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Patterns of growth and stagnation in the late nineteenth century Habsburg economy

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This article addresses two issues that feature prominently in the recent historiography. First, how does the Habsburg Empire's economic performance compare to the record for other European economies in terms of levels and growth of national income? Second, to what extent was the Austrian economy subject to prolonged stagnation after 1873? These questions are examined on the basis of new annual estimates of GDP for Austria and Hungary for 1870 to 1913. The article argues, first, that over the whole period under review Austrian *per capita* income failed to expand at a pace broadly commensurate with the country's relative income position. The Austrian economy did not catch up with the leaders and failed to keep pace with other 'followers'. Second, the Hungarian economy recorded a markedly higher rate of *per capita* income growth, placing it about mid-range in a European growth comparison. Third, the new evidence supports the notion of a 'great depression' in the western half of the empire (Austria) after 1873. The distinct periodicity and differential rates of Austrian and Hungarian growth are consistent with the argument that the outflow of Austrian capital to Hungary after the 1873 Vienna stock market crash was crucial in prolonging economic stagnation in Austria, whilst fuelling the first widespread wave of industrialisation in Hungary. The reversal of this capital outflow in the early 1890s was associated with an increase in Austrian economic growth and a decrease in Hungary's rate of expansion.

1. Introduction

The Habsburg Empire, one of the largest economies on the European Continent before 1918, rarely features in comparative studies of long-run growth for, it seems, two major reasons. First, the empire was dissolved in the aftermath of the First World War and gave way to a multitude of successor states. Consequently, the Habsburg economy cannot be included readily in comparative data sets that encompass the twentieth century. Second, much of Central and Eastern Europe lies in a 'statistical dark age' compared to Western Europe (Good 1994).

This article presents new annual estimates of GDP for Austria and Hungary for 1870 to 1913. These estimates are used to address two issues that feature prominently in the recent historiography. First, how does the Habsburg Empire's economic performance compare to the record for other European economies in terms of levels and growth of national income? Williamson (1996) argued recently that the late nineteenth century witnessed a process of rapid growth and convergence in living standards, at least among those countries that now form the OECD. Poor countries at the European periphery tended to grow faster than the developed economies at the centre and often even faster than the richer countries overseas in the New World, while most of the Third World and Eastern Europe did not share in this experience. Placed somewhere midrange on the west-east developmental gradient in Europe and displaying a similar pattern of regional disparities within its own boundaries (Good 1984), where does the Habsburg Empire fit in? Second, to what extent did the Austrian economy experience prolonged stagnation after 1873 (Komlos 1983, März 1985, Schulze 1997)?

The first attempt at a systematic estimation of national income in the Habsburg Empire and its two major subunits, imperial Austria (Cisleithania) and imperial Hungary (Transleithania), was made during the First World War (Fellner 1916, Gürtler 1918). Subsequently, the dissolution of the empire stimulated Fellner (1923) and Waizner (1928) to determine pre-war income levels in the successor-state units. These calculations were concerned solely with income levels in 1911–13 and no attempt was made to derive estimates for the nineteenth century. This early body of work was taken up again by Eckstein (1955) who estimated national income and capital formation in 1900–1950 for Hungary in its interwar boundaries to which the country reverted after World War II. In the 1960s, Nachum Gross in his doctoral thesis on Austria's industrialisation (1966) re-worked Fellner's (1916) and Waizner's (1928) material and complemented it by estimates for earlier benchmark years. This marked the shift in emphasis from predominantly qualitative and descriptive work to quantitative-analytical research in Habsburg economic history.

Much of the initial work in the new vein reflected the search for a major Rostovian or Gerschenkronian economic discontinuity and has led to new annual estimates of sectoral production. The most significant quantitative contributions are the industrial and agricultural production indices of Komlos (1983), which are on both methodological and empirical grounds generally recognised as the best produced so far, and the detailed account of Austrian agricultural production by Sandgruber (1978). Rudolph's (1976) earlier calculations of industrial output are important in this context primarily because they form an integral part of the one annual estimate of Austrian national income that has been produced so far (Kausel 1979). Its derivative, which refers to the territories of modern-day Austria, is included

in the much used Maddison data sets (Maddison 1995). For Hungary, the new GDP estimate presented here is the first annual series of national income for the late nineteenth century. However, earlier attempts at measuring aggregate growth have been made on the basis of estimates for two benchmark years such as Katus's (1970) computation of Gross Domestic Material Product for 1867 and 1913.

More recently, David Good adopted a Crafts-type structural equation approach to estimate *per capita* income levels for five benchmark years in the Habsburg Empire as a function of several proxy variables (Crafts 1983, Good 1991, 1994, 1997; Good and Ma 1998). The main purpose of this work is to estimate relative income levels of the regions and successor-state territories of the Habsburg Empire. Yet it has also been used to assess the relative growth performance of Austria-Hungary. The proxy approach may be a feasible way to approximate output at regional levels for which standard national income measures cannot be computed because of the lack of essential data. For theoretical and conceptual reasons, though, it does not offer an alternative to the national income approach where that can be employed (Maddison 1990; Pammer 1997).[1]

The main comparator for the new estimates is those existing annual estimates of GDP that build on standard national income methodology, that is, Kausel (1979). For Hungary, no such comparable estimates exist. Katus's (1970) figures do not permit an assessment of the phasing of aggregate economic growth as they include only estimates for the very beginning and the very end of the period under review. The re-estimation of GDP involved the construction of new series for secondary sector output. Here, the relevant comparison is with Komlos's (1983) indices for both Austria and Hungary. Table 1 summarises the main results of research on the rate of economic growth in the Habsburg Empire.

This article argues, first, that economic growth in the western half of the empire (imperial Austria) failed by a significant margin to keep pace with rates achieved in most other European economies. In terms of *per capita* income growth, the Austrian economy was not catching up, but falling behind in the late nineteenth century. Hungary, in contrast, recorded a

[1] Pammer (1997) argues that the procedure yields statistical artefacts in terms of both absolute income levels and rates of income growth over time. He maintains that, first, the income estimates are biased as a result of inappropriate functional specification of the estimation equation and the application to relatively backward regions of coefficients which were estimated on the basis of data for relatively advanced economies. Second, individual country effects alter or offset the impact of variables generally associated with income; hence they severely restrict the validity of using these proxy variables (such as crude death rates, the share of the agricultural labour force, and letters posted) for predicting income in other economies. Finally, he questions the validity of using proxy variables that are not theoretically linked to GDP. See Good (1997) and Good and Ma (1998) for a response and revised estimates.

Table 1. *Estimates of GDP per capita growth (per cent per annum).*

	1870–1890	1890–1910	1870–1910
Imperial Austria			
Good (1978)	1.77[a]	1.80[b]	1.78[c]
Kausel (1979)	1.24	1.38	1.31
Good and Ma (1998)	1.10	1.31	1.20
New estimate	*0.70*	*1.35*	*1.03*
Imperial Hungary			
Katus (1970)	–	–	1.67[d]
Good and Ma (1998)	1.49	1.51	1.50
New estimate	*1.48*	*1.26*	*1.37*
Habsburg Empire			
Good and Ma (1998)	1.20	1.36	1.28
New estimate	*0.99*	*1.32*	*1.15*

Notes: [a]1873/75–1895/97; [b]1895/97–1911/13; [c]1873/75–1911/13; [d]GDMP, 1867–1913
Sources: Appendix, Tables A1, A2, for new estimates. References for other figures.

higher than average rate of *per capita* income growth. Second, the new evidence is more in tune with interpretations that postulate a marked slowdown in Austrian economic activity during the 1870s and 1880s, the 'Great Depression' (Komlos 1978, 1983; März 1985; Schulze 1997), than with the 'revisionist' argument of almost uniform growth between 1870 and 1913 (Good 1974, 1978, 1984). Third, the distinct periodicity and differential rates of Austrian and Hungarian growth are consistent with the argument that the outflow of Austrian capital to Hungary after the 1873 Vienna stock market crash was crucial in prolonging economic stagnation in Austria, whilst fuelling the first widespread wave of industrialisation in Hungary (Komlos 1983). The rest of the article is organised as follows: Section 2 describes briefly the derivation of the new GDP estimates, with details on methods and sources provided in the Appendix. Section 3 offers a comparison with earlier estimates of GDP and industrial production. Finally, Section 4 summarises the results and points to some of their implications.

2. Deriving GDP estimates for the Habsburg Empire

The new estimates of Austrian and Hungarian GDP in constant 1913 prices are based on eight sectoral series (agriculture, mining, manufacturing, construction, handicrafts, trade and communications, public and private services, housing).[2] These output series and their constituent sub-series are

[2] The estimates for 'Austria' refer to all *Kingdoms and Lands represented in the Imperial Council*, those for 'Hungary' to all territories of the Hungarian crown (Hungary proper, Fiume, Croatia-Slavonia). Bosnia-Hercegovina, occupied in 1878 and annexed by Austria-Hungary in 1908, is not included in the estimates.

combined using constant 1913 value added shares as weights.[3]

Total gross value added (or GDP) for 1913 and its sectoral components are reconstructed on the basis of estimates by Fellner (1916; for Austrian non-state regulated manufacturing, Hungarian manufacturing and handicrafts production), Gürtler (1918; for Hungarian agriculture), Katus (1970; for Hungarian construction, trade, transport and communications), Kausel (1979; for Austrian trade, transport and communications, public and private services, housing), Komlos (1983; for Austrian and Hungarian mining), and Waizner (1928; for Austrian agriculture, state regulated manufacturing, construction, handicrafts).[4] In addition, new estimates have been produced for Austrian and Hungarian iron and steel production. Value added as documented in Table 2 was projected backwards drawing on a broad range of sector-specific output indices. The methods and sources used in the derivation of these indices are set out in the Appendix.

3. A comparison with earlier estimates of GDP and industrial output

Kausel draws on Waizner's estimates of net national income for 1911/13 which he projected backwards after rebasing them to 1913 and conversion into gross value added format. The main data sources for extrapolation are Sandgruber (1978) for agricultural production, an index of industrial output compiled by Rudolph (1976), estimates of industrial production for several census years and an approximation of national income for 1841 made by Gross (1966). Estimates for the tertiary sector are made largely on the basis of material published in Brusatti (1973). However, virtually all of the substantial difference between Kausel's results and the new GDP calculations is due to the different data and methods used in estimating output in the mining and secondary sectors.

Gross (1966) has produced estimates of industrial output in current prices for 1841, 1865, 1880, 1885 and 1911/13, and deflated these using a German wholesale price index. Rudolph (1976), in contrast, compiled a weighted

[3] There are some minor exceptions to this rule. First, Sandgruber's (1978) index of output of fieldcrops and wine, which forms the core of the estimate of agricultural production, draws on average 1911/13 quantities and prices as weights. Second, the new estimate of construction output rests on a composite index which uses 1907 weights derived from Hoffmann (1965). Third, the value-added estimates for steel refining and electricity generation are measured in 1911 prices, and the estimate for petroleum output is given in 1912 prices.

[4] Many of the sectoral output data provided by Fellner (1916), Gürtler (1918) and Waizner (1928) are either for single years between 1911 and 1913 or a period average over these years. As a rule, their figures have been converted into 1913 prices, relying on product-specific price indices from Mühlpeck *et al.* (1979) and rebased to 1913 using branch-specific production indices.

Table 2. *Composition of gross value added, 1913.*

	Austria		Hungary	
	m. K	Share	m. K	Share
Fieldcrops, wine, vegetables	2,517.0	0.131	3,823.2	0.348
Fruit	267.8	0.014	159.5	0.015
Livestock	1,363.8	0.071	1,065.8	0.097
Forestry	106.9	0.006	125.9	0.011
Mining	360.5	0.019	122.9	0.011
Beer	230.7	0.012	38.8	0.003
Sugar	74.2	0.004	38.5	0.003
Tobacco	31.3	0.002	24.5	0.002
Spirits	32.6	0.002	27.2	0.002
Petroleum	142.8	0.007	20.8	0.002
Iron and steel	258.9	0.014	121.3	0.011
Mechanical engineering	316.3	0.017	93.0	0.008
Transport engineering	103.5	0.005	42.7	0.004
Electrical engineering	45.0	0.002	31.9	0.003
Instruments and apparatus	63.7	0.003	#	#
Metal-working	406.6	0.021	106.9	0.010
Brick, clay, glass	366.8	0.019	103.7	0.009
Flour	112.9	0.006	115.1	0.010
Food processing	707.8	0.036	277.4	0.025
Textiles, clothing, leather, rubber	1,045.3	0.054	114.0	0.010
Electricity generation	60.3	0.003	27.4	0.002
Fuel and light	102.8	0.005	36.4	0.003
Other*	728.4	0.038	324.1	0.030
Construction	451.7	0.024	220.0	0.020
Handicrafts	1,522.4	0.080	512.6	0.047
Trade, transport, communications	3,278.0	0.171	930.0	0.085
Public and private services	2,676.0	0.140	1,449.2	0.132
Housing	1,767.0	0.092	1,019.3	0.093
GDP	19,140.8	1.00	10,971.6	1.00

Notes: * Includes wood-working, paper-making, printing, chemicals, misc. # Included under electrical engineering.
Sources: See text.

annual index based on volume indicators for five branches (mining, metal-making, machine-building, food processing, textiles). For 1870 to 1913, Kausel 'joined' these two series in a not altogether transparent way such that their mean rate of growth was taken to reflect the long-run rate of growth of industrial production. Rudolph's annual values were then incorporated into this 'frame' by interpolation. The series so obtained was then used to project backwards total value added in mining, manufacturing, handicrafts production and construction. This procedure and the underlying estimates entail several problems which severely impede the quality of Kausel's

results. First, Gross's observations do not lend themselves to any measurement over time since the underlying original (census and survey) data were generated by using different methods and gathered unsystematically relative to the business cycle (Komlos 1983; cf. Huertas 1977). Some of the dates of the estimates are closer to troughs while others are closer to peaks and, therefore, growth rates cannot be calculated properly. Second, the examination of the composite's sub-series reveals that Rudolph's index is biased in a different way. The main problem here is that the Hungarian trade statistics have not been used to isolate Austria's share in the Habsburg Empire's foreign trade and constant coefficients have been used instead. Moreover, the substantial internal trade between the two halves of the empire is not taken into account. As a result, the actual consumption of industrial input materials is seriously misrepresented by most of the sub-series. Rudolph's index and Kausel's derivative, first, overestimate the rate of industrial growth between 1870 and 1913, and, second, mask important variations over the business cycles. This is what a comparison with both the new industrial output estimates presented here and Komlos's indices would suggest.[5]

In order to gauge the extent of the bias thus introduced into Kausel's GDP estimates, Table 3 compares trend growth rates of the new estimates with those of both the original and adjusted versions of the Kausel data.[6]

Table 3. *Trend rates of growth, GDP per capita (per cent per annum).*

	Imperial Austria						Imperial Hungary		
	New estimate			Kausel	Kausel A1	Kausel A2	New estimate		
		Lower bound	Upper bound					Lower Bound	Upper Bound
1870–1913	1.08	0.99	1.17	1.33	1.12	1.11	1.34	1.20	1.48
1870–1895	0.71	0.58	0.84	1.19	0.89	0.71	1.85	1.57	2.13
1895–1913	1.49	1.32	1.67	1.47	1.31	1.47	1.15	0.78	1.52

Notes: Kausel A1: Kausel estimate adjusted, using Komlos's industrial output index; Kausel A2: Kausel estimate adjusted, using new industrial output index (Table A1); Lower, upper bounds: 95% confidence interval.
Sources: Appendix, Tables A1, A2; Kausel (1979), Komlos (1983: Table E4).

[5] Komlos (1983) offers a detailed critique of the Rudolph index. For a discussion of Rudolph's treatment of the engineering sector, see Schulze (1996).

[6] Fitted log-linear trend, using OLS. For the new estimates for Austria (1870–95), the results of the Chow predictive failure and structural stability tests are significant at the 5 and 1 per cent levels respectively, suggesting a structural break in trend growth in the early to mid-1890s. For Hungary, the structural stability test also points in this direction (significant at the 1 per cent level). Hence fitting a linear trend over the *whole* period under review may not be particularly useful.

The two sub-periods 1870–95 and 1895–1913 have been chosen in accordance with the literature which, conventionally, views the early to mid-1890s as marking the end of the Great Depression in Austria. Kausel's level estimates have been adjusted by keeping his original 1913 sectoral value-added shares unchanged,[7] but substituting Komlos's (1983) index of mining, manufacturing and construction and, alternatively, the new estimate of industrial production for his industrial output series. Table 3 (Kausel A1) shows that using Komlos's index leads to a reduction in the overall rate of growth and, perhaps more significantly, to a widening of the growth differential between the two sub-periods. These effects are even more pronounced when the new industrial output estimates are used for adjustment rather than those of Komlos (Table 3, Kausel A2). In terms of growth, the Kausel estimates so adjusted hardly differ from the new GDP *per capita* estimates, displaying a large growth gap of about 0.7 of a percentage point between the 1870–95 and 1895–1913 periods.

For Hungary, the timing of economic expansion seems to mirror the Austrian experience in reverse. Trend growth was much faster during 1870–95 than it was in the following years to 1913 (Table 3). This growth differential and the lower rate of growth over the whole period contrast with Good and Ma (1998). It should be emphasised that adjusting the new GDP estimates for Hungary by replacing the new secondary sector estimates with the Komlos industrial output index, in a fashion identical to the adjustments of the Kausel estimates, makes no material difference to this finding.[8] The main message of Table 3 is, therefore, that both the timing and the rates of *per capita* income growth in the Habsburg Empire were markedly different from what earlier estimates suggested.

Table 4 shows that in Austria all major sectors of the economy grew more rapidly after the mid-1890s than before. The growth differential, though, was widest in the secondary sector (including mining). In Hungary, on the other hand, the pattern was more complex. Here it was agriculture that decelerated more strongly than industry, whilst growth in services even increased after 1895. In both halves of the empire, however, the secondary sector was by a significant margin the fastest growing sector over each of the two sub-periods. As a result, its share in constant price GDP increased from 28 per cent (1870) to 37 per cent (1913) in Austria, and from about 11 to 22 per cent in Hungary (Tables A1, A2).

Virtually all of the difference between Kausel and the new GDP estimates

[7] Building on Waizner's (1928) work, Kausel's (1979) 1913 gross value-added shares are as follows: (1) agriculture, forestry: 0.203; (2) mining, manufacturing, crafts, construction: 0.385; (3) trade, transport: 0.175; (4) public and personal services: 0.142; (5) housing: 0.095. These shares are, overall, fairly close to those used in the new estimates (see Table 2).

[8] The trend growth rates of GDP *per capita* so adjusted are: (a) 1870–1913, 1.27 per cent; (b) 1870–95, 1.72 per cent; (c) 1895–1913, 1.11 per cent per annum.

Table 4. *Annual growth by sector (per cent).*

	Austria				Hungary			
	Primary	Secondary	Tertiary	GDP	Primary	Secondary	Tertiary	GDP
1871–1912	1.40	2.46	1.63	1.85	2.08	3.78	1.43	2.15
1871–1895	1.38	1.84	1.28	1.44	2.41	4.23	1.30	2.32
1895–1912	1.43	3.34	2.10	2.43	1.59	3.10	1.63	1.90

Note: Peak-to-peak measurement. Since the peaks in the individual series do not correspond exactly with one another, the periods of measurement are not always identical.
Sources: Appendix, Tables A1, A2.

is down to the different treatment of the secondary sector.[9] However, the new estimates also express a more pronounced temporal pattern of output expansion in the secondary sector than the Komlos (1983) production indices. The overall rate of Austrian industrial growth was practically equal to that estimated by Komlos, but the growth gap between the sub-periods before and after 1895 was much wider (Table 6). For Hungary, the new estimates indicate a higher rate of industrial expansion for 1870–1913 and the two sub-periods (Table 7). Both estimates agree, however, on the sharp deceleration after the mid-1890s.

These differences result from the inclusion of additional output series not covered in the Komlos indices, from revisions in series such as iron and textiles, and from the different weighting of industrial branches in the aggregate. The Komlos overall index is calculated as the unweighted sum of value added in individual industrial sectors, measured in constant prices. However, weighting is introduced implicitly by the 1913 relative prices with which the sub-series have been combined. Given that the sub-series of the index do not span the full range of industrial sectors, this kind of implicit weighting leads to different results than the explicit weighting adopted here. First, handicrafts production, which in 1913 accounted for more than a fifth of total secondary sector output in both Austria and Hungary (Table 2), is not included in the Komlos estimates. Second, construction, constituting about 6 and 9 per cent of Austrian and Hungarian value added in the secondary sector (Table 2), is represented in the Komlos index only by railway building and maintenance. In contrast, the new estimates (especially for Austria) also comprise road and waterway construction, a proxy for commercial investment in buildings and a series for residential construction (see Appendix). Third, the Komlos manufacturing series includes eight subseries (beer, sugar, spirits, iron, flour, woollen textiles, cotton textiles, electricity), while the new estimates build on about double that number. The

[9] This is confirmed by substituting the new agricultural output index for Kausel's series which has no effect on GDP *per capita* growth. Both the new estimates and Kausel rely largely on Sandgruber (1978) for the computation of output in agriculture and forestry.

weights of each of these eight branch series in the aggregate of the new manufacturing series are accordingly lower. Fourth, among the new additional output series are some, such as the engineering branches, which display a particularly high degree of responsiveness to variations in aggregate economic activity.

Tables 5 to 7 illustrate the relative extent to which differences between Komlos and the new estimates for 'industry' are due to different weights

Table 5. *Shares in industrial value added, 1913.*

	Austria		Hungary	
	New estimate	Komlos	New estimate	Komlos
Mining	0.050	0.190	0.051	0.186
Manufacturing	0.674	0.792	0.643	0.747
Handicrafts	0.213	–	0.214	–
Construction	0.063	0.018	0.092	0.067

Sources: Table 2; Komlos (1983: Tables E5, E6, E10, E12, E14)

Table 6. *Annual growth of industrial output, Austria (per cent).*

	New estimate					Komlos			
	Mining	Manuf.	Crafts	Constr.	Total	Mining	Manuf.	Constr.	Total
1871–1912	3.76	2.51	2.41	1.56	2.46	3.76	2.36	−0.88	2.36
1871–1895	4.15	1.89	1.75	0.78	1.84	4.15	2.13	−2.61	2.07
1895–1912	3.24	3.39	3.34	2.53	3.34	3.24	2.68	1.84	2.76

Note: Peak-to-peak measurement. Since the peaks in the individual series do not correspond exactly with one another, the periods of measurement are not always identical.
Sources: See text for new estimates; Komlos (1983: Tables E6, E14).

Table 7. *Annual growth of industrial output, Hungary (per cent).*

	New estimate					Komlos			
	Mining	Manuf.	Crafts	Constr.	Total	Mining	Manuf.	Constr.	Total
1871–1912	3.42	4.09	3.81	2.44	3.78	3.42	3.80	0.26	3.08
1871–1896	3.34	4.42	4.27	3.72	4.23	3.34	4.36	0.75	3.46
1896–1912	3.52	3.57	3.08	0.36	3.10	3.52	2.98	−0.71	2.51

Note: Peak-to-peak measurement. Since the peaks in the individual series do not correspond exactly with one another, the periods of measurement are not always identical.
Sources: See text for new estimates; Komlos (1983: Tables E5, E14).

and the different treatment of the handicrafts, construction and manufacturing sectors.

The first point worth noting is mining's much lower weight in the new estimates (Table 5). Albeit from a comparatively low base, this was a sector that, in Austria, expanded faster during the first two decades under review than thereafter. In Hungary, there was no significant difference in the growth of mining during the two sub-periods. The new estimates, being based on the total of value added in the industrial sector rather than on a sub-sample, correct for the implicit weighting bias by reducing the overall weight of this branch in the industrial aggregate.

Second, construction is also given a more prominent weight. However, in comparison to Komlos, the new construction indices for both halves of the empire entail positive rates of expansion over all sub-periods, and, for Austria, a much less pronounced growth differential between the two sub-periods (Tables 6, 7).[10] Hence this treatment of the construction sector is, if at all, biased *against* the view advanced here. The new construction series are more comprehensive, as noted above, and cyclically far less volatile than series based on railway construction alone.

Third, according to Fellner (1916) and Waizner (1928) the handicrafts sector accounted for approximately one fifth of secondary sector output (including mining) before the First World War. It is not incorporated in the Komlos estimates. Here, a value added share weighted index of manufacturing and construction has been used as a proxy (see Appendix). This feeds into an overall rate of 'industrial' growth in Austria that is slightly higher for the whole period, lower for 1871–95 and higher for 1895–1912 (Tables 6, 7).

Finally, manufacturing assumes a lower weight in the new estimates of industrial output than in the Komlos index (Table 5). Again, this is an outcome of explicit weighting and the fuller coverage of industries that make up the secondary sector as a whole. Irrespectively, it is manufacturing that primarily drives the pattern of expansion of the secondary sector and makes for much of the difference between Komlos's and the new estimates. The latter cover an additional set of manufacturing branches that (1) expanded fairly rapidly over the whole period and (2) more importantly displayed pronounced growth differentials between the two sub-periods in both Austria and Hungary. These include the engineering and metalworking industries. The coverage of those branches, in turn, implies a reduction in the weight accorded to other branches within manufacturing. Tables A3 and A4 present annual output indices for groups of related manufacturing branches, documenting the effects of the wider coverage of the new estimates. For example, Austria's engineering sector as a whole (mechanical

[10] In Tables 6 and 7, growth in Komlos's railway construction series has been measured to 1909 (Austria) and 1908 (Hungary). This leads to higher estimated growth than had the lower 1912 'peaks' been used.

engineering, transport engineering, electrical engineering, instruments and apparatus) expanded at 2.7 per cent per annum between 1872 and 1895, but at 7.6 per cent thereafter. Hungarian engineering output, on the other hand, increased at a higher rate before the mid-1890s than after, though the growth differential was not nearly as wide as for Austria.

4. Results and implications

The new GDP estimates suggest a pattern of Habsburg economic growth that is distinctly different from that implied in earlier national product estimates. First, Austria's GDP *per capita* grew by only 1 per cent per annum between 1870 and 1913 (Table 1). Whilst confirming the tendency towards downward adjustment of the Austrian growth rate during the last twenty or so years of research, this result places Austria near the bottom of the European growth league for the period under review (Table 8). Second, economic growth in Hungary was faster than in the western half of the empire and this result matches with most previous estimates. In European comparison, Hungarian *per capita* growth of 1.3 per cent per annum was about mid-range. Third, for both halves of the empire the new estimates reflect a pattern of expansion that was far from uniform over time. The comparative growth rates presented in Tables 1 and 3 indicate that Austrian growth in the two decades after 1870 proceeded at a rate between 0.4 and 0.5 of a percentage point below Kausel's and Good and Ma's (1998) estimates. Moreover, the increase in the rate of growth of Austrian *per capita* GDP after 1890 was not on a par with that achieved elsewhere. The post-1890 period was one of incomes generally rising at higher rates than before. The unweighted average growth rate for twelve European countries rose from 1 per cent per annum for 1870–90 to 1.5 per cent for 1890–1913 (Table 8, excluding Switzerland). Finally, in contrast to previous estimates, Hungarian GDP *per capita* growth decelerated after 1890 to a rate below the European average. This was to a considerable extent an outcome of the sharp slow-down in agriculture after 1906, when it was still the dominant sector in terms of both output and employment. Service sector output even accelerated during this period and although industrial growth was slower than in the preceding two decades, it still continued at an annual rate of more than 3 per cent to 1912 (Table 4). These results raise several questions about the process of growth in the Habsburg Empire.

4.1. The pace of growth

The literature stresses the eighteenth century antecedents of nineteenth century economic expansion in Austria (Good 1984, Komlos 1983). John Komlos (1989) went even further and argued that the industrial revolution in Austria began at about the same time as in Britain, though without imply-

ing that it even spread at nearly the same rate as there. Viewed against this background, it seems a little surprising that the late nineteenth century Austrian economy did not display the growth characteristics of a typical Gerschenkronian latecomer to industrialisation. However, the comparatively low rate of Austrian *per capita* GDP growth is equivalent to that achieved in *advanced* economies such as Britain and Belgium, which by 1870 had *per capita* incomes about twice the level of imperial Austria. The growth experience of economies in the south-east of the Continent makes Austria's record appear much less unfavourable in European comparison. Bulgaria and Serbia, for instance, suffered actual falls in *per capita* output during the late nineteenth century (Palairet 1997).[11] Yet in the broad context of European growth in the period this was an extreme experience and the problem remains: if initially low levels of *per capita* output (or labour productivity) entail the potential for faster growth than in the more advanced economies (Gerschenkron 1962, Abramovitz 1986), then the question arises why the western half of the empire failed to expand at a pace broadly commensurate with its relative GDP position. For example, the economies of three other European countries with roughly comparable levels of *per capita* GDP in 1870, that is, Italy, Spain and Norway, grew markedly faster during the period up to 1913 (Table 8). Using Good and Ma's (1998) 'imperial Austria/modern Austria' ratios to make some tentative approximations of *per capita* output levels in the territories of modern Austria, we might ask by the same token why the economically most advanced part of the Habsburg Empire failed to keep pace with the expansion achieved in countries such as Denmark, France and Germany, all of which had broadly similar GDP *per capita* levels in 1870. Nachum Gross (1966, p.96) argued that 'long-run industrial growth in nineteenth century Austria was not sufficiently rapid to make her economy relatively less backward at the end of the period than it had been in the middle of the century'. The new evidence on economic growth supports this assessment. Moreover, given her dominant weight in total output of the empire, imperial Austria's lacklustre performance meant that the customs union's growth record was also poorer than that of most other European economies.

[11] The magnitudes implied in Palairet's (1997, pp. 323–27) detailed reconstruction of national product for Serbia and Bulgaria in 1910 do not match with the results of the proxy approach. First, according to Good and Ma (1998), Serbia's *per capita* GDP was about 3 per cent above that of Bulgaria while Palairet's calculations suggest that it was 26 per cent below the Bulgarian level. Second, Good and Ma's estimates place Serbia right at the top of the European growth league with a rate of 1.8 per cent per annum for 1870 to 1910, and Bulgarian GDP is reported to have grown by 1.3 per cent during 1890–1910. In contrast, Palairet argues that Serbian *per capita* income shrank by at least 0.2 per cent per annum between 1863 and 1910 and that Bulgarian *per capita* product is also likely to have fallen.

Table 8. *Levels of GDP per capita (1990 Geary-Khamis $).*

	1870	1890	1913	Δ (% p.a.)
				1870–1913
Imperial Austria	1,421	1,635	2,222	1.05
Imperial Hungary	978	1,313	1,722	1.32
Habsburg Empire	1,230	1,498	2,008	1.15
Modern Austria#	1,856	2,077	2,871	1.02
Belgium	2,640	3,355	4,130	1.05
Denmark	1,927	2,427	3,764	1.57
Finland	1,107	1,341	2,050	1.44
France	1,858	2,354	3,452	1.45
Germany	1,820	2,412	3,647	1.63
Italy	1,467	1,631	2,507	1.25
Netherlands	2,640	3,228	3,950	0.94
Norway	1,303	1,617	2,275	1.30
Spain	1,376	1,847	2,255	1.16
Sweden	1,644	2,086	3,096	1.48
Switzerland	2,172	n/a	4,207	1.55
UK	3,263	4,099	5,032	1.01
USSR	1,023	925	1,488	0.88

Note: # New estimate using Good and Ma's (1998) 'imperial Austria/modern Austria' ratios.
Sources: See text for Austria-Hungary; Maddison (1991, 1995).

4.2. The periodicity of growth

The very low rates of *per capita* growth between 1870 and 1890, both relative to rates of expansion achieved elsewhere in Europe during this period and relative to Austria's post-1890 record, are an expression of the Great Depression that affected the western part of the Habsburg Empire after 1873 (März 1968, 1985; Komlos 1978). Moreover, the distinct timing and differential rates of Austrian and Hungarian growth are consistent with the view that the direction of intra-empire capital flows played a crucial role in prolonging economic stagnation in Austria after the 1873 Vienna stock market crash and fostering economic expansion in Hungary. Subsequent to the crash and as a result of Austrian investors' preferences for safe bonds, capital left Austria for Hungary (Komlos 1983; cf. Pammer, 1998). This outflow of capital was paralleled by a dramatic contraction in machinery investment and low rates of industrial growth. In Hungary, on the other hand, the inflow of Austrian funds allowed a substantial increase in investment and was instrumental in stimulating a process of rapid industrialisation (Schulze 1997). These trends were only reversed in the late 1880s/early 1890s when capital was repatriated to Austria and industrial activity there picked up again, coinciding with a slow-down in Hungarian growth. In contrast to the argument advanced in Good (1974, 1978, 1984), the evidence

on aggregate growth shows that Austria's Great Depression was not a myth or a phenomenon confined to price deflation, but a long-lasting slowdown of the real economy (Table 3).[12] This finding raises the question about the long-term impact of this depression on the pace of growth. For instance, to what extent were the institutional and structural changes that emerged in Austria during this period detrimental to more rapid growth subsequently?[13] For what looked like a relatively favourable income position in 1870 was to be eroded during the protracted stagnation of the 1870s and 80s and, most importantly, was not to be regained in the following decades to 1913. By the time of the First World War, imperial Austria's relative income position had deteriorated against nine of the 13 other countries in Table 8 when compared with 1870.

To some extent a better understanding of the nature of this prolonged stagnation requires a look back to the preceding decades. To what extent was Austria's economic performance during the Great Depression marked not only by a deviation from its course after, say, 1890 but also from what was happening before 1870? Unfortunately, the data at our disposal are severely limited. There are no annual estimates of national product that would permit a reasonably satisfactory assessment. Yet some observations can be made nevertheless on the basis of industrial output.

During the 1860s, there came first a sharp downturn in Austrian industrial production (1862) which was eventually followed by extremely rapid recovery growth from 1866. The initial contraction was first and foremost an outcome of the cotton famine associated with the American civil war, which led to a 56 per cent fall in cotton imports in 1862. In its wake, output in other manufacturing branches contracted too, albeit at considerably lower rates than in the cotton industry (Liese and Schulze 1993). It seems probable, however, that the available data overestimate somewhat the effect of this exogenous shock on manufacturing output and subsequent expansion. The 1913 weight of cotton textiles in Komlos's manufacturing index (Komlos 1983, Table E6) is far higher (27 per cent) than it would be if the full range of manufacturing branches were covered in the index (12 per cent). These problems notwithstanding, the evidence on industrial growth points to rapid expansion prior to 1870, a marked slowdown thereafter and acceleration from the mid-1890s. Using an index for mining, manufacturing and construction in Austria and measuring from peak to peak, the following average annual rates apply: 1846–71, 3.66 per cent; 1871–95, 2.07 per cent; 1895–1912, 2.76 per cent.[14]

[12] See note 6.

[13] This question is the subject matter of current research.

[14] Komlos (1983, Table E4). Note that the high growth rate for 1846–71 is not solely an outcome of the boom of the late 1860s. During 1846–61 industrial output increased at a rate of nearly 3 per cent per annum, i.e. at almost one percentage point above the rate for 1871–95.

The phasing of expansion in Hungarian industry is in line with the pattern that Komlos has drawn, even if growth rates differ somewhat over individual cycles. There was rapid growth between 1870 and the early 1890s, a marked slow-down up to 1906 and renewed vigorous growth again to the last peak before the First World War (1912). As such the new estimates of industrial output support the argument that the timing of economic growth in Hungary was influenced not only by changes in the volume and direction of intra-empire capital flows, but also by the related changes in government expenditure and movements in Hungary's terms of trade *vis-à-vis* Austria. The latter improved during the 1880s and 1890s (causing a rise in Hungarian real incomes), worsened from 1898, and turned favourable again after 1906. The transfer of funds from Austria after 1873 was associated with fiscal expansion. With the repatriation of Austrian capital in the mid-1890s, growth in government expenditure slowed to a rate below the increase in taxes and government investment stagnated. From 1906, government expenditure grew again far faster than taxes. Though primarily funded out of domestic resources, the associated rise in national debt growth was augmented by a growing inflow of foreign capital (Komlos 1983, pp. 147–205).

Table 9. *Relative contributions to GDP growth, Hungary (per cent)*.

	Primary sector	Secondary sector	Tertiary sector	GDP growth	GDP growth p.a.
1870–1885	24.19	11.16	7.16	42.51	2.39
1882–1895	10.60	8.37	5.63	24.60	2.22
1895–1906	13.10	4.15	5.46	22.71	1.88
1906–1912	1.64	6.78	3.78	12.19	1.94

Note: Measurement for all sectors from peak to peak in GDP. For each period, relative contributions to GDP growth are computed as each sector's growth rate weighted by that sector's share in GDP at the beginning of the period.
Source: Appendix, Table A2.

At the aggregate level, however, the impact of these stimuli and constraints was less clear cut. Although GDP growth fell markedly after 1896, there was no subsequent increase in the growth rate after 1906. This was an outcome of the performance of the rural economy. Output growth in the primary sector decelerated heavily after 1906 to about half a per cent per annum. This more than compensated for the rapid expansion in industry and the 2 per cent annual increase in service sector output. As it turns out, the pattern of Hungarian growth throughout the late nineteenth century was to a significant extent shaped by agriculture. Over the period under review, Hungary's economy expanded most rapidly between 1870 and 1885 (2.4 per cent per annum). Nearly 60 per cent of all GDP growth that occurred during this period was a result of agriculture's vigorous expansion (Table 9). During the next cycle to 1895, when aggregate growth declined slightly

to 2.2 per cent, the continuing rise in industrial output (over 4 per cent) was counterbalanced by the rural sector's falling contribution to GDP growth. That rose again in the following decade when growth in GDP and industry was at its slowest (1.9 and 1.8 per cent, respectively), while agriculture expanded again at a slightly higher rate. Thus, in conjunction with the stable rate of expansion in services, agricultural growth helped to some extent in reducing the adverse effects of the contraction in industry. However, after 1906, as noted above, the primary sector became a major drag on economic growth, effectively preventing a return to the high rates of expansion prevalent during the 1870s and 1880s.

Table 10. *Relative contributions to GDP growth, Austria (per cent).*

	Primary sector	Secondary sector	Tertiary sector	GDP growth	GDP growth p.a.
1871–1884	4.96	4.10	5.65	14.71	1.06
1884–1895	3.68	10.95	8.20	22.83	1.89
1895–1908	7.48	18.04	12.76	38.28	2.52
1908–1912	0.24	5.01	3.47	8.72	2.11

Note: Measurement for all sectors from peak to peak in GDP. For each period, relative contributions to GDP growth are computed as each sector's growth rate weighted by that sector's share in GDP at the beginning of the period.
Source: Appendix, Table A1.

In Austria, the primary sector's relative contribution to GDP growth in each of the four sub-periods was more limited than in the eastern half of the empire. This reflects the rural sector's much smaller share in national product and lower rates of expansion than in Hungary. Only during the cycle 1871–84 did agriculture contribute more than 30 per cent to aggregate growth (Table 10). However, even then agricultural growth was not sufficiently rapid to raise GDP growth significantly above the 1 per cent mark. For this was the period when both the secondary and the tertiary sectors were almost stagnant, expanding by less than 1 per cent per annum. During the next cycle to 1895, sluggish expansion in the primary sector became a severe constraint. First, it reduced the impact on GDP growth of the industrial revival after 1889 and of the marked rise in service sector output. Second, slow growth in rural incomes is likely to have reduced demand for manufactures and may have contributed to slow growth in industry during the 1880s. In the following cycle to 1908, output of the primary sector rose at higher rates than before, augmenting the effects of the industrial upsurge. However, in the last period 1908–12, when the industrial sector and services continued to expand at almost the same rates as during 1895–1908, agriculture made no contribution to GDP growth. As in Hungary, it was stagnation in the rural economy that led to a slowdown in GDP growth in the last five years or so before the First World War.

5. Conclusions

First, the Austrian economy failed to catch up with the leaders and continued to fall behind most other European economies in terms of GDP *per capita* growth. Second, the extent of the post-1873 depression in Austria was such that it affected not only the industrial sector but left its imprint on the aggregate economy. Third, the broad pattern of industrial expansion in one half of the empire coinciding with contraction in the other is also reflected in the behaviour of national product. Fourth, despite rapid industrial advance, the rural sector continued to dominate the pattern of growth in Hungary into the early twentieth century. Finally, Hungary's economy grew at a markedly faster rate than Austria's over the period as a whole and ranked about mid-range in the European growth comparison.[15]

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[15] This finding tends to support the view that Hungary gained more from the customs and monetary union than Austria did (Komlos 1983).

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Appendix: Estimates of GDP – methods and sources

Agriculture

Fieldcrops, wine, vegetables. Austria (A): Index of fieldcrop and wine production comprising 22 commodities (Sandgruber 1978, Table 50). Hungary (H): Index of crop production comprising 36 commodities (Komlos 1983, Tables D1, D4, D7).

Fruit. (A), (H): Three-year moving averages of wine production based on Sandgruber (1978, Table 50) and Komlos (1983, Tables D8, D10).

Livestock. (A): Volume indices for meat, milk and wool production were computed by interpolation between the 1869, 1880, 1890, 1900, and 1910 benchmark estimates produced by Sandgruber (1978, Tables 39, 40, 41), and either extrapolated to 1913 or amended by additional data given in Fellner (1916) and Waizner (1928). The volume index of silk production is based on Sandgruber's period averages and, for 1911 to 1913, on Fellner (1916). An index composed of the four series, with 1913 value added shares as weights, was then used to estimate total livestock production. (H): Index based on Katus's (1970, Table 20) calculation of growth in value added between the two benchmarks 1865/70 and 1911/13.

Forestry. (A): Index of annual 'Einschlag' based on growth in timber stocks (Sandgruber, 1978, Table 43). (H): Index based on Katus's calculation of growth between the two benchmarks 1865/70 and 1911/13 (including game and fisheries which, however, account for less than 10 per cent of combined output in forestry, game, fisheries).

Mining

(A), (H): Comprehensive calculations of gross value added in mining are taken from Komlos (1983, Tables E10, E12). For Austria, these estimates encompass eight mining products (anthracite, lignite, iron ore, silver, mercury, copper, lead, zinc), which account for 99 per cent of the gross value of total mining output in 1913 (SHB 1913), plus output of crude oil and salt. The Hungarian estimates cover eleven mining products.

Manufacturing

Beer, sugar, spirits, flour. (A),(H): Four separate indices of value added in beer, sugar, spirits, and flour production by Komlos (1983, Tables E5, E6). Trend extrapolation for spirits 1870–76.

Tobacco. (A): The volume and value of output of tobacco products is given in the official statistics. Thus a series of gross output in constant 1913 prices was readily available and converted into value added, using a proportion of 34 per cent (Fellner 1916, Waizner 1928). (H): Volume index based on output data from the official statistics (MSE, various issues) for 1881–1913 and trend extrapolation for 1870–80.

Petroleum. (A): Volume index of Austrian crude oil production derived from the official statistics. Domestically produced crude oil accounted for between 90 and 100 per cent of crude oil input in Austrian refineries. (H): As no adequate data are

available it was assumed that output in this small sector (see Table 1) expanded in line with manufacturing as a whole.

Iron and steel. (A), (H): For both Austria and Hungary, the volume and value of cast iron and pig iron production are well documented in the official statistics (SJB, SHB, MSE). Drawing on input cost coefficients from Waizner (1928) and Burnham and Hoskins (1943), a value added proportion of 37 per cent was used for smelting. The Austrian 1913 price of pig iron was 79.4 crowns per ton and that of cast iron 93.7 crowns. The volumes of Austrian and Hungarian steel production are reported in Kupelwieser (1901), Schuster (1910) and ÖZBH (1911–1914), while estimates of wrought iron output were taken from Schulze (1996). Value added in refining was then computed by, first, converting steel and wrought iron output into value terms (using the 1911 mean of plate and bar iron prices in Austria, i.e. 211 crowns per ton; a 1913 price is not available) and, second, applying a constant value added proportion of 53 per cent (Komlos 1983). This procedure differs from Komlos's estimates of value added in iron and steel production mainly in its reliance on contemporary records on the actual volume of steel and, partially, wrought iron output. This helps avoid the tricky issues of stock variations and the use of scrap that may affect estimates of wrought iron and steel output derived solely from output and net imports of pig iron. In addition, the further processing of iron and steel in the metal working industry has been estimated separately (see below). Note that neither Fellner (1916) nor Waizner (1928) account for value added in refining. The estimation equation for Austria's value added in iron smelting and refining was:

$$[0.37^{*}(79.4^{*}Q_{1} + 93.7^{*}Q_{2})] + [0.53^{*}211^{*}(Q_{3} + Q_{4})],$$

where Q_1 is the volume of pig iron output, Q_2 the volume of cast iron output, Q_3 the volume of steel output and Q_4 the volume of wrought iron production. The estimates for Hungary were produced in identical fashion but rely on Hungarian price data.

Mechanical engineering. (A), (H): Annual estimates of output are taken from Schulze (1996) where the estimation methods and sources used are set out in detail. These estimates build on wage-sums paid in the machine-building industry and on the volume of iron and steel inputs. Hoffmann's steam engine price index for Germany was revised so as to account for Austrian rather than German input prices (Hoffmann 1965). This revised price index was used for deflating output in all four engineering series.

Transport engineering. (A), (H): Output in this engineering branch was estimated as for mechanical engineering, drawing on material reproduced and sources cited in Schulze (1996). For both branches, the value-added proportion was 55 per cent.

Electrical engineering. (A): Wage-bill data are available only for 1897 to 1911 and for these years value added was calculated as for mechanical engineering. An initial attempt to approximate value added in this 'new' industry by use of a series of the number of telephones (Komlos 1983) was abandoned, as the growth in this series outstripped that of the electrical engineering series by a very large margin during the years with overlap. Using iron and steel inputs for extrapolation did not seem sensible either, as a considerable proportion of output is not iron and steel intensive. Instead, a log-linear trend was fitted to obtain values for the missing years. (H): Index comprises the series for mechanical and transport engineering with 1913 value added shares as weights, as no branch-specific data are available for extrapolation.

Instruments and apparatus. (A): Weighted index comprising the series for mechanical, transport and electrical engineering. The 1913 shares in combined value added of these branches were used as weights. (H): Index comprising the series for mechanical and transport engineering with 1913 value added shares as weights.

Metal-working. (A), (H): Output in this branch was calculated as for mechanical engineering and transport engineering (Schulze 1996). The price index used is a composite of several iron and steel input prices. The value added proportion is 45 per cent. Value added in the non-ferrous metal working branch of this sector is assumed to have grown in line with that in the iron and steel using branches.

Brick, clay, glass (construction materials). (A), (H): Weighted indices derived for construction (see below).

Food processing. (A), (H): Weighted indices of value added in beer, sugar, spirits and flour milling (Komlos 1983, Tables E5, E6).

Textiles and clothing. (A): Weighted index of value added in woollen, cotton and linen textiles production. The two indices for woollen and cotton textiles are taken from Komlos (1983, Table E6). These have been combined with linen production using their respective 1913 shares in total value added as weights. Linen textiles production was estimated in a two stage process (spinning, weaving) on the basis of domestic flax production, net imports of flax and net imports of linen yarn. Given the high rate of non-marketed output (Sandgruber 1982), it was assumed that only half of domestically produced flax was used for commercial linen production. The value added proportions were 46 per cent for both spinning and weaving (Fellner 1916, Gross 1966). Rates of conversion from flax to yarn (73 per cent for domestically produced flax fibre and 60 per cent for imported flax) and from yarn to cloth (88 per cent) are taken from Hoffmann (1965). According to the official export statistics, the average 1913 price of yarn was 2.56 crowns per kilogram; the price of cloth was 7.78 crowns. The estimation equation for value added in linen spinning and weaving was:

$$[0.46*2.56*(0.73*0.50*Q_1+0.60*Q_2)]+[0.46*7.78*0.88*((0.73*0.50*Q_1+0.60*Q_2)+Q_3)],$$

where Q1 is the volume of domestic flax production, Q2 is the volume of net imports of flax and Q3 the volume of net imports of yarn. (H): 1913 weighted index of value added in woollen and cotton textiles production (Komlos 1983, Table E5).

Leather and rubber. (A), (H): It was assumed that value added in this branch grew in line with value added in textiles and clothing, i.e. the respective weighted textile indices have been used.

Electricity generation. (A): Output was approximated in four stages. The number of central power stations is available for 1886, when the first station was built in Austria, to 1890 (Matis and Bachinger 1973) and for 1906 to 1913 (Österreichisches Handelsmuseum 1916). For the years between 1890 and 1906, the number of generating plants was approximated by linear interpolation. Total electricity output (in kw) and output per power station is available only for 1906 to 1913 (Österreichisches, Handelsmuseum 1916). It was assumed that electricity output per unit rose between 1886 and 1905 at the same rate as for 1906 to 1913. Multiplying estimated unit output by the actual (1886–90) and estimated (1891–1905) number of power stations yielded annual estimates of total electricity output for the years with missing data, which were then combined with the original

data for 1906 to 1913. Finally, the output series so obtained was used to calculate value added for 1886 to 1913 on the basis of the 1911 value added/physical output ratio. Note that this series is measured in 1911 prices. (H): No adequate data are available for Hungary and it was assumed that electricity output there rose at the same rate as Austria's.

Fuel; light; wood-working; paper-making; printing; chemicals; misc. (A), (H): No data are available for Austria and Hungary and it was assumed that value added grew in line with manufacturing as a whole. Note that total output in these branches accounted for only 4 per cent of Austrian GDP and 7 per cent of total commodity output in 1913 (3 and 4 per cent, respectively, for Hungary; see Table 2).

Construction

(A): Weighted index that includes an infrastructure series, a series for residential building, and a series for commercial investment in buildings (machinery production as a proxy). The infrastructure series is composed of Komlos's (1983, Table E14) index for value added in railway construction and repair, and two new indices for road construction and inland waterway construction which draw on official data (annual issues of SJB and SHB). Using a proportion of 35 per cent, value added in road construction was estimated for new construction and for maintenance on the basis of road length and expenditure data. The cost of constructing one kilometre of new road in 1913 was approximately 57,562 crowns per year; that of maintaining one kilometre of road was 1,477 crowns.[16] The incomplete and inconsistent data on the length of inland waterways necessitated to estimate value added in the construction of waterways solely on the basis of public expenditure data.[17] A new series was obtained by deflating total annual outlays for new construction and maintenance (using the general price index of Mühlpeck *et al.* (1979)) and applying a value added proportion of 35 per cent. The three indices for railway, road and waterway construction are combined using 1913 shares in joint value added as weights.

The new series for residential construction is based on additions to the housing stock as recorded in the censuses and adjusted for population growth to correct for the effects of unrecorded changes in the average size of residential dwellings (annual issues of SJB and SHB).

Finally, the infrastructure, residential and commercial building indices are combined using 1907 weights derived from Hoffmann (1965).

(H): No data are available on changes in the housing stock. Residential construction was, therefore, estimated on the basis of population growth and the assumption that the average number of residents per dwelling in Austria applied also to Hungary. Data on road and waterways construction are either lacking altogether or are incomplete and inconsistent. Hence the infrastructure series is

[16] These figures are based on the average 1913 expenditure on state roads (1,921 crowns per kilometre) and the assumption that the *ratio* between the costs of new construction and the costs of maintenance approximated to that which applied in railway construction (Komlos 1983).

[17] Note, however, that in 1913 state expenditure on inland waterways accounted for less than half the expenditure on state roads which, in turn, made up only about 13 per cent of the total road network.

based solely on railway construction and repair (Komlos 1983, E14; three year moving average to smooth the impact of the high level of volatility in railway construction). As for Austria, machinery production has been used as a proxy for commercial building. The three series are combined using the same weights as for Austria.

Handicrafts

(A), (H): The share of handicrafts production in commodity output remained more or less constant throughout the late nineteenth century (Gross 1966, Fellner 1916). The official census data would suggest, moreover, that the handicrafts sector did not lose out to industry in terms of employment. In short, there is little evidence that the handicrafts sector declined in absolute or relative terms. This resilience can be explained, at least partly, by this sector's shift into custom production, components making and repair work. It was, therefore, assumed that value added in handicrafts production expanded in line with manufacturing and construction, i.e. weighted indices of manufacturing and construction were used for extrapolation. The respective 1913 shares of manufacturing and construction in combined value added were used as weights.

Trade, transport and communications

(A): The value added series for trade and communications is taken from Kausel (1979, Table 1) without further adjustment. He assumed, first, that trade moved in line with primary and secondary production and, second, that only half of agricultural output was traded. Kausel used data from Bachinger (1973) to approximate output of rail and road transport, of shipping and of the postal system. (H): weighted index of output in transport and communication and output in trade. The index of output in transport and communication is taken from Katus (1970, Table 37), while the trade series is based on the annual average rate of growth between Katus's (1970, Tables 35, 40) benchmark estimates for 1867 and 1913. 1913 value added shares have been used as weights (0.65 for transport and communication, 0.35 for trade).

Services

(A): Value added in 'productive' (private and public) and 'personal' services has been estimated by Kausel (1979, Table 1) on the basis of official employment statistics. His series is incorporated into the GDP estimates without further adjustment. (H): Fellner's (1916) estimates of incomes generated in services are inconsistent and a comparison with Kausel (1979) would suggest that his figures for Austria seriously underestimate service sector output. Hence they have not been used here. As a first step, the 1913 level of the labour force in public and private services was estimated using the data provided in Katus (1970, Tables 40, 46). It was then assumed that the 1913 ratio of Hungarian to Austrian output per worker in trade, transport and communications (Katus 1970, Table 40; Kausel 1979, Tables 1, 3, 7) prevailed also in private and public services. Applying this ratio to Austrian labour productivity in services yielded an approximation of the level of Hungarian service output for 1913. Finally, this was extrapolated using the trend rate of growth of Austrian service sector output for 1870–1913.

Housing

(A): Kausel (1979, Table 1) estimated rental income from housing for 1870 to 1913 using the total number of residents' parties and assuming a constant size and quality of the dwellings, while taking account of owner-occupation. Again, no attempt at further adjustment has been made before integrating this series into the GDP estimates. (H): Drawing on housing tax records, Fellner (1916) estimated rental income as a proportion of the capital value of residential dwellings in the Habsburg Empire. Kausel's computations for Austria (and comparisons with other economies) would suggest that Fellner's data and procedure underestimate the actual level of rental incomes by a large margin. Here an approximation was made by, first, calculating the average 1913 'rent per head' of population in Austria. Then the income differential between the two economies was taken into account by computing the ratio of Hungarian to Austrian total output of commodities and trade and communications *per capita* (as proxy for average income). Applying this ratio to the Austrian figure of 'rent per head' yielded an approximation of the respective Hungarian 'rent per head' which was, finally, extrapolated by the index of population.

Table A1. *Austrian GDP in constant 1913 prices (m. Crowns).*

	Primary sector[a]	Secondary sector[b]	Tertiary sector[c]	GDP	GDP *per capita*	
					Crowns	1913=100
1870	2377.5	2427.8	3892.0	8697.3	423.0	64.0
1871	2415.8	2800.7	3983.0	9199.6	445.5	67.4
1872	2398.7	2782.3	4008.0	9189.0	443.3	67.0
1873	2332.8	2558.7	4001.0	8892.5	428.8	64.8
1874	2609.7	2577.5	4067.0	9254.2	442.8	67.0
1875	2556.7	2572.1	4092.0	9220.8	436.8	66.0
1876	2569.2	2542.3	4129.0	9240.5	433.4	65.6
1877	2721.3	2647.7	4180.0	9549.0	444.8	67.3
1878	2923.9	2637.3	4233.0	9794.3	453.2	68.5
1879	2551.5	2660.0	4239.0	9450.5	433.3	66.5
1880	2619.0	2701.8	4271.0	9591.8	436.4	66.0
1881	2744.5	2867.5	4341.0	9953.0	450.2	68.1
1882	2693.7	2966.9	4373.0	10033.7	450.3	68.1
1883	2740.2	3111.4	4445.0	10296.6	458.9	69.4
1884	2871.1	3178.7	4503.0	10552.7	466.3	70.5
1885	2943.1	2973.8	4516.0	10433.0	458.0	69.3
1886	2955.1	2970.8	4587.0	10512.9	458.1	69.3
1887	3094.3	3227.0	4649.0	10970.3	473.9	71.7
1888	3080.0	3204.3	4675.0	10963.3	469.9	71.1
1889	2917.9	3299.4	4766.0	10983.3	466.2	70.5
1890	3121.5	3570.1	4848.0	11539.7	486.7	73.6
1891	3055.7	3750.6	4958.0	11764.3	492.4	74.5
1892	3243.8	3826.4	5047.0	12117.2	503.2	76.1
1893	3012.1	3976.2	5112.0	12100.3	498.8	75.4
1894	3311.1	4193.3	5262.0	12766.4	522.4	79.0
1895	3260.0	4335.2	5368.0	12963.2	525.9	79.5
1896	3205.4	4343.0	5462.0	13010.4	522.5	79.0
1897	3145.6	4555.0	5544.0	13244.6	526.6	79.7
1898	3461.0	4761.3	5710.0	13932.3	548.5	83.0
1899	3602.9	4848.0	5808.0	14258.9	555.7	84.0
1900	3454.5	4828.4	5883.0	14166.0	546.5	82.7
1901	3601.1	4958.0	6020.0	14579.1	556.9	84.2
1902	3631.9	5171.3	6120.0	14923.2	564.6	85.4
1903	3547.8	5246.2	6216.0	15010.0	562.8	85.1
1904	3540.2	5385.9	6329.0	15255.1	566.7	85.7
1905	3998.5	5616.2	6533.0	16146.7	596.3	90.2
1906	4118.7	5987.9	6704.0	16810.6	614.4	92.9
1907	4124.0	6513.6	6931.0	17568.6	636.5	96.3
1908	4231.4	6676.0	7022.0	17929.4	644.0	97.4
1909	4239.2	6757.6	7124.0	18120.8	645.6	97.6
1910	4126.5	6653.8	7247.0	18027.4	636.6	96.3
1911	4027.1	7028.5	7416.0	18471.6	647.7	98.0
1912	4274.0	7575.4	7644.0	19493.4	678.0	102.6
1913	4255.5	7164.3	7721.0	19140.8	661.2	100.0

Notes: [a] Agriculture; forestry. [b] Manufacturing; mining; handicrafts; construction. [c] Trade, transport, communications; public and private services; housing.
Sources: See text.

Table A2. *Hungarian GDP in constant 1913 prices (m. Crowns).*

	Primary sector[a]	Secondary sector[b]	Tertiary sector[c]	GDP	GDP *per capita*	
					Crowns 1913 = 100	
1870	2180.5	483.2	1856.8	4520.5	291.1	56.8
1871	2028.7	550.2	1876.2	4455.1	286.5	55.9
1872	2014.0	532.3	1897.0	4443.3	285.4	55.7
1873	2005.3	507.9	1916.1	4429.3	284.1	55.4
1874	2007.4	480.7	1932.4	4420.5	283.2	55.3
1875	2114.6	425.7	1947.1	4487.4	287.1	56.0
1876	2003.3	411.4	1958.9	4373.6	279.5	54.5
1877	2383.9	456.4	1981.2	4821.5	307.7	60.0
1878	2375.5	556.4	1998.2	4930.1	314.2	61.3
1879	2451.8	521.1	2008.7	4981.6	317.1	61.9
1880	2662.9	552.0	2024.8	5239.7	333.1	65.0
1881	2936.8	667.9	2056.8	5661.5	357.0	69.7
1882	3364.5	830.6	2088.5	6283.6	393.5	76.8
1883	3101.1	985.9	2121.8	6208.8	384.2	75.0
1884	3253.6	994.1	2146.6	6394.3	390.6	76.2
1885	3274.8	987.1	2180.2	6442.1	388.8	75.9
1886	3141.5	976.8	2200.0	6318.3	376.5	73.5
1887	3404.0	955.8	2231.5	6591.4	389.1	75.9
1888	3463.3	1075.9	2276.3	6815.5	398.1	77.7
1889	3141.4	1042.3	2306.9	6490.6	374.3	73.0
1890	3442.3	1032.3	2349.9	6824.5	390.9	76.3
1891	3549.0	1164.0	2391.5	7104.5	403.4	78.7
1892	3437.5	1130.6	2425.2	6993.3	395.3	77.1
1893	3625.7	1382.0	2477.8	7485.5	418.9	81.7
1894	3381.2	1420.4	2519.8	7321.4	405.6	79.1
1895	3958.2	1524.4	2543.5	8026.2	439.6	85.8
1896	3842.4	1549.0	2589.5	7981.0	432.6	84.4
1897	3334.5	1491.3	2619.8	7445.5	399.0	77.9
1898	3834.3	1453.7	2655.8	7943.8	422.1	82.4
1899	4011.4	1560.7	2689.7	8261.7	434.1	84.7
1900	4104.5	1560.5	2726.1	8391.1	435.9	85.1
1901	3991.1	1396.5	2764.8	8152.4	420.0	82.0
1902	4320.5	1489.0	2794.7	8604.2	439.7	85.8
1903	4586.6	1556.5	2836.4	8979.4	455.1	88.8
1904	3555.7	1542.7	2874.8	7973.1	400.9	78.2
1905	4351.7	1651.3	2925.0	8928.0	445.3	86.9
1906	5009.9	1857.4	2981.5	9848.8	487.3	95.1
1907	4431.1	1928.7	3041.9	9401.7	461.3	90.0
1908	4499.6	1972.3	3076.7	9548.6	464.7	90.7
1909	4656.0	2080.6	3140.8	9877.4	476.7	93.0
1910	5113.7	2167.0	3203.3	10484.0	501.9	97.9
1911	4816.6	2275.8	3283.5	10375.9	493.4	96.3
1912	5171.9	2523.8	3353.6	11049.3	520.2	101.5
1913	5173.8	2399.3	3398.6	10971.6	512.4	100.0

Notes: [a] Agriculture; forestry. [b] Manufacturing; mining; handicrafts; construction. [c] Trade, transport, communications; public and private services; housing.
Sources: See text.

Table A3. *Indices of manufacturing production in Austria (1913 prices, 1913 = 100).*

	Food	Iron	Engin.	Metalw.	Energy	Textiles	Constr. mats.	Total
1870	41.2	13.1	9.3	11.7	11.2	50.9	48.9	33.3
1871	44.2	15.7	11.8	14.7	12.9	61.4	56.6	38.5
1872	46.7	19.2	16.0	20.0	12.9	52.3	56.8	38.2
1873	48.5	17.4	14.1	17.4	11.8	42.3	51.3	35.0
1874	47.9	16.8	9.1	11.0	12.0	52.1	47.4	35.6
1875	48.1	16.3	9.3	11.0	11.9	50.2	49.1	35.4
1876	47.1	15.7	9.3	10.9	11.9	52.1	45.5	35.2
1877	47.3	14.5	8.8	10.2	12.3	56.2	49.7	36.5
1878	48.9	15.8	10.6	12.3	12.4	56.7	42.1	36.9
1879	48.7	13.6	9.4	10.7	12.5	58.8	43.5	37.1
1880	47.6	16.7	10.4	11.7	12.4	55.1	51.2	36.9
1881	54.3	19.4	12.5	14.2	13.5	59.7	43.9	40.1
1882	55.1	22.6	13.9	15.8	14.1	62.0	44.6	41.6
1883	55.6	24.6	13.9	15.5	14.7	68.1	46.4	43.6
1884	56.2	21.3	12.7	13.9	14.8	66.4	56.4	43.7
1885	58.5	20.5	13.1	14.2	13.9	57.7	46.7	41.3
1886	54.7	20.0	11.3	11.9	16.0	61.9	48.1	41.0
1887	59.5	21.7	12.6	13.3	17.4	67.8	51.4	44.7
1888	58.6	25.7	17.5	18.7	17.5	57.9	56.1	43.8
1889	59.7	26.3	18.1	17.1	18.7	65.3	50.8	45.6
1890	63.4	28.2	20.1	20.2	20.7	70.4	50.0	48.8
1891	66.8	27.3	22.0	22.8	21.3	70.3	71.7	52.0
1892	69.1	28.3	23.7	26.7	21.9	72.0	58.1	52.8
1893	73.1	29.6	26.1	30.4	22.9	71.5	62.6	55.0
1894	72.7	34.4	29.3	32.3	27.9	76.9	67.4	57.9
1895	78.2	36.9	30.3	33.6	28.6	78.6	65.7	60.3
1896	76.9	41.7	32.4	37.1	31.7	73.2	68.9	60.0
1897	80.1	44.4	36.0	38.8	33.1	72.6	76.8	62.4
1898	79.2	49.9	40.2	41.6	35.5	80.2	77.8	65.5
1899	83.6	53.0	43.6	43.9	36.3	76.1	78.3	66.7
1900	84.6	53.4	47.5	45.8	38.0	72.9	75.0	66.7
1901	83.4	52.9	48.0	42.4	41.3	79.6	78.0	68.3
1902	86.0	52.7	44.2	48.3	47.8	86.7	80.0	71.6
1903	82.0	52.0	46.6	54.4	55.0	88.2	82.1	72.4
1904	85.9	55.5	50.4	55.4	63.0	87.7	80.5	74.7
1905	84.3	62.8	53.7	60.8	64.0	94.2	85.4	77.8
1906	92.7	68.6	62.8	65.7	65.0	95.3	90.1	83.0
1907	92.4	75.2	72.0	72.2	85.4	111.8	90.5	90.9
1908	95.6	82.4	79.3	72.8	112.7	103.0	90.3	93.1
1909	91.2	77.8	77.7	78.2	129.9	104.3	94.8	93.8
1910	93.1	86.0	79.0	90.2	117.9	94.9	91.6	92.7
1911	100.4	91.1	87.5	97.6	109.9	103.9	92.5	98.8
1912	97.4	104.9	108.8	110.7	100.3	115.4	105.6	106.2
1913	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: *Food*: weighted index of beer, sugar, tobacco, spirits, flour, and other food-processing; *Iron*: weighted index of iron smelting and refining; *Engineering*: weighted index of mechanical engineering, transport engineering, electrical engineering, instruments and apparatus; *Metalworking*: index of ferrous metalworking; *Energy*: weighted index of petroleum, electricity generation, fuel and light; *Textiles*: weighted index of cotton, woollen, linen textiles; *Construction materials*: weighted construction index; *Total*: includes also residual other manufacturing not listed separately.
Sources: See text.

Table A4. *Indices of manufacturing production in Hungary (1913 prices, 1913 = 100).*

	Food	Iron	Engin.	Metalw.	Textiles	Const. Mats.	Total
1870	31.5	7.0	4.4	4.6	1.4	29.7	18.7
1871	30.6	8.8	5.9	6.1	7.0	40.8	20.3
1872	28.2	8.1	5.7	5.9	4.3	42.5	19.1
1873	30.7	8.5	5.3	5.5	3.1	33.4	19.2
1874	34.6	8.2	4.1	4.2	5.3	21.2	19.7
1875	31.7	8.8	4.5	4.7	4.5	14.3	17.9
1876	27.6	121.5	6.8	7.0	6.9	13.9	17.2
1877	31.7	10.8	6.2	6.3	9.0	16.0	19.1
1878	43.5	9.6	5.6	5.6	10.8	15.1	24.2
1879	38.8	9.6	5.8	5.9	12.7	15.5	22.4
1880	34.3	9.8	5.9	5.9	14.5	30.4	21.9
1881	40.0	13.9	9.0	9.,0	16.3	36.8	26.4
1882	49.9	13.7	9.5	9.4	17.2	52.6	32.4
1883	52.0	15.6	11.1	10.9	21.8	77.0	36.6
1884	52.1	16.6	11.6	11.4	17.3	79.2	36.6
1885	54.1	18.7	11.8	11.5	14.5	74.0	37.0
1886	50.8	16.0	9.4	9.1	17.0	81.0	35.5
1887	54.9	15.8	9.9	9.6	18.0	67.6	36.4
1888	60.1	21.2	14.3	13.7	18.6	76.0	41.0
1889	52.4	22.5	14.3	13.6	19.7	81.9	38.4
1890	56.0	30.5	19.7	18.7	19.6	63.2	40.4
1891	67.2	30.2	20.4	19.3	22.5	68.0	46.3
1892	67.6	31.0	26.5	24.9	24.1	52.3	46.7
1893	77.0	34.8	33.3	31.1	26.0	78.8	55.4
1894	75.8	37.2	34.9	32.4	23.0	87.0	55.9
1895	76.2	42.7	37.6	34.7	23.9	102.3	58.7
1896	74.8	49.8	39.9	36.6	28.5	101.8	59.8
1897	64.5	50.9	41.4	37.8	30.6	105.8	56.2
1898	66.1	55.3	43.7	39.6	31.9	89.0	56.5
1899	74.2	54.8	45.9	41.4	30.9	94.6	61.0
1900	73.7	56.6	46.6	41.8	29.7	92.2	60.8
1901	66.7	50.9	46.3	41.3	33.4	71.8	55.6
1902	72.8	52.5	48.3	42.8	40.6	74.5	59.9
1903	81.9	49.8	45.2	39.8	44.0	74.0	63.3
1904	75.5	52.0	48.5	42.4	45.9	77.6	61.7
1905	78.0	59.3	56.1	48.7	46.9	83.3	66.3
1906	89.2	63.6	61.8	53.4	70.2	87.1	75.9
1907	82.8	75.5	73.2	62.8	70.9	97.6	77.9
1908	74.5	79.9	88.5	75.4	75.6	102.5	79.1
1909	82.6	79.3	87.4	72.3	91.0	103.7	84.1
1910	90.7	80.9	87.1	86.1	89.8	100.4	88.9
1911	97.4	88.6	91.6	99.8	106.0	90.4	95.6
1912	104.8	96.5	104.9	106.4	111.5	111.6	104.9
1913	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: *Food*: weighted index of beer, sugar, tobacco, spirits, flour, and other food-processing; *Iron*: weighted index of iron smelting and refining; *Engineering*: weighted index of mechanical engineering, transport engineering, electrical engineering, instruments and apparatus; *Metalworking*: index of ferrous metalworking; *Textiles*: weighted index of cotton and woollen textiles; *Construction materials:* weighted construction index; *Total*: includes also electricity generation and residual other manufacturing not listed separately.
Sources: See text.