the shares of value added and employment by industrial branch. Compared with the large differences between the two countries in 1935, which can be seen in Table 2, the shares of output and employment in 1989 were much more similar. By 1989, chemicals, metals and engineering accounted for a much larger share of output and employment than textiles and clothing, food, drink and tobacco and miscellaneous, which dominated manufacturing in 1935. Mining and quarrying had also shrunk in relative importance between 1935 and 1989, particularly in the United Kingdom.

Sectoral PPPs are provided in Table 10. Factory gate prices are taken from the UK *Census of Production* and Czechoslovak official sources, as detailed in the notes to Table 10. For industry as a whole, the number of matched products totalled 36, covering around a quarter of total sales in both countries. This is a much better coverage than for 1935, and is broadly in line with the coverage achieved in comparable studies based on

productivity position also deteriorated strongly compared with West Germany, where employment remained just as stable as in Czechoslovakia (Broadberry, 1997; van Ark, 1996).

⁹ We are grateful to Bart van Ark for making available information on Czechoslovak prices for 1989, since the original information is no longer available from the Statistical Office in Prague, as a result of extensive damage caused by flooding.

matching factory gate prices.¹⁰ The exchange rate for international trade in 1989 was £1 = Kčs 23.93, while the PPPs for individual branches ranged from 6.58 to 16.82, using the geometric averages of PPPs at UK and Czechoslovak weights.¹¹ Prices of food, drink and tobacco and mining and quarrying products were relatively cheap in Czechoslovakia, while prices of engineering products and chemicals were relatively expensive. Applying the sectoral PPPs from Table 10 to value added per employee by industrial branch yields the comparative labour productivity estimates in Table 11. For industry as a whole, Czechoslovak labour productivity in 1989 was 41.2 per cent of the UK level, which is very close to the time series projection of 41.9 for industry as a whole. The biggest productivity gap was in engineering, which accords well with the idea that problems emerged with the switch from mass production to flexible production, since this development was centred on engineering. In industries which were less obviously affected by modern flexible production technology, such as textiles and clothing, chemicals, metal manufacturing and mining, Czechoslovak productivity remained closer to UK levels.

4. Allowing for quality differences

So far, we have not made any explicit quantitative allowance for quality, which was widely thought to have been lower in centrally planned economies, at least for technically sophisticated consumer products (Bergson, 1991; Maddison, 1996; Kouwenhoven, 1998).

¹⁰ For example, for his comparison of Czechoslovakia and West Germany in 1989, van Ark (1996: 304) covers 23.2 per cent of West German and 32.0 percent of Czechoslovak sales. For a comparison of the UK and West Germany in 1987, O'Mahony (1992: 60) reports coverage ratios of 21.9 per cent for the UK and 21.4 per cent for West Germany.

¹¹ There are many different exchange rates in a command economy. We present the exchange rate for international trade derived from the International Monetary Fund (1995: 196).

Here, we follow van Ark (1996: 276) in deriving a quality adjustment ratio from a comparison of passenger cars and applying it to the engineering sector. The data for the 1989 quality comparison are set out in Table 12A. Two Czechoslovak cars which were sold in the UK market have been identified and their detailed specifications noted from trade sources. These cars have been matched against a small number of cars with equivalent specifications, which were both made and sold in the UK market. The fact that the Czechoslovak cars sold at an average discount of 32.2 per cent is taken as indicative of a quality difference of the same magnitude. The scale of the price difference between east European and locally produced cars in western markets during the 1980s accords with the results of studies for other engineering products, and may therefore be applied to the sector as a whole (van Ark, 1996: 276). This results in a substantial adjustment to the Czechoslovak/UK industrial labour productivity performance in engineering in Table 11, from 29.7 per cent to 20.1 per cent. Since the share of engineering averaged 37.3 per cent of industrial value added in the two economies in 1989, this results in a smaller reduction of the overall Czechoslovak/UK industrial labour productivity performance from 41.2 per cent to 36.3 per cent. The scale of the discrepancy between the benchmark for 1989 and the time series projection for the same year in Table 7 (at 41.9 per cent) then becomes more significant, but still not particularly large.

Furthermore, the calculations in part B of Table 12 suggest that the quality problem in Czechoslovakia emerged only after the era of mass production. At the height of mass production in 1965, we have made a similar calculation comparing a Czechoslovak-made car sold in the UK market with a number of British-built cars of a

similar specification. At this time, there was no substantial price discount for the Czechoslovak car. This would suggest that the quality problem emerged only after the mass production era, a theme that is taken up in more detail in the next section.

VI. INSTITUTIONAL REGIMES AND INDUSTRIAL PRODUCTIVITY PERFORMANCE

1. The existing literature on industrial performance in eastern Europe

The existing literature on east European industrial performance during the twentieth century is based largely on the experience of the Soviet Union. A common view is that the rapid industrial growth of the Soviet Union from the 1920s to the 1960s was a form of extensive growth, based on the transfer of resources from the agricultural sector (Ofer, 1987). In addition to the redeployment of surplus labour from agriculture, there was a rapid growth of capital in industry, as a result of a squeeze on consumption (Bergson, 1973; 1991). The acceleration by central planning of the transfer of resources from the relatively low value added activity of agriculture to the higher value added activity of industry initially helped the Soviet Union to catch-up on the west (Allen, 2003). However, note that this view also contains within it an explanation of the subsequent slowdown of industrial expansion and overall catching-up, as the supply of surplus labour from agriculture must eventually be exhausted, and as diminishing returns to rapid capital accumulation set in. This approach has also been applied to the region of eastern Europe as a whole in a number of general economic histories of the period after World War II, when central planning was introduced as a result of Soviet influence (Eichengreen 2007: 133-141; Berend, 2006: 172-178).

Note, however, that the above framework makes no explicit mention of the role of technology in industrial performance. It is indeed possible to explain the slowdown of Soviet growth from the 1960s without any reference to a changing rate of technological progress. Weitzman (1970) argues that with a constant elasticity of substitution less than unity, and with capital growing faster than labour, the share of capital in income declines. Hence, with the weight of the more slowly growing factor increasing over time, output growth slows down, without any change in the rate of technological progress. Weitzman argues that the Soviet Union had limited capital-labour substitution possibilities, estimating a constant elasticity of substitution (CES) production function with an elasticity of substitution equal to 0.4. Applying this approach to the Soviet slowdown of output growth, he finds no decline in the total factor productivity (TFP) growth rate, which is often equated with technological progress. Bergson (1973; 1983), by contrast, explains the Soviet growth slowdown largely through a declining rate of TFP growth, assuming an elasticity of substitution of one, as in the conventional Cobb-Douglas specification of the production function. The Soviet debate inspired a number of writers to estimate production functions for other east European economies, but as in the Soviet case, without reaching consensus on the relative importance of diminishing returns and technological progress in declining industrial growth (Whitesell, 1985; Brada, 1989; Rusek, 1989).

One obvious problem with this debate concerns the quality of the east European capital stock data, which has received much less attention than the output and

employment data (Földvari and van Leeuwen, 2010). However, perhaps a more significant limitation is that this debate cannot go beyond what Maddison (1988) calls the “proximate” sources of growth. But as Ofer (1987: 1818) points out, it is possible for a declining marginal productivity of capital to be the result of misdirected R&D spending rather than problems of investment policy, and for declining TFP growth to be the result of suboptimal investment policies rather than unsuccessful R&D spending. Thus it is not clear that dividing output growth into its various proximate sources can shed much light on what Maddison (1988) calls the “ultimate” sources of growth. The approach taken in this paper is to delve beneath the proximate sources to examine the interaction between institutions and technology, although we shall return briefly to the issue of TFP growth in the final section.

2. Mass production, central planning and industrial performance

Although economic historians have noted the inability of eastern European societies to adjust to the increasing use of information technology during the flexible production era of the 1970s and 1980s, they have not paid as much attention to the flip side of this, the suitability of the central planning system for the mass production technology of the previous era (Harrison, 2002: 409). The path of Czechoslovak industrial labour productivity suggests that central planning was able to cope with mass production technology about as well as the regulated market system that existed in Britain at the same time.

Mass production of high volumes of standardised products, using special purpose machinery, flow production methods and hierarchical management became the leading business model in US manufacturing during the first half of the twentieth century (Hounshell, 1984; Lazonick, 1990; Chandler, 1990). Whilst Hounshell (1984) traces its development through the Springfield Armory, the Singer Sewing Machine, the McCormick Reaper and the bicycle industry, pride of place is reserved for the motor vehicle industry and the Ford Motor Company's adoption of the moving assembly line in 1913 and the five-dollar day in 1914. This meant that by the time of the Russian Revolution in 1917, a technological system was in place that was suitable for the allocation of resources within large scale industrial units, using hierarchies rather than markets. While it lasted, this technological system encouraged a whole range of experiments in economic organisation, ranging from the authoritarian-fascist regimes which sprang up in Italy, Germany and other parts of western Europe, to the centrally planned economic system of the Soviet Union, with other western economies retreating from laissez-faire to a more regulated market system (Berend, 2006).

However, as Broadberry (1997) notes, there were difficulties in simply adopting US-style mass production technology in interwar Europe because of different factor endowments and demand conditions, and it was not until after World War II that much of European industry seriously attempted to adopt mass production technology. Broadberry (1997: 292-394) provides a detailed discussion of the difficulties encountered during the application of high volume methods in postwar Britain, covering chemicals, metals, engineering, textiles and clothing, food, drink and tobacco and miscellaneous industries.

These attempts at “Americanisation” caused enormous problems in the institutional framework of postwar Britain, particularly the system of industrial relations, where disputes arose between shopfloor workers and management over control of the labour process (Prais, 1981; Broadberry, 1997).

When the Czechoslovak Communist Party took monopoly control of power in 1948, the more democratic machinery of the Two-Year Plan implemented by the Communist-led National Front gave way to the centralised system of central planning established in all countries under the Russian sphere of influence (Brus, 1986: 610-613). At the top of the hierarchy was the State Planning Office, with ministerial rank, presiding over the ministers responsible for individual industries. The next level down was the main administrative bodies, with the lowest level being the individual enterprises (Teichova, 1988: 135). As in the Soviet system, the plan involved setting targets for individual outputs and checking for consistency with input-output coefficients. After initial drafting, the plan was fed down the hierarchy and adjusted before repeating the process (Eichengreen, 2007: 135).

Whilst the system of central planning can undoubtedly be criticised for distorting the composition of output towards heavy industry and away from consumer goods, its performance in terms of raising labour productivity in the production of the goods that the central planners chose to manufacture was initially, at least, surprisingly good. In this respect, the centrally planned and regulated market economies may not have been so different during the heyday of mass production in the 1950s and 1960s. Both systems

allocated resources within large industrial units, using hierarchies rather than markets. If the similarities were already apparent in mass production consumer goods industries such as motor vehicles, they were even more striking in the production of armaments, where markets played little role in western countries like Britain as well as in centrally planned economies such as Czechoslovakia (Jürgens et al., 1993; Nelson, 1993; Ergas, 1987).

Qian et al. (2006) provide a general framework for comparing the performance of market and centrally planned economies during the era of mass production. The central distinction is between a U-form (unitary form) and an M-form (multidivisional form) organisation. In a U-form organisation, units are complementary to each other, such as the Sales and Manufacturing departments at Ford Motors in the 1920s, while in an M-form organisation, units are self-contained and similar to each other, such as the Oldsmobile and Chevrolet divisions at General Motors in the 1930s. The U-form organisation is efficient where economies of scale are the predominant concern, while the M-form organisation is efficient where economies of scope are more important. Whilst centrally planned economies were able to implement institutional structures which matched the scale economies of the U-form corporation in market economies, they found it much harder to achieve the economies of scope achieved by the M-form corporation. So long as output remained highly standardised in market economies, during the era of mass production, it was possible for centrally planned economies to achieve tolerable productivity outcomes.

3. Flexible production and the collapse of central planning

It seems, then, that the system of central planning was better able to cope with the requirements of mass production technology than is sometimes thought. However, it was singularly ill-equipped to deal with the revival of flexible production technology from the 1970s. Modern flexible production technology involved a return to customisation of production whilst preserving the benefits of high volume through the application of information and communications technology (Piore and Sabel, 1984; Edquist and Jacobson, 1988; Broadberry, 1994). Such a system was bound to run into difficulties in a system of central planning, which is anything but flexible. McDermott (2002: 45-63) documents the consequences of attempts to improve flexibility within the Czechoslovak system as demands for greater variety increased, and could not be ignored in export markets. Given the difficulties of co-ordination between sectors under different ministerial control, and even between plants within individual industries, where plans had to be approved centrally, individual plants became increasingly autarkic, producing as many components as possible rather than relying on other plants to customise parts for their particular needs. This growing loss of economies of scale inevitably hit productivity performance, and Czechoslovak industry could no longer keep up with western producers.

The problems of coping with the revival of flexible production technology were made more severe as a result of the desire of the state to retain tight control over information and communications (Berend, 2006: 182; Eichengreen, 2007: 294-295). As industrial productivity stalled in Czechoslovakia, it picked up dramatically in Britain

during the 1980s, as the old corporatist regime of the regulated market was deregulated (O'Mahony and Wagner, 1994; Broadberry, 1997).

Finally, we return to the proximate sources of growth, since our focus on the interaction between institutions and technology has implications for the patterns of TFP growth, which are set out in Table 13. Industrial TFP growth was faster in Czechoslovakia than in Britain during the period of catching-up in the peak mass production era of the late 1950s and early 1960s. After 1965, however, industrial TFP growth was not only slower in Czechoslovakia than in Britain, but also declined fairly steadily, eventually turning negative as flexible production became the dominant technology.

VII. CONCLUDING COMMENTS

We now know a great deal about comparative industrial labour productivity performance among west European countries for the whole of the twentieth century. By contrast, we know very little about productivity developments in eastern Europe before the very recent past. This paper attempts to fill this important gap in our knowledge of European economic development by providing a detailed quantitative study of industrial labour productivity in Czechoslovakia, the main industrial powerhouse of the region, compared with the United Kingdom. Drawing on industrial census data for these two countries, we provide estimates of comparative Czechoslovak/UK labour productivity for industry in 1935, and use this as a basis for time series projection to other years. We are thus able to

cover both the interwar period of private enterprise and the postwar period of communist rule.

Czechoslovak industrial labour productivity fluctuated around two-thirds of the UK level during the interwar period and from the 1950s to the end of the 1970s. During the high period of mass production in the early postwar period, Czechoslovakia's productivity position even improved to around three-quarters of the UK level. During the 1980s, however, Czechoslovakia's productivity position deteriorated sharply, falling to around one third of the UK level by 1991.

The relationship between institutional regime and productivity performance appears to have been historically contingent. Central planning allowed Czechoslovak industry to improve its comparative productivity position temporarily during the era of mass production. However, central planning was unable to cope with the requirements of flexible production technology during the 1980s, and the ensuing crisis contributed to the end of communist rule, which was followed shortly after by the break-up of the Czechoslovak state. We have focused here on the specific case of Czechoslovakia, but the approach has wider applicability to the region of eastern Europe, which accounted for around a quarter of Europe's population in 1950, or around a half if the Soviet Union is included.

TABLE 1: Net output, employment and labour productivity in industry, 1935

A. Czechoslovakia			
	Net output (Kč 000)	Employment (000)	Labour productivity (Kč)
Chemicals	1,132,257	32.218	35,144
Metal manufacturing	1,017,624	48.604	20,937
Engineering	2,514,529	166.583	15,095
Textiles & clothing	4,524,913	274.552	16,481
Food, drink & tobacco	1,078,533	45.846	23,525
Miscellaneous	3,129,940	216.802	14,437
MANUFACTURING	13,397,796	784.605	17,076
Mining & quarrying	1,649,342	85.993	19,180
INDUSTRY	15,047,138	870.598	17,284
B. United Kingdom			
	Net output (£ 000)	Employment (000)	Labour productivity (£)
Chemicals	103,461	249.616	414.48
Metal manufacturing	146,455	661.367	221.44
Engineering	256,077	1,134.422	225.73
Textiles & clothing	249,166	1,641.279	151.81
Food, drink & tobacco	201,515	520.649	387.05
Miscellaneous	224,979	950.153	236.78
MANUFACTURING	1,181,653	5,157.486	229.11
Mining & quarrying	137,044	845.092	162.16
INDUSTRY	1,318,697	6,002.578	219.69

Sources: Czechoslovakia: Ústřední Statistický Úřad v Praze (1941: 176-179); United Kingdom: Board of Trade (1938-1944).

TABLE 2: Shares of net output and employment by industrial branch in 1935 (%)

A. Czechoslovakia		
	Net output	Employment
Chemicals	7.5	3.7
Metal manufacturing	6.7	5.6
Engineering	16.7	19.1
Textiles & clothing	30.1	31.5
Food, drink & tobacco	7.2	5.2
Miscellaneous	20.8	24.9
MANUFACTURING	89.0	90.1
Mining & quarrying	11.0	9.9
INDUSTRY	100.0	100.0

A. United Kingdom		
	Net output	Employment
Chemicals	7.8	4.2
Metal manufacturing	11.1	11.0
Engineering	19.4	18.9
Textiles & clothing	18.9	27.3
Food, drink & tobacco	15.3	8.7
Miscellaneous	17.1	15.8
MANUFACTURING	89.6	85.9
Mining & quarrying	10.4	14.1
INDUSTRY	100.0	100.0

Sources: Derived from Table 1.

TABLE 3: Czechoslovak/UK PPP in 1935 for industrial goods

Product	Units	Czechoslovak price (Kč)	UK price (£)	PPP (Kč per £)
Bar iron	tonnes	1,185.00	11.81	100.33
Steel plates	tonnes	1,204.30	9.10	132.28
Copper	tonnes	4,350.00	34.83	124.88
Lead	tonnes	1,652.50	15.97	103.45
Tin	tonnes	29,625.00	225.00	131.67
Zinc	tonnes	2,422.70	15.22	159.21
Nickell	tonnes	24,900.00	196.85	126.49
Cotton	tonnes	8,052.50	61.63	130.65
Wheat flour	tonnes	1,351.00	11.34	119.15
Bricks	1000s	226.60	2.42	93.56
Rubber	tonnes	7,347.50	54.93	133.76
Coal	tonnes	129.40	0.80	161.75

Sources: UK prices: Board of Trade (1939) and the Editor of the Statist (1951). Czechoslovak prices: Státní úřad statistický (1937); Státní úřad statistický, *Statistická ročenka republiky Československé*.

TABLE 4: Comparative Czechoslovak/UK labour productivity in 1935

	Czech net output per employee (Kč)	UK net output per employee (£)	PPP (Kč per £)	Czech/UK labour productivity (UK=100)
Chemicals	35,144	414.48	118.10	71.8
Metal manufacturing	20,937	221.44	118.01	80.1
Engineering	15,095	225.73	118.01	56.7
Textiles & clothing	16,481	151.81	130.65	83.1
Food, drink & tobacco	23,525	387.05	119.15	51.0
Miscellaneous	14,437	236.78	110.40	55.2
MANUFACTURING	17,076	229.11	118.10	63.1
Mining & quarrying	19,180	162.16	161.75	73.1
INDUSTRY	17,284	219.69	122.77	64.1

Sources: Net output per employee from Table 1; Branch level PPPs for manufacturing derived from Table 3 using gross output weights from UK Board of Trade (1938-1944). Net output weights for manufacturing and mining & quarrying in PPP for total industry from Table 2.

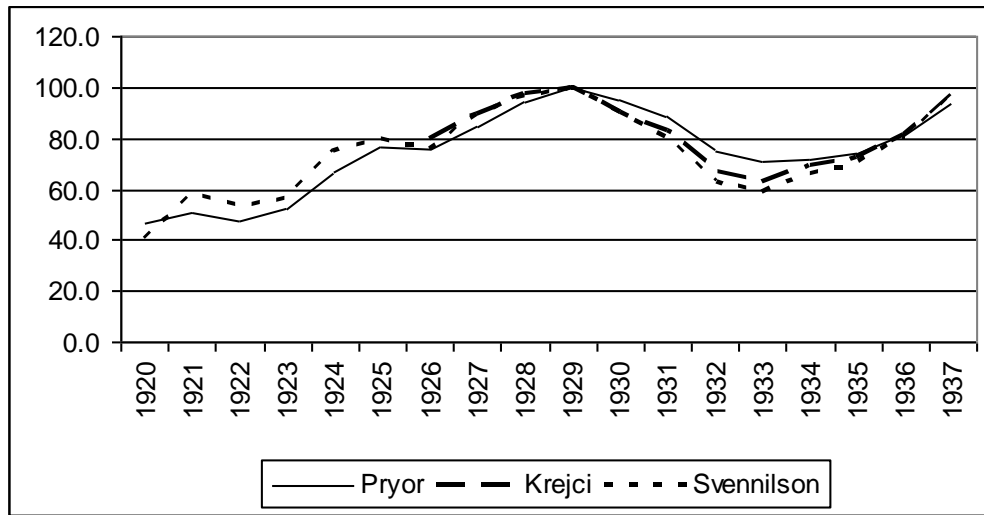
TABLE 5: Labour productivity in Czechoslovakia, Germany and the United Kingdom in 1935 (UK=100)

	Czech/UK labour productivity (UK=100)	German/UK labour productivity (UK=100)
Chemicals	72	123
Metal manufacturing	80	116
Engineering	57	120
Textiles & clothing	83	97
Food, drink & tobacco	51	41
Miscellaneous	55	102
MANUFACTURING	63	102
Mining & quarrying	73	124
INDUSTRY	64	99*

Sources: Czechoslovak/UK: Table 4; German/UK: Broadberry (1997: 31; 2006: 48).

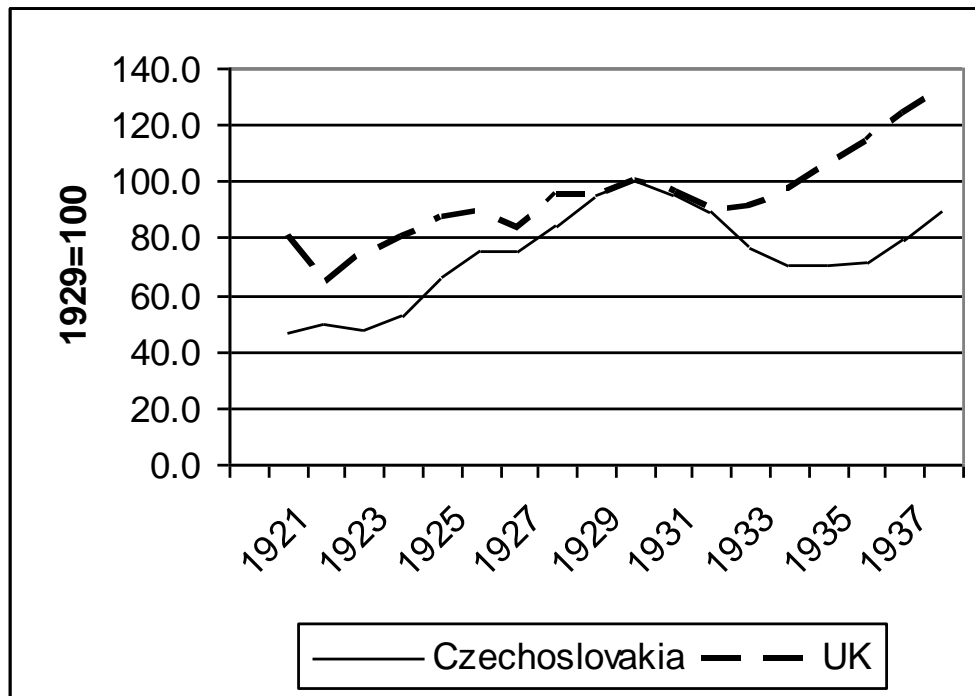
* Includes building and gas, electricity & water.

FIGURE 1: Alternative estimates of Czechoslovak industrial production (1929=100)



Sources: Pryor et al. (1971: 36); Krejčí (1968: 254); Svenilson (1954: 304-305).

FIGURE 2: Industrial production in Czechoslovakia and the United Kingdom (1929=100)



Sources: Czechoslovakia: Pryor et al. (1971: 36); UK: Feinstein (1972: Tables 9 and 51).

TABLE 6: Industrial output, employment and labour productivity, 1921-1935

A. Czechoslovak labour productivity (1935=100)				
	Output	Employment	Labour productivity	
1921	68.0	118.3	57.5	
1926	102.4	136.3	75.1	
1930	128.7	127.5	100.9	
1935	100.0	100.0	100.0	

B. UK labour productivity (1935=100)				
	Output	Employment	Labour productivity	
1921	55.5	93.9	59.2	
1926	72.8	99.2	73.4	
1930	84.4	97.5	86.6	
1935	100.0	100.0	100.0	

C. Czechoslovak/UK labour productivity				
	1935=100			UK=100
	Czechoslovakia	UK	Czech/UK	Czech/UK
1921	57.5	59.2	97.1	62.2
1926	75.1	73.4	102.3	65.5
1930	100.9	86.6	116.5	74.7
1935	100.0	100.0	100.0	64.1

Sources: Industrial production: see sources for Figure 1. Industrial employment: Czechoslovakia: data are available for large firms in 1926 and 1935 from Teichova (1985: 245) and for large firms in 1930 from Státní úřad statistický, *Statistická ročenka republiky Československé*, (1936); data are available for all firms in 1921 from Státní úřad statistický, *Statistická příručka republiky Československé*, (1932) and for all firms in 1930 from Státní úřad statistický, *Statistická ročenka republiky Československé*, (1934). Large firm and all firm employment data are linked up using the fact that data are available on both bases in 1930, and making use of data on employment in a compulsory sickness, accident and old-age insurance scheme from League of Nations (various issues), *Statistical Yearbook*. UK: Feinstein (1972: Table 59). Comparative labour productivity in 1935: Table 4.

TABLE 7: Industrial output, employment and labour productivity, 1935-1991

A. Czechoslovak labour productivity (1935=100)				
	Output	Employment	Labour productivity	
1935	100.0	100.0	100.0	
1953	153.6	120.3	127.7	
1960	277.5	149.0	186.3	
1968	363.6	169.8	214.2	
1973	440.9	182.4	241.7	
1979	527.8	180.3	292.7	
1985	578.3	185.7	311.4	
1989	592.6	193.1	306.9	
1991	433.8	176.3	246.0	

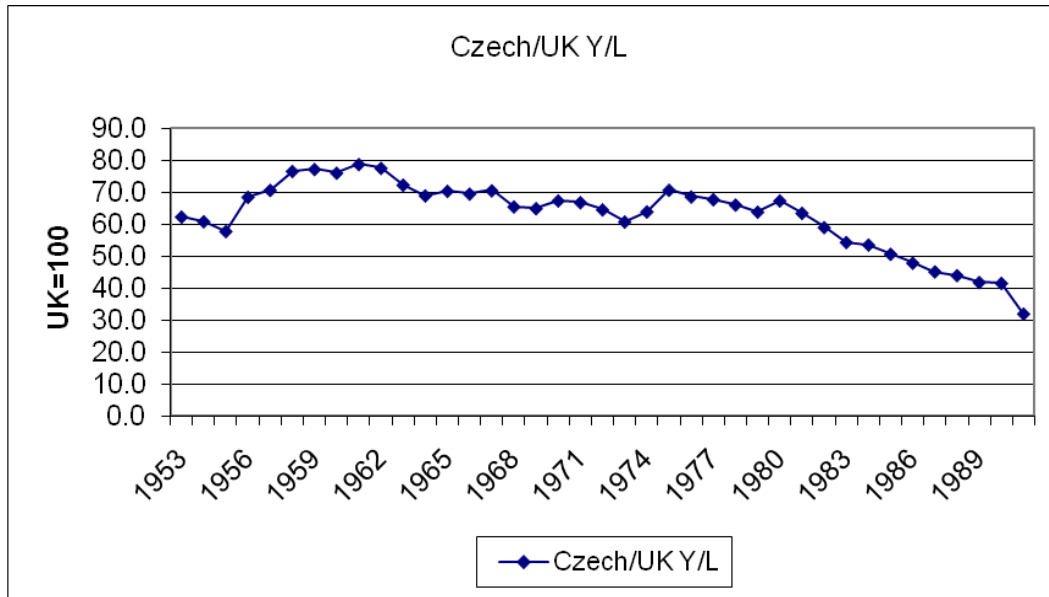
B. UK labour productivity (1935=100)				
	Output	Employment	Labour productivity	
1935	100.0	100.0	100.0	
1953	158.4	120.6	131.4	
1960	200.3	127.6	157.1	
1968	257.0	122.6	209.6	
1973	294.5	115.6	254.8	
1979	316.9	107.8	293.8	
1985	319.7	81.2	393.6	
1989	364.8	77.7	469.4	
1991	351.2	71.5	491.4	

C. Czechoslovak/UK labour productivity				
	1935=100			UK=100
	Czechoslovakia	UK	Czech/UK	Czech/UK
1935	100.0	100.0	100.0	64.1
1953	127.7	131.4	97.2	62.3
1960	186.3	157.1	118.6	76.0
1968	214.2	209.6	102.2	65.5
1973	241.7	254.8	94.8	60.8
1979	292.7	293.8	99.6	63.9
1985	311.4	393.6	79.1	50.7
1989	306.9	469.4	65.4	41.9
1991	246.0	491.4	50.1	32.1

Sources and notes: Industrial production: Czechoslovakia: 1935-1937: Pryor et al. (1971: 36); 1937-1965: Lazarcik (1969: 8-11); Alton et al. (1985: 7); 1975-1991: Alton et al. (1992: 16); UK: 1950-1991 from National Statistics, *Economic Trends Annual Supplement*, (2006, Table 2.8), linked to 1935 using Feinstein (1972: Table 51); Employment: Czechoslovakia: 1953-1988: *Statistická ročenka Československé socialistické republiky*; 1988-1991: *Statistická ročenka České a Slovenské Federativní republiky*; Employment in 1935 has been linked across World war II on the basis of the postwar boundaries, i.e. excluding Ruthenia, for consistency with Lazarcik's output

series. Industrial employment in Ruthenia in 1935 is assumed to be the same proportion of total industrial employment as in the 1930 employment census; UK: 1950-1991 from O'Mahony (1999: 76-77), linked to 1935 using Feinstein (1972: Table 59).

FIGURE 3: Comparative Czechoslovak/UK industrial labour productivity, 1953-1991 (UK=100)



Sources: See Table 7.

TABLE 8: Output and employment by industrial branch, 1989

A. Czechoslovakia				
	Gross value of production (Kčs m)	Value added (Kčs m)	Workers (000)	Employees (000)
Chemicals	138,003.00	54,502.00	112.96	172.20
Metal manufacturing	108,612.00	32,928.00	168.89	191.40
Engineering	285,182.00	118,823.00	1,014.15	1,072.30
Textiles & clothing	69,653.00	25,243.00	313.99	334.90
Food, drink & tobacco	137,965.00	20,735.00	155.04	211.70
Miscellaneous	93,871.00	38,710.00	325.05	344.10
MANUFACTURING	833,286.00	290,941.00	2,090.08	2,326.60
Mining & quarrying	39,154.25	18,179.17	169.13	134.08
INDUSTRY	872,440.25	309,120.17	2,495.73	2,224.17

B. United Kingdom				
	Gross value of production (£m)	Value added (£m)	Workers (000)	Employees (000)
Chemicals	46,574.70	16,514.60	331.90	542.50
Metal manufacturing	29,944.40	10,012.70	285.30	475.90
Engineering	106,537.00	39,898.90	1,102.60	1,795.90
Textiles & clothing	16,262.60	6,250.50	430.10	535.90
Food, drink & tobacco	55,029.40	13,267.80	461.20	597.90
Miscellaneous	54,672.00	22,346.40	639.80	1,005.10
MANUFACTURING	309,020.10	108,290.90	3,250.90	4,953.20
Mining & quarrying	4,417	2,401	98.90	85.00
INDUSTRY	312,720.20	110,321.30	5,043	3,329

Sources: Czechoslovakia: Gross value of production, value added, and number of employees from van Ark (1989: 308); Number of workers from Československá statistika, (1991: Table 13); Mining & quarrying from Federální statistický úřad (1990: pp. 7, 54, 55, 58). UK: Central Statistical Office (1991: Tables 1, 2).

TABLE 9: Shares of output and employment by industrial branch in 1989 (%)

A. Czechoslovakia		
	Value added	Employment
Chemicals	17.6	6.9
Metal manufacturing	10.7	7.7
Engineering	38.4	43.0
Textiles & clothing	8.2	13.4
Food, drink & tobacco	6.7	8.5
Miscellaneous	12.5	13.8
MANUFACTURING	94.1	93.2
Mining & quarrying	5.9	6.8
INDUSTRY	100.0	100.0

B. United Kingdom		
	Value added	Employment
Chemicals	15.0	10.8
Metal manufacturing	9.1	9.4
Engineering	36.2	35.6
Textiles & clothing	5.7	10.6
Food, drink & tobacco	12.0	11.9
Miscellaneous	19.9	19.7
MANUFACTURING	97.8	98.0
Mining & quarrying	2.2	2.0
INDUSTRY	100.0	100.0

Sources: Derived from Table 8.

TABLE 10: Czechoslovak/UK PPP in 1989 for industrial goods

	Number of unit value ratios	Matched sales as % of total sales		Unit value ratios (Kčs/£)		
		Czecho- slovakia	United Kingdom	Czechoslovak weights (Kčs/£)	UK weights (Kčs/£)	Geometric average (Kčs/£)
Chemicals*	2	-	-	15.53	15.53	15.53
Metal manufacturing	2	37.71	52.7	14.25	14.25	14.25
Engineering	6	15.13	33.12	14.11	20.04	16.82
Textiles & clothing	8	22.93	13.74	9.87	13.08	11.37
Food, drink & tobacco	12	21.25	15.34	9.58	9.62	9.60
Miscellaneous	5	15.34	1.5	13.14	12.96	13.05
MANUFACTURING	35	22.26	25.95	13.57	14.76	14.15
Mining & quarrying	1	78.47	81.66	6.58	6.58	6.58
INDUSTRY	36	24.71	27.06	13.16	14.38	13.76

Note: asterisk indicates prices matched from alternative sources, therefore matched percentage not available. Matched percentage for manufacturing and industry excludes chemicals.

Sources: Czechoslovakia: Engineering, textile and clothing, food, drink and tobacco, miscellaneous from data underlying van Ark (1996); Chemicals from Federální statistický úřad (1988: Table 10-3); Metal manufacturing from Federální statistický úřad (1988: Table 10-3) and Federální statistický úřad (1992: Table 10-3); Mining & quarrying from Federální statistický úřad (1992: Table 10-3). UK: Metal manufacturing from Statistical Office of the European Communities (1991: 127, 130) and Central Statistical Office (1991); Chemicals from Central Statistical Office (1988); Engineering, textile and clothing, food, drink and tobacco, and miscellaneous from Central Statistical Office (1990); Mining & quarrying from Department of Energy (1990: Table 66).

TABLE 11: Comparative Czechoslovak/UK industrial labour productivity in 1989

	Czech value added per employee (Kčs 000)	UK value added per employee (£ 000)	PPP (Kčs per £)	Czech/UK labour productivity (UK=100)
Chemicals	316.50	30.44	15.53	67.0
Metal manufacturing	172.40	21.04	14.25	57.4
Engineering (unadjusted)	110.81	22.22	16.82	29.7
Engineering (adjusted for quality)			(24.81)	(20.1)
Textiles & clothing	75.37	11.66	11.37	56.9
Food, drink & tobacco	97.95	22.19	9.60	46.0
Miscellaneous	112.50	22.07	13.05	39.1
MANUFACTURING	125.05	21.83	14.15	40.5
Mining & quarrying	107.49	24.28	6.58	67.3
INDUSTRY (unadjusted)	123.86	21.88	13.76	41.2
INDUSTRY (adjusted for quality)			(15.64)	(36.3)

Sources: Derived from Tables 7 and 10, with quality adjustment based on Table 12.

TABLE 12: Quality comparison of cars produced in Czechoslovakia and Britain**A. 1989 comparison**

Czechoslovak cars	Price in UK market (£)	British cars with equivalent specification	Price in UK market (£)	CZ/UK price ratio (UK=100)
Favorit 136L	4,858	Rover Metro 5-door 1.3 City X	6,559	74.1
		Rover Maestro 5-door 1.3 Special	7,095	68.5
		Ford escort 5-door 1.3 Popular Plus	7,584	64.1
Skoda 120L Five	3,698	Ford Fiesta 5-door 1.0 Popular	5,736	64.5
Average				67.8

B. 1965 comparison

Czechoslovak cars	Price in UK market (£)	British cars with equivalent specification	Price in UK market (£)	CZ/UK price ratio (UK=100)
1100 MB	479	Austin A40 de Luxe	495	96.8
		Austin 1100 de Luxe	505	94.9
		Ford Anglia 1200 Super	475	100.8
		Morris 1100 4-door de Luxe	505	94.9
Average				96.9

Sources and notes: The matching of cars was based on the following characteristics: wheelbase, track lengths, width, weight, engine capacity, number of cylinders, rpm, maximum speed, average fuel consumption, acceleration (0-80 kmph for 1965 comparison and 0-100 kmph for 1989 comparison). 1965 specifications from Culshaw and Horrobin (2006) and www.skoda-mb.prekladys.com and 1989 specifications from www.cars-data.com. Price data for 1965 from *Autocar*, (1965) and for 1989 from *Autocar & Motor*, (1989)

TABLE 13: Total factor productivity growth, 1953-1989

	Czechoslovakia	United Kingdom
1953-1965	3.1	1.8
1965-1973	1.4	2.7
1973-1979	1.3	1.3
1979-1989	-0.8	3.3

Sources: Output and employment: sources listed under Table 7. Capital: Czechoslovakia: Federální statistický úřad (1985); Federální statistický úřad (1985, 1989), *Statistická ročenka Československé socialistické republiky*; Federální statistický úřad (199), *Statistická ročenka České a Slovenské Federativní republiky*. UK: Feinstein (1972); Central Statistical Office, *National Income and Expenditure of the United Kingdom*.

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