

AN ESTIMATE OF THE SIZE AND STRUCTURE OF THE NATIONAL PRODUCT OF THE EARLY ROMAN EMPIRE

BY RAYMOND W. GOLDSMITH

Yale University

On the basis of rough estimates from the expenditure as well as from the income side, it is suggested that the national product per head of the Roman Empire at the death of Augustus (AD 14) was somewhat below 400 sesterces (31 g gold) yielding an aggregate national product of fully HS 20 billion for a population of 55 million and that these figures were approximately valid from the late first century BC to the mid-second century AD. The share of government expenditures in national product was very low, probably not above five percent, and that of gross capital expenditures even lower, probably not in excess of two percent. An attempt is also made to appraise the concentration of personal income and it is estimated that the 600 senatorial families, representing approximately the top 0.04 per cent of the population, received about 0.6 percent of total personal income while the share of the top three percent of income recipients was in the order of 20–25 percent of total personal incomes. The second part of the article compares these estimates as well as a few indicators of the standard of living and of welfare in the early Roman Empire with the corresponding figures for a few countries before the industrial revolution and for mid-20th century less developed countries.

I. NATIONAL PRODUCT AND ITS STRUCTURE

In terms of settled territory the early Roman empire with about 3.3 km² was the largest political, economic and monetary unit in the Western world until it was overtaken by the expansion of the United States and of the Russian empire in the mid-19th century. With about 55 million inhabitants it was more populous than any western country until, again, the mid-19th century, equalling even the present population of the large European nation-states—France, Germany, Great Britain and Italy; and probably was not surpassed by its only two competitors, the Chinese empire and the less durable empires that arose from time to time in the Indian peninsula, until about AD 1000. Finally, in terms of real national product, a comparison which is much more difficult to make, the Roman empire with a national product of, as will be shown below, slightly over 20 billion sesterces (HS), equal to about 1,700 t of gold, probably surpassed any Western economy until the early 19th century. On all three tests, then, the early Roman empire was the largest Western economic unit for nearly two millennia. An estimate of the size and structure of its national product, even a rough one which often establishes orders of magnitude rather than precise figures, seems therefore well worth the effort.¹

1. *Why?*

Estimates of national product, or of material product, in current prices are used primarily for two purposes. The first is to serve as the scalar or the

¹Throughout this article I have limited the text, with a few exceptions, to setting forth the figures used in calculating the main relevant aggregates, but have relegated their justification and their sources to the footnotes.

denominator of numerous economic magnitudes, such as the product of different productive factors, sectors, regions or classes as well as of foreign trade, the tax burden, military expenditures, money in circulation, the capital stock, the population or the labor force. The second purpose is to provide the basis of intertemporal or interlocal comparisons, now preferably in terms of a common price basis rather than in the current prices of a given place and date. Since no estimate of total national product, in current or other prices, seems to have been published for the early Roman Empire²—or, for that matter for the Roman republic or the later Empire—it seemed worthwhile to make an attempt at an estimate for at least one date, viz. the death of its founder in AD 14. That date has been chosen for three reasons: First, because it is far enough removed from the chaos of the late republic to reflect a reasonably stable situation; secondly because the situation at that date may also be regarded as representative in economic terms of the full century from the 20s BC to the late first century AD; thirdly, and not least, because the material is less scarce than for several earlier and later centuries, particularly the inflationary and disintegrating situation of the third and fourth centuries AD. Rough, and often indirect, as any resulting estimates will have to be,³ they should be preferable in interpreting the economy of the early empire to doing without any figures on this crucial economic magnitude. It is hardly necessary to add that these estimates are destined primarily for economists and economic historians rather than for classicists.

2. Caveats

As almost all classical authors were non-numerate in the modern sense, i.e. had very little interest in figures and where they used them in their writings were generally imprecise or ambiguous, almost all quantitative work on the economy of the early Roman empire must be based on archeological evidence, i.e. the results of excavations of buildings, artifacts, ostraca and coins, on inscriptions, and in the case of Egypt on papyri. The difficulty with using this type of evidence—and still more the evidence in the classical literature—however, is the very small number of cases for a given type of fact, say the area of towns from which their population might be estimated, or of crucial figures such as the price of wheat or the wage of common labor. The main exceptions are the weight and metallic content of coins, many thousands of which have been found throughout the Empire;⁴ the age of death which has been inferred from thousands of funerary

²The only two estimates that have been found, will be compared with the estimate developed here in footnotes 51 and 52.

³As the margin of uncertainty has been put at about 10 percent for the United States in the 1920s and 1930s (S. Kuznets, *National Income and its Components, 1919–1936*, pp. 528, 1954) it should be evident that the margin is likely to be considerably, though hopefully not radically, higher for any estimate of the early Roman empire, as for every estimate for any country before the mid-19th century and for many of them to the present day. The judgment of an expert in historical economic statistics may be relevant, viz. that an estimate with a margin of error of 50 percent is better than no figure at all. (J. and J. Fourastié, *pouvoir d'achat, prix et salaires*, p. 67, 1977). For a similar argument cf. P. Bairoch (*Revue Economique*, XXVIII, 178–179, 1977).

⁴The numismatic literature is large and sophisticated. It may be sufficient to refer to M. Bernhart, *Handbuch zur Münzkunde der römischen Kaiserzeit*, 1926 and H. Mattingly, *The Roman Imperial Coinage*, 1923, in addition to the relevant articles in Pauly–Wissowa (*Realencyclopädie der classischen Altertumswissenschaften*—henceforth P–W).

inscriptions, also in general dateable;⁵ and the prices of municipal offices.⁶ Regional differences add to the difficulties. They were certainly substantial, making the estimation of empire-wide averages even more hazardous, as very little is known about them except for Egypt, which was the least typical of all the provinces, partly because it had a token currency not circulating in the rest of the empire and a much lower price and wage level.⁷

There is, however, one mitigating factor, viz the apparent absence of substantial changes in the price and wage level⁸ and in many other economic characteristics throughout the first century AD, partly reflecting the power of custom, a circumstance which in most cases permits the use of data which refer to any part of the century following the installation of the principate in 27 BC to reconstruct the situation at one date, here the death of Augustus, and thus substantially increases the number of available pieces of evidence.

Another, and most important, mitigating factor is the fact that by its very nature the calculation or estimation of national product within the modern system of national accounts is to a substantial extent self-checking. As a result the margin of uncertainty in the estimate of national product is usually smaller than that in many if not most of its components.

3. Approaches

In the absence of aggregates like the value of the production or consumption of individual commodities, final sales of various types of enterprises or of several categories of income, such as the wage bill or interest payments, which form the basis of modern national income and product accounts, any estimate for the Roman Empire, or for almost any other country before the 19th century, must start with estimates of income or expenditures of an average or typical person, household, member of the labor force or income recipient, and must derive totals

⁵Cf. footnote 36.

⁶E.g. R. Duncan-Jones, *The Economy of the Roman Empire*, 1982—probably the most valuable single source for this study—Chapters 3 and 4.

⁷Duncan-Jones, 51, 250; A. C. Johnson, in T. Frank, *An Economic Survey of Ancient Rome*, Vol. II, 1935 *passim*; R. Kahrstedt, *Kulturgeschichte der römischen Kaiserzeit*, p. 210, 1958. Egypt also differed from the rest of the empire in its much higher level of interest rates; the modal value of the agricultural interest was 12 percent (G. Mickwitz, *Geld und Wirtschaft*, 207–225, 1932), about double the rate in the other provinces.

⁸The strongest, if indirect, evidence of the absence of any secular even modest rise in the level of wages and prices (cf. Duncan-Jones, 9) is the fact that military pay did not increase at all for the century between the beginning of the principate and the reign of Domitian and then after a step-up by one-third—from HS 900 to HS 1,200 for the common soldier (e.g. R. McMullen, *The Roman Emperors' Army Costs*, Latomus, 1984) remained unchanged for over a century. Given the political strength of the military it is most unlikely that they would have stood for any noticeable reduction in their real pay and hence in their standard of living. While evidence is insufficient for a confident statement the rise under Domitian is more likely to have been an advance in real pay rather than an adjustment for past or expected increases in the cost of living. This argument would remain valid even if account were taken of the donatives and other supplements to regular pay which became the practice at the ascension of an emperor. The only price index that has been found puts the increase between the reign of Antoninus Pius and Marcus Aurelius, i.e. for a period of about 25 years, at between seven and 13 percent (G. Mickwitz), i.e. at between 0.3 and 0.5 percent per year. It is likely that the average for the 150 years before the reign of Antoninus was considerably smaller. The sharp increase in prices started only, and suddenly, at the close of the second century AD, but then may have tripled the price level within 30 years (Szilagyí, *Acta Antiqua*, 11, 278, 1962).

by multiplying these figures with the appropriate aggregate such as the total number of households, workers, or population.

There are thus two basic approaches to the estimation of national product, from the expenditure and from the income side. In the case of the early Roman Empire the calculation from the expenditure side starts from the largest, and relatively best known, component, the expenditure on wheat, derived from estimates of the volume of wheat consumption per head and the average wheat price. This figure must then be stepped up to allow for, first, expenditures on other foods; secondly for other consumption expenditures, such as those on clothing, other consumer goods, services and rent; and thirdly for other expenditures, particularly private capital outlays and government expenditures. Since direct evidence for these step-up ratios is scarce, it is necessary to use by analogy ratios from other countries and periods to obtain estimates for all food, all consumer and finally all national expenditures, or at least to use such ratios as checks on whatever indicators exist in the literary or archeological evidence.

Proceeding from the income side the starting point is the rate of pay for common labor and of the imputed value of the labor of free or unfree workers who constituted the great majority of the labor force in agriculture. This rate must then be stepped up, first, for the difference between the wage of unskilled labor and average personal income which includes rent and interest income; and secondly for other than personal incomes, i.e. essentially indirect taxes and depreciation.

The estimates, direct or by analogy, of the components of total average income and expenditures will be discussed in the two following sections. To obtain an estimate of aggregate national product it is then necessary to multiply total average expenditures or income by population or by income recipients. The derivation of these aggregates will be explained in section 6.

4. Expenditures

The available evidence referring to soldier and slave rations points to an annual consumption of up to 50 modii of wheat of about $6\frac{3}{4}$ kg each, i.e. about 340 kg, per adult male.⁹ Since women, children and old people consumed less the average consumption of the entire population may be put at 35 to 40 modii.¹⁰

Although a leading classicist declared 70 years ago the determination of a scientifically satisfactory average for the entire empire to be an "insoluble task," the values cited by him lie with few exceptions between two and four sestericii (HS) per modius of wheat (outside of Egypt with its much lower price level), and he even estimated the average price for the producing countries as well as for

⁹A rate of about 50 modii is attested for soldiers, male free laborers and slaves (cf. e.g. McMullen, 6; 1983; Michaelis, *Zeitschrift für die Gesamte Staatswissenschaft*, 53, 4; 1897; and Szilagyi, 382). Wheat consumption in mid-15th century Florence has been estimated by a contemporary at 250 kg, or 39 modii, per head (R. A. Goldthwaite, *The Building of Renaissance Florence*, p. 346, 1980).

¹⁰A ratio of two-thirds between the average wheat consumption of a family and that of adult males is indicated for Roman Egypt and one of four-fifths for Italian peasants (C. Clark, *The Conditions of Economic Progress*, p. 549, 1951).

Rome at about HS three per modius in normal times.^{11,12} The same value has been used by other authors and is accepted here as apparently as good an estimate as can be made at the present time on the basis of published data.¹³

Using these estimates for consumption and price the average expenditure on wheat is HS 110–115. Expenditure on all bread-grains should be only slightly higher given the small and decreasing importance of barley, the only other foodgrain used on a substantial scale, whose price seems to have been on the average two-fifths below that of wheat.¹⁴ An increase of the average to HS 130 seems therefore to be adequate to cover all foodgrains.

The difficulties and uncertainties begin in earnest when the expenditures on foodgrains are stepped up to yield estimates on first, all food and then of all consumer expenditures. One estimate, the basis of which is not indicated, puts total food expenditures at a modest level at 2 HS per day or 730 HS per year.¹⁵ The figure is compatible with the estimate of annual expenditures on foodgrains of HS 130 provided it refers to a household of three to four persons. It then implies a share of foodgrains in total food expenditures of about three-fifths which is similar to the Indian ratio of 55 percent in 1951 or 1961.¹⁶

The same estimate claims that expenditures on food absorbed one-half of wage income and hence of total expenditures of the lower classes and the ratio should be slightly lower for the entire population.¹⁷ This is considerably below the Indian ratio of nearly two-thirds,¹⁸ but close to the average ratio for

¹¹M. Rostovtsev, article "frumentum" in P-W, VII, (1910), 143ff. This is also the price implied by Seneca (Duncan-Jones, 54). For additional information on wheat prices cf. Szilagyi, 335–337, and G. Rickman, *The Corn Supply of Ancient Rome*, p. 144ff and particularly 153, 1980. As would be expected in an economy extending over a wide area with different climatic conditions and with very high costs of transportation short-term fluctuations in food prices were common and often violent and regionally diverse.

¹²The monetary system of the early Roman Empire as fixed around 20 BC by Augustus used four main coins, the aureus with a mint weight of almost 8 g gold of a fineness of approximately 0.99 = 25 denarii of nearly 4 g silver of a fineness of at least 0.95 = 100 sestercii (HS) of fully 27 g of orichalcum (brass) = 400 asses of slightly over 11 g of copper, implying a value ratio of gold to silver of 12½ to one (cf. e.g. E. A. Sydenham, *Numismatic Chronicle* 19, 115, 1919; Szilagyi, 386–418). At a gold price of \$400 (\$20.67) per ounce the coins had a metallic value of about \$100 (\$5.35) per aureus, \$4.00 (\$0.21) per denarius, \$1.00 (\$0.053) per sestercius and \$0.25 (\$0.013) per as.

¹³Cf. e.g. Duncan-Jones 50–51, 145–146, 345–356; E. H. Cavaignac, *Population et Capital dans le Monde Méditerranéen Antique*, p. 136, 1923; Hopkins, p. 119, 1980; P. Garnsey and R. Sallen, *The Early Principate: Augustus to Trajan*, p. 15, 1982.

¹⁴N. Jasny, *The Wheats of Classical Antiquity*, 1944; *idem* in *Wheat Studies of the Food Research Institute*, XX (1944) and in *American Historical Review* XLVII (1942). Evidence of the low esteem in which barley was held is the fact that it was issued to soldiers or slaves as punishment (Orth, in article "Gerste" in P-W, VII, 1, p. 125ff, 1910). This predominance of wheat is in striking contrast to Europe where through the 18th century coarse grains were the dominating cereal and wheat a luxury except for the wealthier classes (F. Braudel, *Civilisation Matérielle, Economie et Capitalisme XV^e–XVIII^e Siècle*, Vol. 3, p. 108ff, 1979).

¹⁵Kahrstedt, 211.

¹⁶Mukherjee, *National Income of India*, p. 421, 1969.

¹⁷Kahrstedt, 211. It has been estimated that the Egyptian peasant spent late in the first century about 40 percent on cereals; about 30 percent on other food, mainly oil and wine; nearly one-tenth on clothing; and 25 percent on taxes in kind or money—the latter ratio certainly much higher than in any other province or occupation. (Heichelheim cited by Johnson in Frank, II, p. 306, 1936, after reducing estimate of other food which Johnson regarded as too high). In view of the notorious poverty of the Egyptian peasant the share in expenditures other than taxes is likely to have been considerably lower in the rest of the empire than his fully 50 percent for cereals or nearly 70 percent on all foods.

¹⁸Mukherjee, 421.

16 less developed countries in the 1970s of 47 percent¹⁹ and is approximately equal to the ratio in England and Wales in 1688.²⁰ On the basis of expenditures on foodgrains of fully one-third,²¹ consumer expenditures per head would be in the order of HS 350.

There is fortunately another body of evidence bearing on average consumer expenditures in Italy, the living cost allowance (*alimenta*) in government regulations and in testaments. Late in the first century AD the allowances for children (up to 14 years for girls and 18 years for boys) ranged from HS 10 per month for illegitimate girls to HS 16 for legitimate boys and other similar private schemes provided for allowances of between HS 8 (for girls) and HS 20 (for boys).^{22,23} Since most of the beneficiaries were boys,²⁴ an average of HS 15 per month or HS 180 per year would seem appropriate, a rate certainly well below the average of the population.²⁵ On this basis consumer expenditures per head should have been well in excess of HS 300 in Italy and somewhat lower for the Empire as a whole.^{26,27}

The final step-up from consumer expenditures to total national expenditures is less controversial as government expenditures are not likely to have exceeded five percent of the total,^{28,29} and gross private capital expenditures, mostly for housing, probably were even smaller. These two items therefore should increase consumer expenditures per head of HS 350 by not more than ten percent raising total national expenditures per head to about HS 380.

¹⁹United Nations, *Yearbook of National Accounts Statistics*, 1980 I, *passim*; these are all the countries for which the ratio can be calculated from this source.

²⁰Gregory King's estimate (P. Studenski, *The Income of Nations*, Pt. 1, 36).

²¹This figure is very close to that obtained by applying Glotz's estimates for Delos of a share of three-eighths of breadgrains in total consumption (Szilagyi, 349) or to that in India in the 1950s (Mukherjee, *loc. cit.*).

²²Duncan-Jones, 30, 51, 144–145, 288.

²³For similar data on *alimenta* cf. Szilagyi, 354–355.

²⁴Duncan-Jones, 294.

²⁵These amounts "evidently provided only the bare minimum" of children's total living expenditures (Duncan-Jones, 145) and thus a still lower fraction of average consumer expenditures.

²⁶A check on the order of magnitude starts with an estimate of daily expenditures of a small family in Pompei around 79 AD of six to seven *secterces* (Breglia, in *Pompeiana*, 53, 1950), i.e. about HS 2,400 per year. Applying this figure to the approximately 1½ million urban families yields an estimate of their aggregate expenditures of HS 3.6 billion. The level of expenditures of rural families was undoubtedly substantially lower. Putting them at between two-fifths and three-fifths of the urban level, reasonable lower and upper bounds of the ratio, leads to aggregate expenditures of about 12½ million rural families of HS 12 to 18 million and hence for total consumer expenditures within the Empire of between HS 18½ and 21 billion, but this should be slightly reduced to account for somewhat lower prices outside of Italy, particularly in Egypt.

²⁷This calculation, as well as the corresponding estimates from the income side, use market prices to value self consumption and market wages for labor input not remunerated in cash. If these items were valued at farm values of product and corresponding figures for labor compensation the estimates of national product would be lower, though to an unascertainable extent. On the basis of estimates for a few European countries in the 19th century (Clark, *The Conditions of Economic Progress*, p. 80ff, 1951) the difference may be of the order of one-fourth.

²⁸Central government expenditures have been put at about HS 475 million or nearly HS nine per person including HS 75 mill. for separation payments. (T. Frank, *An Economic Survey of Ancient Rome*, V, p. 4ff, 1940). Allowance for expenditures of local governments—many officials serving without pay and even paying for holding office (Frank, *op. cit.*, Chapter 4; Duncan-Jones, 82ff and 147ff)—should not have raised this amount to much over HS 10 per inhabitant and tax collectors' exactions declined well below the levels of the late Republic. Three recent estimates put total expenditures of the central government at about HS 600 mill. (derived from McMullen, 1984), HS 825 mill. (Hopkins, 1980, 125) and "at most HS 1000 mill." (Pekary, *Die Wirtschaft der griechisch-*

5. Incomes

Most available data point to an average daily wage for free male common labor outside of Egypt of HS $2\frac{1}{2}$ to 4 per day,³⁰ or between HS 500 and HS 1000 for a work-year of 200 to 250 days. This is one of the most uncertain estimates, crucial because wage and similar income accounts for the majority, probably as much as three-fourths, of national income. There is, in particular, no direct evidence for the assumption of 200 to 250 working days per year.³¹

The earnings attributable—rather than paid in cash—to women and children, particularly in agriculture, as well as to slaves should be substantially lower.³² On the other hand wages for the much less numerous skilled workers were substantially higher.³³ Average annual income per member of the labor force may then have been close to HS 800 using an average labor income of HS $3\frac{1}{2}$ to allow for the higher wage of skilled workers as well as for the, generally imputed, lower wages of women, children and slaves, and an average work year of 225 days, with a rather wide margin of uncertainty.

This figure must now be stepped up to take account of other than wage incomes, i.e. mainly rents, interest, indirect taxes and depreciation. While the last two are known to be small, there is no direct evidence for the first two items. Recourse must therefore be had to the situation in other less developed countries. On that basis a step up by 20 percent may be justified³⁴ bringing the average per recipient of monetary or imputed income to close to HS 1000.

römischen Antike, 105, 1979), equal to between HS 12 and HS 18 per head and to between 3 and 5 percent of gross national product. McMullen and Hopkins assign fully one-half or two-fifths of the total to military expenditures excluding separation payments. A breakdown of other expenditures is provided only by Frank (*op. cit.*, 4/6) who puts military expenditures at nearly three-fifths of the total if separation payments are excluded and at nearly three-fourths if they are included.

²⁹The tax burden may have increased somewhat in the second half of the century. Frank (V, 53–54) puts the increase between the middle of Augustus' reign and that of Vespasian, i.e. between about 10 BC and AD 75, at between 140 and 200 percent, i.e. to HS 680 million to HS 800 million. Hopkins regards Frank's estimate for Augustus' reign as too low, as confirmed by Cavaignac and McMullen, and that of Vespasian's as too high (*op. cit.*, 117) thus implying a much smaller rate of increase—between five and 20 percent—which appears more reasonable.

³⁰Thus HS $1\frac{1}{2}$ for rural and HS 3 for urban labor in Italy (Duncan-Jones, 54); HS $2\frac{1}{2}$ and HS 4 (Kahrstedt, 210–211); HS 4 (McMullen, 1974). A large number of data on wages may be found in Szilagyi's article. HS 4 is the rate given in the New Testament (Mathew, 20, 2; *δηνάριον*) which is rendered in the King James version as "a penny," not to be taken as any indication of its purchasing power since in later 16th century England the daily wage of common labor was about eight pence (H. Phelps-Brown and S. Hopkins, *A Perspective of Wages and Prices*, p. 11, 1981).

³¹Clark (*op. cit.*, 549) uses a considerably higher number of work days, viz. 300, which apparently does not allow for the slack season in agriculture. (Cf. Hopkins, *Conquerors and Slaves*, p. 24, 1978). On the other hand Vauban (in E. Daire, *Economistes Financiers du XVIII^e Siècle*, p. 84ff, 1851) assumes 180 work days per year for agricultural laborers as well as for urban craftsmen in 18th century France. Bairoch's rule (footnote 77) implies a work year of below 200 days.

³²Szilagyi (382–384) estimates that the cost of maintenance of a slave was only about one-half the wage of a free laborer.

³³Duncan-Jones puts the pay of legionnaires of different ranks, presumably including donatives and other supplements, at between HS 1,200 and HS 2,000 (*op. cit.*, 79) compared to the base pay of HS 900 under Augustus for the lowest grade. The salary of three scribes in Urso (Spain) ranged from HS 800 to HS 1,200. (Frank, V, 94–95).

³⁴In 1972 rents and returns to capital in low-income countries were equal to 23 percent of labor income and to 16 percent of gross national product. (C. W. Reynolds, in C. Kindleberger, ed., *Economics in the Long View*, Vol. 1, p. 198, 1982). It has been assumed that the ratio was somewhat lower in imperial Rome.

6. Population and Labor Force

We now turn to the multipliers of average expenditures and income: population and labor force.

The population of the Roman empire at the death of Augustus (AD 14) appears to have been between 50 and 60 million.^{35,36} A similar figure may be regarded as also applicable nearly two centuries later at the death of Marcus Aurelius as there is no evidence of a substantial or sustained increase.³⁷ This stability was a result of high, though unknown, birth and death rates, the latter evidenced by the very low expectation of life at birth of not more than 25 and possibly even less than 20 years.³⁸ It seems that only 10 to 15 percent of the

³⁵A figure of 55 million is close to the earliest modern estimate of J. Beloch of 54 million (*Die Bevölkerung der griechisch-römischen Welt*, 1886, p. 507), and slightly above the average of six later estimates, viz. Beloch's of 70 million (*Zeitschrift für Sozialwissenschaft*, II, p. 618, 1899); E. Stein's 70 million (*Geschichte des Spätömischen Reiches*, p. 3, 1928); and the more recent estimates of 50 million (Duncan-Jones, 2); 50 to 60 million (M. Finley, *The Ancient Economy*, p. 30, 1973); and the 50 million for the Empire excluding Gaul and Spain (McMullen, p. 88, 1974). It is, however, considerably above the latest estimate, that of C. McEvedy and R. Jones of 39 million for AD 1 which includes very low and not explained estimates for the African and Asian provinces of the Empire. They only say that "the case against higher figures [presumably meaning primarily the Asian and African provinces] is now a very strong one." (*An Atlas of World Population History*, p. 353, 1978). It is also well above an estimate—without sources or arguments—of at least 40 million for the middle of the secondary century (P. Gagé, *Les Classes Sociales dans l'Empire Romain*, p. 41, 1964). Disregarded are two much older estimates, that of Gibbon (*The History of the Decline and Fall of the Roman Empire*, Vol. I, p. 43, 1776) of 120 million although it is claimed to be based on careful research, and that of Moreau de Jonnés, *Statistiques des Peuples de l'Antiquité*, p. 378, 1857) of 83 million.

³⁶Beloch and McEvedy and Jones put the population of the European provinces of the Empire around AD 1 at 24 and 22 million respectively. They disagree sharply, however, on that of the Asian and African provinces. Beloch's estimate of 31 million is fully 80 percent higher than McEvedy and Jones' of 17 million. Since McEvedy and Jones do not indicate their sources an explanation of the differences, very pronounced for all provinces except Egypt, for which both their and Beloch's estimates are well below others, is not possible. As a result McEvedy and Jones' share of the European provinces in the total population of the empire is 56 percent compared to Beloch's 43 percent, a very significant difference for the interpretation of many economic and social features of the Empire. Three other estimates which provide a full geographic breakdown (cited J. Durand, 29, 1974) put the population of the European provinces at between 25 and 32 million and that of the Asian and African provinces at between 22 and 34 million (their estimates for the entire empire range from 47 to 64 million) and the share of the European provinces at between 47 and 56 percent.

³⁷McEvedy and Jones' estimates raise the Empire's population from 39 million in AD 1 to 45 million in AD 200 (*op cit.* 22). Most of the increase, however, may be accounted for by territorial acquisitions, particularly the provinces of Raetia, Noricum, Pannonia and Moesia under Augustus and Dacia under Trajan. The remaining increase probably was negligible. There is little doubt, however, that the population of the territory of AD 1 was somewhat higher in ca. AD 100 than at the beginning of the period or a century later. There is also little doubt that changes in population over these two centuries differed substantially among provinces and even more among smaller territorial units.

³⁸Most available estimates, based on tombstones, yield figures in the low 20s, starting with Beloch's computation based on 1809 tombstones (p. 49, 1886). J. Durand (*American Journal of Sociology*, 65, 372, 1959–60) reviewing earlier estimates puts average expectation of life at birth for the entire empire—while the other estimates reflect essentially urban mortality—at 20 to 30 years. For other reviews of estimates cf. G. Acsadi and J. Nemeskery, *History of Human Lifespan and Mortality*, Chapter VI, 1970, and R. H. Ward and K. M. Weiss, *Demographic Evolution and Human Population*, Chapter 9, 1971. Hopkins (*Population Studies*, p. 246, 1966) is very sceptical of all estimates derived from tombstones but does not present one of his own. An even more pessimistic conclusion can be drawn from a study of Egyptian peasants under Roman rule, which puts their expectation of life at age 15 at 14.4 years. Given the author's assumption that only one half of the new-born survived

population were unfree³⁹ while another substantial proportion were freedmen. The working population may be put at approximately two-fifths of the total,⁴⁰ or about 22 million persons, and the share of agriculture at between three-fourths and four-fifths.⁴¹

The degree of urbanization was substantial.⁴² Approximately one million people lived in Rome⁴³ and one to 1½ million more in the three largest provincial cities, all in the non-European part of the Empire, each of which may have had close to one-half million inhabitants: Alexandria, Antioch and Carthage.⁴⁴ These four metropolises thus accounted for about two million people or four percent of the total population of the Empire. There were “numerous” or “a series of”

to age 10 the expectation of life at birth would be well below 20 years (cited Salmon, *Population et Dépopulation dans l'Empire Romain*, p. 172, 1974). The most recent estimate which starts from a table by the jurist Ulpian (died AD 223) rather than from tombstones, suggests an expectation of life at birth of between 19 and 23 years (B. Frier, *Roman Life Expectancy: Ulpian's Evidence*, in *Harvard Studies in Classical Philology*, 86, 250, 1982). If it is assumed that the population of the Roman Empire showed no trend in the two centuries following 27 BC, such stability is compatible with an expectation of life at birth of twenty years and an annual crude birth rate of five percent (A. J. Coale, *Scientific American*, 231, 45, 9/1974), both reasonable values. Such stability is also compatible with a life expectation of 25 years and a birth rate of 4.1 percent.

³⁹McMullen's estimate for the Empire is about one eighth, for Italy possibly one-fourth, for the provinces close to one-tenth—(92, 1974), though he puts the share of slaves, their children and freedmen in the city of Rome at one-third to one half (103, 1974). P. A. Brunt (*Italian Manpower 225 BC–AD 14*, p. 122, 1971) regards the Italian ratio of slaves of about two-fifths of total population—slightly above Hopkins estimate of about 34 percent (101, 1978)—as “extraordinarily high.” N. G. L. Hammond and H. H. Scullard, eds., *Oxford Classical Dictionary* (2nd ed., p. 995, 1972) suggest that “even in cities with a high slave density the ratio of slave to free did not exceed 1:3.” In four Italian cities of over 5,000 inhabitants the ratio was put at slightly above one-fifth (Duncan-Jones, 273). The share in Egypt and North Africa was much lower, in Egypt less than one-tenth (McMullen in H. Temporini ed., *Aufstieg und Niedergang der Römischen Welt-Prinzipat*, Vol. II-1, 197, 255–256, 1975).

⁴⁰This estimate is based on the ratio prevailing in 1960 in less developed countries (International Bank for Reconstruction and Development, *World Development Report*, p. 146, 1982) assuming a share of their population below 15 years of about 40 per cent.

⁴¹Three-fourths is the share in less developed countries in 1960 (*loc. cit.*). McMullen suggests very guardedly a ratio of 70 to 75 (253, 1975). In Egyptian villages between five and 20 percent of the population was engaged in non-farming activities (McMullen, 153, 1974). Since villages accounted for about nine-tenths of the Empire's population the share of the agricultural population for the Empire as a whole would be between 72 and 85 percent if the Egyptian ratios are applicable to the average of the other provinces. As late as 1700 the share of the primary sector, i.e. essentially agriculture, has been estimated at slightly above four-fifths (P. Bairoch, *Annales*, 26, 965).

⁴²“The Graeco-Roman world was more urbanized than any other society before the modern era” (Finley, 325, 1977), a statement which must be qualified to date the “modern era” from at the latest the 16th century, at whose start urbanization in Flanders and Holland already exceeded 40 percent and 50 percent respectively (J. deVries, *The Dutch Rural Economy in the Golden Age*, pp. 84, 86, 1974).

⁴³This is the value of one of the most detailed estimates (Kahrstedt in L. Friedlaender, *Darstellungen zur Sittengeschichte Roms*, Vol. IV, 20, 1921, for AD 1) as well as that of a recent estimate (K. Hopkins, in P. Abrams and E. A. Wrigley, *Towns in Societies*, pp. 37 and 96–98, 1978), and one of the oldest estimates (Beloch, 616, 1899), and is not far from Gibbon's two centuries old figure of 1,200,000 (*op. cit.*, Vol. III, p. 219, 1781). It is also close to the average of more than a dozen of estimates made in the past century which range from 250,000 to 1,600,000 for usually unidentified dates in the first century BC to the third century AD most of which are listed in P. Salmon, 10–11.

⁴⁴Beloch (1886), 479; Duncan-Jones (260–261); McMullen (57, 1974) give Alexandria over half a million and Antioch and Carthage about as much. Sharply lower, and rather unlikely, estimates have been put forth by J. C. Russell (*Late Ancient and Medieval Populations*, p. 77ff, 1938), viz. 216,000 for Alexandria, 90,000 for Antioch and 38,000 to 50,000 for Carthage; together with his estimate of the population of Rome of 350,000 (*op. cit.*, 73) they put the total for the four cities at only about 700,000—far below any other estimate—or not much over one percent of the population of the Empire.

or “possibly half a dozen” other cities with more than 100,000 inhabitants,⁴⁵ together having at least another million and possibly as much as two million inhabitants, which would bring the share of large cities to about six to seven percent. The estimation of the population of the about 3,000 smaller cities⁴⁶ is more hazardous. While most of them were undoubtedly quite small⁴⁷ in the later empire “several hundred” cities in the oriental provinces were large enough to issue their own token coins.⁴⁸ It is therefore unlikely that the population of these cities could have averaged less than one thousand, for an aggregate two million, and it may have reached three million. Total urban population, including some inhabitants of the adjacent countryside, therefore should have been between five and seven million, or between nine and 13 percent of total population, nearer the lower boundary at the beginning of the principate and nearer the upper boundary two centuries later. Urbanization was well above the average in Italy and considerably lower in the European provinces.⁴⁹

The average income of the urban population was as everywhere considerably higher than that of the preponderant rural population although the latter included many middling and large landowners. Even if it was twice to $2\frac{1}{2}$ times as high⁵⁰ it would increase the average income for the entire empire by only about 15 percent above that of the rural population. For an estimate of the average income of the Empire that of the rural population is therefore decisive.

⁴⁵These three vague terms are found, respectively, in Heichelheim, *Handwörterbuch der Sozialwissenschaften*, 9, p. 978, 1959; M. Finley, 139, 1973, and R. McMullen, *Roman Social Relations, 50 BC to AD 284*, p. 57, 1974.

⁴⁶One estimate puts the number of cities in Italy (300), Iberia (300), the eastern provinces (900) and North Africa (300) at 1,800 (Hopkins, 1978) which on the basis of population (Beloch's estimates) suggests a total for the empire of about 2,500. The figures for North Africa are the same as those given in another source for the middle of the second century, but are twice as high as those for Italy and Iberia (Kahrstedt, 146). A more detailed estimate yields 430 in Italy (Duncan-Jones, 339). If the density of cities had been the same in the provinces the Empire would have counted about 3700 cities. The index of A. H. M. Jones (*The Cities of the Eastern Roman Provinces*, 2nd. ed., 1971) lists about 1,800 names, some of which seem to refer to large villages or fortresses rather than to cities. If the density was the same in the western provinces the total for the empire would be in the order of at least 3,500.

⁴⁷The average population of late medieval German cities has been put at about 500 (H. Bechtel, *Wirtschaftsstil des Deutschen Spätmittelalters*, p. 35, 1930).

⁴⁸Pekary, p. 103.

⁴⁹On the basis of the data for the areas and/or population of 30 cities, mostly with a population of over 5,000 (Beloch, 487, 1886; Duncan-Jones, 273; Russell, 63ff) their aggregate population may be put at fully 300,000. The 400-odd other cities (Duncan-Jones, 339), should have added at least another 300,000 bringing the total population of Italy, which may have included some inhabitants of rural areas, to approximately $1\frac{1}{2}$ million (including 1,000,000 for Rome), i.e. to about one-fifth of a total population of seven million, a ratio of urbanization probably not reached again in any part of the world before the 18th century except in the Low Countries (de Vries, *loc. cit.*) and in some parts of Italy. The population of nearly 100 larger cities in North Africa, Egypt, Syria and Asia Minor (excluding Carthage, Alexandria and Antioch) has been estimated at about 1.2 million or four percent of the population of these provinces which accounted for fully one-half of that of the Empire. (Russell, 76ff, whose estimates of city populations are generally below others).

⁵⁰A ratio of urban to rural common labor of two to one is indicated by Italian wages in the first century AD as well as two centuries later in Diocletian's price edict (Duncan-Jones, 11). For all urban and rural residents the ratio may not be much higher, the incomes of the larger landowners offsetting that of the urban skilled workers, businessmen and rentiers.

7. National Product

The estimates on expenditures and income per head are summarized in Table 1. They yield estimates of national product, accepting a population figure of 55 million, of about HS 21 billion based on an average of approximately HS 380 per head per year from both the expenditure and the income side.^{51,52} These figures will be adopted as the best estimates that apparently can now be made,

TABLE 1
DERIVATION OF GROSS NATIONAL PRODUCT PER HEAD, ROMAN EMPIRE AD 14

| | Estimates (rounded) |
|---|------------------------|
| I. <i>From expenditure side</i> | |
| 1. Wheat consumption per year (modii) | 37½ |
| 2. Wheat price per modius (HS) | 3 |
| 3. Wheat | 112 |
| 4. Foodgrain | 130 |
| 5. Food | 200 |
| 6. Total consumer | 350 |
| 7. Total national expenditure (HS) | 380 |
| II. <i>From income side</i> | |
| 1. Average daily labor compensation (HS) | 3½ |
| 2. Working days per year | 225 |
| 3. Average annual labor compensation (HS) | 790 |
| 4. Dependency ratio ^a | 2.5 |
| 5. Labor income per head of population (HS) | 315 |
| 6. Step-up for non-labor income | 1.20 |
| 7. Total income per head (HS) | 380 |

^aInverse of share of labor force in population.

⁵¹It is now time to compare the estimate of national product just derived of close to HS 380 per head with a recent partial estimate from the expenditure side. Hopkins (*Journal of Roman Studies*, 119, 1980) puts the value of grain consumption of HS 8½ billion per year, or about HS 153 per head of a population of 54 million. This is a result of multiplying a minimum net consumption of 250 kg. wheat equivalent (about 38 modii) per head per year, with a production/consumption of wheat ratio of 4/3 and a price of HS 3 per modius. This figure is somewhat higher than that of HS 130 adopted here as a result of the inclusion of grain for seed, which in an estimate following national accounting principles should be excluded as a cost element, but is partly offset by a lower estimate of the quantity of breadgrain consumed.

Hopkins obviously regards his estimate as only a partial one, stating that "the gross product of the Roman empire must have exceeded our estimated minimum product considerably," but he may not have realized how much larger a comprehensive estimate of gross national product following modern national accounting techniques would be—viz. about 2½ times as high.

⁵²The second estimate of national product (undated but probably referring to the first and second centuries AD) of "not possibly less than forty milliars [billion] sesterces" qualified by the author as "dangerous and hypothetical figures," together with an estimate of "about four milliard sesterces" for "the annual budget of the Roman State," (A. Bernardi, in C. Cipolla, ed. *The Economic Decline of Empires*, 22, 1970) is presented only for completeness' sake and as a curiosum. It is based on assumed average incomes of HS 800 (in turn derived from incomes of HS 900 for workers, HS 900 for soldiers and the maintenance cost of slaves of HS 480), but this average is erroneously applied to the total population of 50 to 60 million rather than correctly only to the much smaller number of income recipients which should have been in the order of 20 to 25 million yielding a labor income of 16 to 20 billion HS, close to the figure used here.

though hopefully not forever, with a margin of uncertainty of at least 15 percent, i.e. between about HS 320 and 440 per head and of HS 18 to 24 billion for the aggregate. These estimates may be regarded as applicable to the century following the beginning of the principate in 27 BC, with possibly a very small upward trend of not over 0.02 percent a year, reflecting even smaller increases in incomes per head and in population.^{53,54}

While it is not possible to say whether real income per head under the early Empire differed measurably from that during the last century of the republic there is little doubt that it was substantially above that of the third to fifth centuries AD.⁵⁵

8. Monetization

Though it has been claimed that the economy of the early Roman empire was, and to an increasing extent, a money economy,⁵⁶ the share of nonmonetized transactions remained undoubtedly high. There is, of course, no direct evidence of the degree of monetization which varied not only as between urban and rural areas but also among provinces, apparently being lower in Egypt and some border regions than in Italy and most of the Asian provinces. Hence, again, analogies must serve. In India in the early 1950s the share of monetized household consumption was slightly in excess of three-fifths.⁵⁷ At the present time the monetization ratio of gross domestic product in the least developed (African) countries is in the neighbourhood of one half.⁵⁸ In the early Roman Empire in which home-produced food supplied a large part of household consumption the monetization

⁵³The use value of government structures and equipment cannot have amounted to more than a very few percent of national product. In the United States in the 1950s to 1970s the share (excluding military durables) has been put at about four percent of national product. (F. Martin, J. S. Landefeld and J. Peskin, "The value of services provided by the stock of government-owned fixed capital, 1948-79," pp. 331-350 in this issue, Tables 5 and 8 1983). It must have been substantially lower in the Roman empire where equipment, which accounted for about two-fifths in the United States, was negligible and educational buildings and conservation and development, accounting for another one-fifth in the United States, were very small. Even a considerable increase in the use value of government capital could not have led to a noticeable increase in total national product.

⁵⁴Two components of national product may well have, and are even likely to have, increased through at least part of the first and second centuries: public building and luxury consumption. These two components however, can hardly have accounted for as much as one-tenth of total national product. Hence even if their volume had doubled in the two centuries after the beginning of the principate—almost certainly an over-estimate—this would be equal to an average rate of growth of less than 0.05 percent. Unless it can be shown that consumption per head, and food consumption in particular, increased substantially, the hypothesis that there was no noticeable increase in real national product, per head or in the aggregate, in the early Roman empire will have to stand, and there is no evidence for such an increase in mass consumption. The contrary fairly isolated assertion of F. Oertel (*Cambridge Ancient History*, p. 390, 1934), put forth half a century ago, that there was "an immense increase in consumption" was not accompanied by any quantitative evidence. A rise in per head output during the first two centuries AD has recently been claimed, but again without qualification or qualitative evidence (Gunderson. *Explorations in Economic History*, 13, 1976, 51).

⁵⁵For many pieces of evidence, cf. Szilagyi, e.g. 339.

⁵⁶Duncan-Jones, 6.

⁵⁷Chandavarkar, *IMF Staff Papers*, 24, pp. 685, 679, 1977. (But cf. fn. 59).

⁵⁸In seven tropical African countries the money income of the indigenous population has been estimated to have been equal in 1950 to, on the weighted average, just over one-half of net geographic product. (United Nations, *Scope and Structure of the Money Economies in Tropical Africa*, pp. 9, 19, 1955.)

ratio of national product is unlikely to have been as high as one-half.⁵⁹ This would indicate a monetized national product of about HS 10 billion with a range of HS 9 to 12 billion.

9. Capital Formation

There is no possibility of estimating the volume or proportion of gross or net capital formation in the conventional sense of expenditures on durables. While expenditures on equipment or consumer durables other than housing were undoubtedly small and may not have been substantially in excess of capital consumption, there is extensive archeological evidence of large scale building activity in the fields of residential structures, for the masses as well as for the elite, of public buildings and of roads, all evidenced in additions to the stock of structures of these types not only in Rome and Italy but also in the provinces, i.e. of net as well as of gross capital formation if net capital formation is identified with the addition to the stock of durable goods.^{60,61,62} One would therefore expect a not negligible rate of growth of real national product on the basis of the Harrod–Domar equation, according to which the rate of growth is equal to the capital formation ratio divided by the capital-output ratio. With a net capital formation ratio of only three percent, a capital-output ratio of four and the absence of population growth, the annual rate of growth would have been 0.75 percent which implies an increase of real national product per head within a century of 110 percent. There is no evidence of an increase of anything like this magnitude. The explanation of this puzzle is that most of the expenditures on durables did not result in an increase in productive assets in the narrow sense

⁵⁹A much lower figure for the degree of monetization is implied in Hopkins' estimate—called “a hypothetical scheme” and “roughly only true for the [agricultural] population as a whole”—that only one-fifth of peasants' production was sold in the market (17, 1978). If it is assumed that all other sectors of the economy accounted for one-fifth of the national product and sold three-fourths of their product in the market the monetization ratio for the entire economy would have been in the order of 30 percent, well below the corresponding ratios for less developed countries in the mid-20th century, e.g. India for which the fairly reliably known ratio was on the order of two-thirds in the 1950s (S. Ghosh, *Monetization of an Economy*, 26, 1964), but probably was considerably lower before the 20th century.

⁶⁰Virtually all economic histories of the period, as well as the ruins still visible, agree on the increase in building activity and the resulting new fora, temples, public baths, amphitheatres, villas and tenements, inns and roads, particularly in the European and North African provinces.

⁶¹Among the few large projects of the imperial government for which costs can be approximated are the HS 350 million for an aqueduct of nearly 75 km finished under Claudius after 14 years and the HS 400 million for the draining of the Fucine Lake (M. K. and R. H. Thornton, *The Journal of Economic History* XLIII, 377–378, 1983). These expenditures, distributed equally over the period of construction (assumed for the Fucine Lake at 10 years), would have been equal to about 0.3 percent of national product. They apparently were financed, at least in part, out of confiscations rather than ordinary revenues (Frank, V, 42). For other building activities cf. Frank, *op. cit.* 19–20 and 43; for buildings of Augustus, cf. V. Gardthausen, *Augustus und seine Zeit*, Vol. III, Chapters 6 and 7, 1891.

⁶²A recent estimate (M. K. and R. L. Thornton, *op. cit.*) of the volume of public works in and within 60 km of Rome during the period from 29 BC to AD 69 may be interpreted as implying an average annual expenditure of about HS 40 million or about 0.2 percent of the national product of the Empire. Expenditures within the entire Empire must, of course, have been substantially higher, though not in proportion to population, which would require a blow-up ratio of at least 20. It is more likely that they point to a ratio of the public works expenditures of the order of only one to two percent of national product. Though short-term fluctuations in the volume of public works were very pronounced (cf. chart on p. 376) the average for the reign of Augustus, and hence its ratio to national product, seems to have been close to that of the century covered.

of assets yielding additional monetized income or, as for residential buildings or roads, at least imputed income in the conventional sense. Using the national product concept now applied in centrally planned economies most of the expenditures on durables did not increase net material product, though there should have been a significant increase in the output of building materials and in some capital goods like ships. In particular net capital formation apparently did not substantially increase the output of agricultural products which accounted for the dominating share of total national product. There probably was some increase in the output of nondurable consumer goods, such as textiles, but their weight in national product was too low to raise its aggregate level substantially. If allowance could be made for the utility to consumers of the additions of the new public facilities that did not produce much cash income, some—though by modern standards still very small—rate of growth would be shown from the end of the first century BC to the middle of the second century AD in a more broadly defined measure of national product.

10. *Sectoral Distribution*

Since the share of agriculture in the working force appears to have been between three-fourths and four-fifths and average product in agriculture may be assumed to have been substantially lower than in the other sectors, agriculture's share in national product must have been well below two-thirds. If the ratio of average income in agriculture was two-fifths as high as in other sectors, as suggested in section 6, the share of agriculture in national product would have been in the order of three-fifths.

11. *Regional Distribution*

No quantitative evidence exists about differences in income per head in the various provinces except the facts that the level of wages and prices in Egypt was much lower, and that of the level of prices, particularly of rents, and of incomes was substantially higher in Rome.⁶³

12. *Size Distribution of Personal Income*

All available data point to a high degree of inequality of personal incomes. The only statistical evidence is the spread in military pay, that of a centurion (a middle grade officer) being 16 times higher and that of a commander of a legion at least 67 times higher than that of a common soldier.⁶⁴ It is, however, possible,

⁶³The regional distribution of imperial revenue in the reign of Vespasian, "hazarded" by Frank (V, 53–54)—nearly two-fifths from Egypt, one-fourth from Gaul, one-sixth from Syria, one-twelfth from Africa, about five percent each from Spain, the Balkans and Asia and nothing from Italy—cannot be regarded as reflecting the regional distribution of income as the ratio of taxes to income was much higher in the recently acquired provinces of Egypt and Gaul than in most of the other older provinces and particularly than in Italy. Another estimate (Cavaignac, 158) allocates three-fourths of the total to the oriental provinces, including one-fourth to Egypt, one-third to Syria (including a few smaller contributors) and one-sixth to the province of Asia. The one-fifth allocated to the European provinces was attributed primarily to Gaul and Spain. This allocation again differs greatly from that of population.

⁶⁴Duncan-Jones, 79; McMullen, 94, 1974; Szilagyi, 373–377 provide information on base pay and supplements.

to obtain an idea of the income of the three top social classes in the Empire, Roman senators, knights and municipal senators, and of their share in total personal income, due to the existence of property qualifications for these three classes. The 600 Roman senators representing about 0.004 percent of all families,⁶⁵ may be estimated to have had an average annual income of HS 150,000 on the basis of a property qualification of HS 1,000,000, an average fortune of HS 2,500,000,⁶⁶ and a yield of six percent, or fully one hundred times the average family income. This would put their aggregate income at about HS 90 million or about 0.5 percent of total personal incomes.⁶⁷ This figure does not include the personal income of Augustus which may be estimated at at least HS 15 million or nearly 0.1 percent of total personal income on the basis of his legacies of about HS 240 million,⁶⁸ probably substantially below his average fortune, and a yield of six percent.

The approximately 40,000 knights (equites)^{69,70}—a life-long noninheritable rank—who with their families represented fully 0.3 percent of the population, may be assumed to have had an average fortune of twice their property qualifica-

⁶⁵Since most of the senators under the early Empire were Italians (S. I. de Laet, *De samstellingen van den romeinischen senaat* . . . , 1941) the proportion to all families in Italy was higher, probably in the order of 0.3%.

⁶⁶The comparable ratio for U.S. taxpayers with an adjusted gross income in 1980 of more than \$1 million is 2.04 (*SOI Bulletin*, 1, 3, p. 8). The multiplier has been raised here to 2.50 because of the higher degree of concentration at the top of the income pyramid in imperial Rome.

⁶⁷The fortunes of some leading senatorial families have been put at HS 48 or HS 60 million. (Kahrstedt, 213) with incomes of supposedly HS three to four million, or about 0.02 percent of total personal income. A fortune of HS two million, implying an income of about HS 100,000, was regarded as "insufficient" for a senator (*loc. cit.*). There are reports in the later first century of several private senatorial or equestrian fortunes on the order of HS 70 million to HS 100 million and a few of HS 400 million, which should have yielded annual incomes of between HS six million, and HS 25 million. (Duncan-Jones, 4; Frank, V, 24; Kahrstedt, 213), or between 0.03 percent and 0.12 percent of total personal incomes each until they were, as was often the case, confiscated by the emperor. For a list of 28 large private fortunes between the first and third centuries, cf. Duncan-Jones, 343-344. Of them 18 (including only one woman) left fortunes between HS 2 and 400 million averaging HS 100 million and hence supposedly had average incomes of over HS 5 million or over 3000 average family incomes.

⁶⁸Frank, V, 15.

⁶⁹The estimates of the number of knights vary widely. On the one side they are put at "less than 50,000" (cf. C. Starr, *The Roman Empire 27 BC-AD 476*, 64) or at "probably less than one-tenth of one percent" of the total population (McMullen, 89, 1974), which would yield a similar figure. On the other hand J. Gagé allows at the maximum "some ten thousand including their families" (*op. cit.* 41) which suggests less than 10,000 equites, a figure difficult to accept since another estimate puts the number of knights living in Rome at 5,000 (Salmon, 19), unless it refers like de Laet's estimate of some 10,000 (*Revue Belge de Philologie et d'Histoire*, XX, 511, 1941) only to equites equo publico while there were other knights who did not belong to this more restricted category, in which case it may be compatible with the one of 40,000 used here. A. Stein in a work devoted to the knights did not get closer to a quantitative estimate than to say that they were "incomparably more numerous" than the 600 Roman senators and to state that as many as 5,000 of them—obviously a minority of all knights—participated in the annual parade in Rome (*Der Römische Ritterstand*, 83, 1927). In two large cities (Padua and Cadiz) for which the number of knights has been reported they constituted about one percent of the population, but the density for the whole empire is supposed to have been substantially lower (McMullen, 89, 1974). So the figure of 40,000, which implies an average ratio, including their families, of about three percent of the urban population seems to be of the right order of magnitude, though possibly on the high side.

⁷⁰In a small sample of knights living under Augustus and Tiberius—193 or about 0.5 percent of the total—nearly 60 percent were Italians and 40 percent provincials, among whom three-fifths came from the Western provinces (de Laet, *op. cit.* 518). In another similar sample of about 120 knights "far above one-half" came from Italy (Stein, 413).

tion of HS 250,000, i.e. HS 500,000, and hence at a yield of six percent an average income of HS 30,000,⁷¹ about 20 times the average family income of the entire population. Their aggregate income would then have been in the order of HS 1200 million or fully six percent of total personal income. Thus the approximately top one-third of one percent of income recipients would have accounted for about seven percent of total personal income.

The estimation of the income of the much more numerous municipal senators (*decuriones*) is more hazardous. At an average of about 120 per city⁷² and for 3,000 cities,⁷³ they would account for about 300,000 households or 2 percent of the total. The choice of an average income is very difficult. In a fairly large and wealthy city (*Comum*) the property qualification was HS 100,000⁷⁴ indicating average fortunes of HS 200,000 and an average income of HS 12,000. For the average city income should have been considerably lower, say HS 8000 on the average, or less than six times the average family income.⁷⁵ The income of all 360,000 municipal senators would then have been close to HS three billion or about one-sixth of total personal income.

These three percentages cannot be interpreted unequivocally as representing the aggregate income of, respectively, the top 600, 40,000 and 360,000 income recipients because undoubtedly some and probably many knights and even a number of municipal senators and a few people of lower status, particularly freedmen and children of slaves or freedmen, had fortunes and hence incomes exceeding the senatorial qualification. Similarly many municipal senators and people of lower rank had fortunes and incomes in excess of the qualification for knights, and many free rural landowners and artisans and freedmen, and even some slaves, had fortunes and incomes above the property qualification for municipal senators. Hence the number of income recipients in each of the three groups and of their aggregate income must be regarded as minima, but there is no way of forming a judgment about the size of the difference.⁷⁶

⁷¹In estimating average income it is relevant that nearly one-half of a somewhat larger group of knights were or had been in the armed services (*de Laet*, 526, 1944) as officers or subalterns. Since their base pay while on active service ranged from about HS 3,000 for non-commissioned officers, some of whom were granted the rank of knight by the emperor (*Stein* 42, 147ff) to HS 30,000 for middle-grade officers (*centuriones*) and well over HS 100,000 for senior officers (*Duncan-Jones*, 79; *McMullen*, 94, 1974; *Szilagyi*, 370ff.) the average income of knights of HS 30,000 assumed in the text is not likely to be exaggerated.

⁷²Average of the typical number of 100 for the western provinces and the geometric average of the wide range from 30 to 500 in the eastern provinces (*McMullen*, 90, 1974). The average for eight Italian cities was 84 (*Duncan-Jones*, 286).

⁷³This is slightly below the average of the three estimates of the number of cities of footnote 44, assuming a lower density in the Western provinces than in Italy and in the Eastern provinces.

⁷⁴*Duncan-Jones*, 267, 273; *McMullen*, 90, 1974.

⁷⁵Another authority regards a property qualification of HS 100,000 as typical (*Gage*, 163) and suggests it may have been fixed by Augustus (*op. cit.*, 187).

⁷⁶Nearly half a century ago the exponent in the Pareto equation for the Roman Empire at Cicero's time was put at 1.5—a value which Pareto regarded as normal—which corresponds to a Gini coefficient of 0.5 (*H. T. Davis, Econometrics*, 1946, 184–185—I am indebted for this reference to Professor L. R. Klein—and *The Analysis of Economic Time Series*, 1941, 394, 426). Since the details of the derivation of this estimate have not been published it is cited only for the sake of curiosity or completeness. The implied Gini coefficient of 0.5 appears to be on the low side, understating the degree of income concentration, but it cannot be ruled out.

Whether the degree of concentration of income changed during the early Empire we have no means of knowing. A classic historian's assertion "fewer have more"⁷⁷ implies it, but there is no quantitative evidence. Judging from the reported owners of the extremely large fortunes one might surmise that concentration at the very top was highest during the middle of the first century and was lower under the Antonines. But for the rest of the share of the top three percentiles the trend of the number and the average income of the knights and municipal senators is decisive and about that we know nothing.

III. INTERNATIONAL COMPARISONS

1. *Limitations*

Estimates of national product per head or for entire communities in current prices do not provide a basis for international comparisons. For that purpose they must be reduced to a comparable basis by a purchasing power index based on the prices of commodities and services which constitute a large part of total expenditures and are appropriately weighted.⁷⁸ It is not yet possible to construct such an index for the early Roman Empire and thus to derive a figure for its per head or aggregate national product that can be compared directly with similar estimates for other countries and periods.⁷⁹

The best that can be done in this situation, in some respects even preferable to the comparison of national product estimates, is to confront a number of economically relevant magnitudes in the early Roman Empire with those in a few situations that appear to be more or less comparable. In the almost complete absence of such data for another country in antiquity or for an occidental or oriental medieval country comparison is made on the one hand with England, France and the United States before the industrial revolution, and on the other hand with two still less developed countries of different type at an early stage of their economic development, India and Brazil in the mid-19th century, and

⁷⁷McMullen, 38, 1974.

⁷⁸The most elaborate comparisons of this type are those made by Kravis and associates, e.g. I. Kravis, A. Heston, and R. Summers, *World Product and Income*, 1982.

⁷⁹An experienced student of old national product data has recently estimated that for the preindustrial period of western economies through the 19th century the average national product per head has within a rather small margin of error been of the order of 200 times the daily wage of a male unskilled urban worker (Bairoch, *Revue d'Economie Politique*, XXVIII, 2, 777, 1977), but cautions against applying the same ratio to economies of different periods or regions. Its application to early imperial Rome shows how well founded and necessary such a caution is.

On the basis of Bairoch's rule the per head national income of early imperial Rome would have to be put at between HS 600 for a daily male urban wage of HS 3 and at HS 800 for one of HS 4, the figures which bracket most relevant estimates. Even the lower limit seems too high by all the evidence presented in the text, indeed fully one-half higher than the average national product of about HS 380 suggested in section I.7. The much lower value of the multiplier for the early Roman Empire—about 110 for an average daily male urban wage of HS $3\frac{1}{2}$ —may be due to one of two main factors or a combination of them. The first is a lower ratio of the average actual or imputed wage to the wage of the urban male worker, the second a lower ratio of national product to the wage bill. There are good reasons to assume that both ratios were indeed lower in the early Roman empire than in 18th and 19th century Europe from which almost all of Bairoch's data are taken, and possibly considerably lower in the case of the second ratio. The fact that the ratio is put at 160 for the only case outside the period for which the "200 rule" is regarded as applicable, viz. England in 1688, presumably on the basis of King's figures points in the same direction.

sometimes with a contemporary average of all less developed countries. Comparisons with developed countries in the mid 20th century are made only occasionally and in cases where the distance of two millennia does not deprive them of relevance. The subjects of comparison are then the national product equivalent expressed in two basic commodities, gold and wheat; two general indicators of welfare, expectation of life at birth and the share of foodgrains or all food in total expenditure; and four indicators of economic and social structure, the share of agriculture, the degree of urbanization, the share of government expenditures in national product, and the concentration of personal income, and finally the rate of growth of population and national product.

2. National product in terms of commodities

In the face of the inability to express national product in terms of an appropriately constituted basket of commodities and final services the comparison will be limited to two basic commodities.⁸⁰

The comparison of the gold equivalent of national product per head is arithmetically unequivocal, but economically problematic, because the ratio of the price of the representative basket of commodities and services in terms of gold is very difficult to determine but certainly has changed over time. In terms of gold, which was the base of the monetary system of the early Roman Empire, its national product per head of about four aurei, equal to 31 g or about one ounce of gold was higher than those of India and Brazil in the mid-19th century (14 g and 27 g), but substantially lower than those of England in 1688 (over 70 g) or of France and the United States in 1820 (about 100 g).⁸¹

⁸⁰Only one estimate which permits a direct comparison of real product per head of the Roman Empire with that of modern countries has been found. On the basis of prices in Diocletian's edict of AD 301 and of the distribution of expenditures of Italian peasant families in the 1920s the value of expenditures per adult has been estimated at 181 International Units, i.e. U.S.A. dollars of 1925-34 (Clark, 552). As the standard of living in Diocletian's time is likely to have been below that of the early Empire expenditures per adult should have been above 200 IU which compares with 370 IU per occupied person in Italy in 1893, 163 IU in Brazil in 1928, 138 IU in China in 1933 and 132 IU in India in 1867/68 (*op. cit.*, 89, 124, 126, 159). If this estimate is accepted it would put the purchasing power of the sestertius on the basis of expenditures per adult of HS 400 at about 0.50 IU or \$0.50 of U.S.A.: 1927/34 prices or \$3-1/2 in 1983 prices. Another estimate, implied though not explained, apparently referring to the early 1970s, equates the purchasing power of the sestertius to \$2.50 (Finley, 1973, 104) which in 1983 would correspond to about \$5.00. These two estimates put the purchasing power of the sestertius at 3-1/2 and 5 times respectively its exchange value at a gold price of \$400 per oz., a rather high rate, but for the first estimate only slightly above the corresponding ratio of 3-1/4 of India in 1975 (Kravis et al., *Review of Income and Wealth*, 1981, 342). On that basis the purchasing power of national product per head of Augustan Rome would be of the order of \$1,300 or \$1,900 in 1983 prices compared to slightly over \$14,000 in the United States and to about \$850 in India (using the exchange deviation ratio of 1975).

⁸¹Devised from standard sources.

For England and Wales from Gregory King's estimate of national product of £48 million (Ph. Deane and W. A. Cole, *British Economic Growth 1688-1959*, and 55 g gold per £.

For India, from 6.14 billion R. gross national product and 0.35 g gold per R. (R. W. Goldsmith, *The Financial Development of India 1860-1977*, 5.)

For Brazil, R. W. Goldsmith, *The Financial Development of Brazil 1850-1980*, forthcoming.

For France, unpublished estimate of the fr 10 billion of M. Lévy-Leboyer for national product and 0.13 g gold per franc.

For United States, T. S. Berry, *Estimated Annual Variation of Gross National Product 1789 to 1909*, 32, for national product of \$655 million and 0.67 g gold per dollar.

There is also interest in aggregate national product in terms of gold as this figure provides an idea of the economic size of the economies being compared. It then appears that the early Roman Empire with a national product equal to about 1,700 t of gold far outranked not only the 400 t of England in 1688, the 440 t of the United States in 1820 or the 300 t of Brazil in 1850, but was behind the 2100 t of India in 1860 and the 2850 t of France in 1820.

The wheat equivalent of annual national product per head in the early Roman empire of about 125 modii at a price of HS three or close to 850 kg was in the order of one-half the level of England and Wales in 1688, of the United States in 1820 (about 1700 and 2050 kg respectively) and if all less developed countries in 1960 (about 1,500 kg) reflecting the high relative price of wheat in imperial Rome.⁸²

3. Length of Life

Length of life is probably the most important simple indicator of welfare. Here the comparison between the early Roman empire and other countries in more recent times is clearest. The less than 25 or even less than 20 years of the Roman empire are far below the level of England in the late 17th century (32 years) and France and the United States in the early 19th century (37 and 39 years respectively) as well as of all less developed countries in the mid-20th century (42 years).⁸³ Length of life in the Empire, however, probably was not much if at all below that in Europe in the Middle Ages and of that in other parts of the world until the late 19th century.⁸⁴ *Hic brevis vivitur*, as it has been said of the Roman Empire.⁸⁵

4. Share of Food Consumption

A second indicator of welfare is the share of food, or more narrowly foodgrains, in total consumer expenditures since Engel's law is applicable among localities as well as over time.⁸⁶ On that basis the consumer in the early Roman empire with a share of between one-half and three-fifths of food in total consumption was better off than the French peasant of the early 18th century; approximately as well off as the Indian peasant of the mid-20th century or the consumer

⁸²Derived for all less developed countries from IBRD *World Development Report*, 1982, 110, 112, for national product and an international wheat price of \$4.60 per bu. (IMF, *International Financial Statistics Yearbook*, 81, 1982); for England and Wales average of three wheat price quotations for 1686–90 (B. Mitchell and P. Deane, *An Abstract of British Historical Statistics*, 486); for the United States *Historical Statistics of the United States Colonial Times to 1970*, 209.

⁸³For England and Wales, E. A. Wrigley and R. S. Schofield, *The Population History of England 1541–1871: A Reconstruction*, 528ff; for France, Bourgeois-Pichat in D. V. Glass and D. E. Eversley, eds., *Population in History*, 504–505; for the United States W. H. Grabill, *Fertility of American Women*, 70; for less developed countries IBRD, *World Development Report*, 150, 1982.

⁸⁴Among the few estimates of expectations of life at birth of 20 years or less are 15 for the Bronze Age, for West Indian slave populations in 1820–32 and for China in 1930 (Clark, *Population Growth and Land Use*, 39, 1967) and 20 for India in 1901 (Saxena, cited S. B. Mukherjee, *The Age Distribution of the Indian Population*, 232, 1976).

⁸⁵A. R. Burn, *Past and Present*, No. 4, 2, 1953.

⁸⁶This ratio is preferable as an indicator of economic welfare to the quantity of foodgrains consumed because the latter is difficult to measure with sufficient accuracy; the types of foodgrains consumed and their caloric equivalents differ; and requirements are affected by climate as well as by body weight.

in Germany in the 16th and 17th centuries or in the 16th century in Spain; somewhat worse off than the Berlin worker of the early 19th century and considerably worse off than the average British consumer of the late 17th century.⁸⁷

The relations are more favorable to the Roman empire on the basis of foodgrains alone, an important ratio, since as a famous historian has said of a period as late as Europe of the 15th to 18th centuries, “le blé c’est la moitié de la vie quotidienne des hommes,”⁸⁸ where “la moitié” is not to be taken to mean exactly 50 percent. They are still more favorable if allowance is made for the fact that in the Roman empire wheat was the dominating grain while in Europe through the 19th century the mass of the population had to content itself with coarse grains, wheat being a luxury except for the wealthier classes.

5. Share of Agriculture

Probably the most important single characteristic of economic structure is the share of agriculture in the labor force and in national product. Both shares unfortunately can be estimated for the early Roman Empire only indirectly and with a wide margin of uncertainty. They have been tentatively put in sections I.6 and I.10 at 75 to 80 percent for labor force and at about 60 percent for national product. These figures compare with averages of 77 percent for labor force and 50 percent for national product for all less developed countries in 1960,⁸⁹ in the latter case considerably higher at earlier dates. (In India e.g. the share of agriculture in national product was as high as three-fifths to two-thirds at the turn of the century against one-half in 1960.⁹⁰ The early Roman Empire’s share of agriculture in labor force or national product was on the other hand probably higher than in most of Europe since at least the 18th century. In England and Wales the share of agriculture in the national product was slightly below one-half as early as 1688⁹¹ and at that time should have been considerably lower only in the Low Countries. In the United States it should have fallen below one-half only since the middle of the 19th century.⁹² The figures on the share of agriculture in the labor force are difficult to compare because of uncertainties and differences in the treatment of family labor. In the United States the share is given as fully 70 percent as late as 1820⁹³ at a time when the ratio had declined in Great Britain to one-third.⁹⁴ In a less developed European country like Italy the ratio was still as high as 60 percent in 1871⁹⁵ which was probably not much below what it had been during the early Roman Empire.

⁸⁷The sources of these comparisons are: for France Vauban’s *Dime Royale*, which puts the share at two-thirds (Daire, 86–88), a ratio which as it refers to farm workers, the poorest class, is certainly well above the national average; for England, Gregory King (Studenski, 31); for Berlin, W. Abel (cited F. Braudel, *op. cit.*, I, 106); for Germany and Spain H. Phelps-Brown and S. Hopkins, 88; for India M. Mukherjee (*loc. cit.*).

⁸⁸Braudel, *op. cit.*, 107.

⁸⁹IBRD, *World Development Report*, pp. 114, 146, 1982.

⁹⁰R. W. Goldsmith, *The Financial Development of India, 1860–1977*, 6, 1983; IBRD, *World Development Report*, 114, 1982.

⁹¹Mitchell and Deane, 368.

⁹²*Historical Statistics*, 232.

⁹³*Op. cit.*, 138.

⁹⁴Mitchell and Deane, 60.

⁹⁵B. R. Mitchell, *European Historical Statistics 1750–1970*, 158, 1975.

6. Urbanization

An indicator, not only of economic structure but also of civilization—since, as Max Weber stressed, civilization has always primarily been *Stadtkultur*—is the degree of urbanization. Here the picture is rather favorable to the Roman Empire. For all cities the impérial Roman ratio of fully one-tenth is about on the same level as that of Brazil or India in 1850 or of all less developed countries in 1960, but is well below the ratios of England in the late 17th century and France in 1820, though then still substantially above that of the United States, which reached the imperial Roman ratio only by the mid-19th century.⁹⁶

It may be of interest to compare the figures for the early Roman empire with one of the few estimates for a large country in the late middle ages. In Germany, which at that time is supposed to have had a population of about 12 million, or fully one-fifth of that of the Roman Empire, the share of the urban population has been put at about one-eighth, approximately the same as in the Augustan Empire. Germany at that time had no cities of more than about 30,000 inhabitants, of which there were many in the Roman Empire and the share of the 12 to 15 cities with over 10,000 people was much lower than in the Empire—probably not over 2½ percent of total and one-fourth of urban population—as was the average city size of only about 500 inhabitants.⁹⁷

7. Share of Government Expenditures

Reflecting its economically liberal policies, very close to those which would later be called “*laissez faire*,” but also due to the limitations of an as yet only partly monetized economy, the share of the expenditures of central and local governments in national product in the early Roman Empire was very low, probably not above three percent for the imperial government and on the order of five percent for all government units. This is not only far below the figures to which we have become accustomed since World War I in developed countries, but also below those in less developed countries, where the share of public consumption in 1960 averaged eight percent,⁹⁸ a ratio similar to that in England in 1688 and in the United States and in France in 1820.^{99,100}

⁹⁶Sources are for Brazil, R. W. Goldsmith, *The Financial Development of Brazil 1950–1980*, forthcoming; for India idem, *The Financial Development of India 1860–1977*, 3; for all less developed countries IBRD, *World Development Report* 148, 1982; for England and France rough estimates; for United States, *Historical Statistics*, 12.

⁹⁷H. Bechtel, 34ff, where the figure of total population is claimed to be “known with reasonable certainty on the basis of careful estimates.”

⁹⁸IBRD, *World Development Report*, 118, 1982. In India the share of public consumption in national product was seven percent in 1960 (IBRD *World Development Report*, 118, 1982), about the same as it had been a century earlier (Goldsmith, 39).

⁹⁹The shares of central government expenditures were about eight percent in England (Deane and Cole, 2, 6) and ten percent in France (*Annuaire Statistique Rétrospectif*, pp. 484, 555, 1966). Inclusion of the expenditures of local governments should increase these figures by only a few percentage points.

¹⁰⁰In 1902, the first year for which comprehensive figures are available, the expenditures of state and local governments were nearly twice as large as those of the United States Treasury and amounted to five percent of national product (*Historical Statistics*, 224, 1123, 1127) compared to the Treasury's expenditures of 2.6 percent, the latter figure almost identical with the 1820 ratio. If the same relationship had prevailed 80 years earlier the share of total government expenditures in national product would have been in the order of eight percent, about twice as high as in imperial Rome.

8. *Capital Formation*

The capital formation ratio, generally regarded as one of the most important parameters in the comparison of economies over time and space, was lower in the early Roman empire than in almost any other situation on which we have statistical information. Its rate of at most two percent on a net basis was well below the fully four percent in England in 1688,¹⁰¹ the six percent in Japan in the first 15 years after opening of the country (1869–85),¹⁰² and the six percent in Germany at the beginning of its industrialization in the 1850s.¹⁰³ One of the few cases of a similarly low rate of capital formation is India in the last four decades of the 19th century with about two percent, a case also characterized by a very low rate of intensive growth (0.2 percent per head per year).¹⁰⁴ The capital formation ratio of the early Roman Empire is, of course, far below—indeed by nearly an order of magnitude—contemporary levels, e.g. the 1960 average of less developed countries of nearly 20 percent for gross¹⁰⁵ and of well over 10 percent for net capital formation.

9. *Size Distribution of Personal Income*

In an economy in which personal income accounted for about nine-tenths of national product its distribution is not only of economic significance because of its influence on the structure of demand, on the capital formation ratio and on poverty, but it may also be regarded as an indicator of welfare at least in the sense that the mass of the population may feel better off if distribution is not too unequal, and it may finally acquire deep political significance, a possibility that did not materialize in the early Roman Empire.

A comparison of the size distribution of personal incomes over their entire range with other countries and periods is not within reach. It can, however, be attempted for the top of the income pyramid thanks to the existence of property qualifications for the three leading status groups, the Roman senators, the knights and the municipal senators, qualifications which did not change in nominal amount or in purchasing power over the early Empire. Comparisons will be limited to countries, disregarding data on individual medieval or renaissance cities, but in this case will go forward to contemporary situations for which much better data are available.

One of the few occupations in which the situation in imperial Rome can be compared to that in certain medieval and modern countries is the army. The range of 67 to one between the commander of a legion and a common soldier in the army of the early Roman Empire¹⁰⁶ was somewhat lower than the spread of 80 to one between a common soldier (archer) and a senior officer (count) in medieval England¹⁰⁷, though considerably higher than the ratio of 25 to one in

¹⁰¹Based on King's estimates of increase in wealth and total income (Studenski, Pt. I, 31).

¹⁰²R. W. Goldsmith, *The Financial Development of Japan 1868–1977*, 29, 1983.

¹⁰³W. Hoffman et al. *Das Wachstum der Deutschen Wirtschaft*, 825, 1965.

¹⁰⁴Goldsmith, *The Financial Development of India, 1860–1977*, 19.

¹⁰⁵IBRD, *World Development Report*, 1982, 110.

¹⁰⁶Cf. footnote 62.

¹⁰⁷M. G. Mulhall, *Dictionary of Statistics*, 580, 1889, without indication of source.

the Napoleonic civil service between a minister (conseiller d'état) and a clerk (huissier)¹⁰⁸ and it was spectacularly higher than the 8½ to 1 ratio of the starting pay in 1983 of a brigadier-general and an enlisted man in the United States army.

Table 2 compares the share of the income size groups which correspond in their ratio to total population to the three top Roman status groups in England and Wales in 1688, 1801/03 and 1979/80¹⁰⁹ and in the present United States¹¹⁰ and Brazil¹¹¹ with the rough estimates that have been developed in section I, 12 for early imperial Rome.

TABLE 2
CONCENTRATION OF PERSONAL INCOME¹ (PERCENT)

| | Top 0.004% ² | Following | | Top 2.884% |
|---|----------------------------|--------------------|--------------------|---------------|
| | | 0.28% ³ | 2.60% ⁴ | |
| 1. Early Roman Empire ⁵ | 0.6 | 6.5 | 15.0 | 22.1 |
| 2. England and Wales 1688 | 0.6 ¹ | 5.8 | 17.6 | 24.0 |
| 3. England and Wales 1801/03 | 0.6 | 5.2 | 19.2 | 25.0 |
| 4. England and Wales ⁶ 1979/80 | 0.2 | 3.0 | 7.6 | 10.8 |
| 5. United States 1979 | 0.5 | 2.0 | 5.7 | 9.0 |
| 6. Brazil 1980 | . | . | . | 26.5 |

Source: Cf. footnotes 107 to 109.

¹Figures in lines 2 to 6 obtained by interpolation of basic data.

²Roman senators.

³Knights.

⁴Municipal senators.

⁵Based on 15 million families.

⁶United Kingdom; percent of income recipients.

⁷About 1.0 on basis of Lindert's revised estimate.

¹⁰⁸Fourastié, 40.

¹⁰⁹Income distributions calculated from estimates of Gregory King for 1688 (Studenski, *loc. cit.*) and of P. Colquhoun for 1801-03 (L. Soltow in A. B. Atkinson, ed., *Wealth, Income and Inequality*, 57-58). The figures are compatible with Lindert and Williamson's estimate of the shares of the top five percentiles of 30 percent in 1688, and of 33 percent in 1801-03 (*Explorations in Economic History*, 20, 102, 1983). Figures for 1979-80 from *Annual Abstract of Statistics*, 109, 277, 1983. If a recent revision of King's estimates (P. H. Lindert and J. G. Williamson in *Explorations in Economic History*, 19, 393, 1982), which substantially increases the figures for the average incomes of the top 4,600 families, of 0.33 percent of the total, is accepted, the share of the top 0.004 percent in the table would be raised to possibly as much as 1.0 percent of total personal income (assuming the average for the top 56 families which correspond to the top 0.004 percent to be £10,000 rather than the average of £6,060 for the top 200 families in Lindert and Williamson's estimate) while that of the following 0.28 percent would be increased slightly to 7.3 percent and that of the next 2.60 percent to about 17.0 percent resulting in a total of about 25.0 percent instead of the 22.1 percent shown in the table. In that case concentration of income in England and Wales in 1688 would be somewhat more pronounced than in the Roman Empire for the top 0.004 percent and 0.28 percent, but not for the following 2.60 percent. Small changes would also have to be made in the estimates for 1801-03 if Lindert and Williamson's revisions (*op. cit.*, 400-401) are accepted.

¹¹⁰Derived from statistics of adjusted gross income and 80 million income recipients. Figures from U.S. Treasury, *SOI Bulletin*, 1, 3, p. 8 and additional information from Internal Revenue Service.

¹¹¹R. Bonelli, *Distribuição de renda: Evolução nos anos 70*, (IPEA memo, Nov. 1982). The share of the top five percent is about 35 percent (R. Hoffman, *Distribuição de renda em 1980*, mimeo, 1982) which is the same as the average for 30 less developed countries in the 1960s (S. Jain, *Size Distribution of Income*, 1975).

The table as it stands shows a remarkable similarity between the size distribution in the Roman Empire in the early first century AD and in England in the late 17th and the very early 19th centuries not only in the total share of the approximately top three percentiles of income recipients, but also in the three strata which make them up.¹¹² On the other hand the share of the top three percentiles is substantially higher in contemporary Brazil, but radically lower in the United Kingdom and in the United States of today. Indeed the present share of the top three percent of income recipients of about one-tenth of total personal income in these two countries is probably close to that of the top one percent in Augustan Rome or in Jacobean or Georgian England.

An alternative picture of the concentration of personal income is provided by the relation between the average income of the very top income recipients and average family income. In early imperial Rome the average income of each of the 600 senatorial families, close to but somewhat below that of the 600 top income recipients, representing 0.004 percent of all families, of HS 150,000 was fully 100 times as high as that of the average family and there were not a few families with an income of over HS three million, or over 2,000 times average family income. In England in 1688 the average income of the top 55 families, which correspond in their share of the population to the 600 Roman senatorial families, must have been well over £5000,¹¹³ or fully 150 times the average family income of £32, a spread even larger than that of imperial Rome. In 1801/03 the corresponding 90 families' average income of at least £15,000 was about 100 times the average family income of £98¹¹⁴ as in the early Roman Empire. At the present time the 600 top income recipients have an average income on the order of 50 times that of average income recipients. In the United States the top 0.004 percent, or approximately 3,200, income recipients in 1979 has an average adjusted gross income, undoubtedly not negligibly below their actual income, of about \$2³/₄ million or approximately 120 times average family income.

The ratio of the very top incomes to the average is, however, much lower in the United States of today—and presumably in any contemporary country—than it was in the early Roman empire. The fortunes of some leading senatorial families have been put at HS 48 million to HS 60¹¹⁵ million implying incomes of from HS 2.4 to HS 3.6 million or about 0.012 to 0.018 percent of total personal incomes and about 1,700 to 2,400 times average family incomes. Such revenues of the “superrich” would correspond in the United States of 1979 to incomes of between \$235 million and \$350 million. Such incomes do not exist. There were in 1979 only 57 persons declaring an adjusted gross income of over \$10 million with an

¹¹²Concentration increased considerably during the first half of the 19th century, a period of rapid growth, as the share of the top five percentiles rose from 33 percent in 1801–03 to 46 percent in 1867 and was still as high as 44 percent in 1913 (Lindert and Williamson, 102). The following century has, of course, witnessed a radical decline. If a recent revision of King's figure is accepted (Lindert, *Explorations in Economic History*, 393, 1982) the figure would have to be doubled.

¹¹³Estimated on the basis of an average of £2,800, for the 160 temporal lords, the top group identified by King.

¹¹⁴On the basis of an average of £800 for the 287 peers, a number of families of 2.27 million and a total personal income of £222 million as estimated by Colquhoun (L. Soltow, *loc. cit.*).

¹¹⁵Kahrstedt, 213.

average of \$23 million or somewhat less than 0.007 percent of total personal income though fully 900 times average household income.¹¹⁶

By chance it is possible to compare the income of the presumably highest income recipient in Augustan Rome and in Great Britain at the beginning of the 19th century, the monarch. Augustus' income has been estimated at about 0.08 percent of total personal incomes¹¹⁷ while that of King George III apparently came to a mere 0.01 per cent of the same total.¹¹⁸ There is nobody in the United States of today, or presumably in any contemporary developed country, whose income is of that size. In the United States in 1979 nobody had a declared income of as much as \$100 million, which would be equal to 0.005 percent of total personal income.

10. Growth

Last, but not least, is growth, extensive (aggregate) or intensive (per head). It is fairly evident that in the first and second century of the Empire neither population nor product per head nor aggregate product—nor it should be added prices—increased noticeably, i.e. by say more than 0.1 percent and 0.2 percent per year. Even if population and income per head should have been each 20 percent higher at the death of Marcus Aurelius two centuries after the beginning of the principate it would not be appropriate to speak of a growth trend in either population or national product. Any possible increase was so small and irregular and differed so much from province to province and within provinces that for the Empire as a whole it was simply not noticeable. This was a “stagnant”¹¹⁹ economy as we would expect from its extremely low rate of capital formation and from the absence of technological progress in more than details.^{120,121,122}

¹¹⁶Information on number and adjusted gross income of six groups of taxpayers with over \$1 million of adjusted gross income each was kindly supplied by Internal Revenue Service (letter of 5/31/1983).

¹¹⁷Section I.12. There are, however, reports of private fortunes of as much as HS 400 million in the mid-first century AD, mostly by favorites or freedmen of an emperor, which would imply incomes in the order of at least HS 20 million or one per million of total incomes, and the income of some of the emperors after Augustus may have been proportionately even larger.

¹¹⁸Colquhoun, *loc. cit.* If Soltow's mathematics are accepted the highest income recipient was a hypothetical person with a calculated income of £320,000 (Soltow, *op. cit.* 64) or 0.14 percent of total or over 3200 times that of the average family income, or 60 percent more than the income of George III as estimated by Colquhoun.

¹¹⁹McMullen, 101, 1974.

¹²⁰For a detailed discussion of lack of substantial technological progress, cf. M. I. Finley in *The Economic History Review*, XVIII, 29ff, 1965, and for agriculture C. R. Whittaker, in M. I. Finley, ed., *Studies in Roman Property*, 164.

¹²¹A slightly more optimistic view is taken in Hopkins (in P. Garnsey *et. al.*, eds., *Trade in the Ancient Economy*, XIV/XXI, 1983) who concludes that “in the first two centuries AD total production, consumption and trade were greater than they had been in the previous centuries or were in subsequent centuries” without any quantification of “greater” or conjecture as to when the increase occurred (*op. cit.*, XXI).

¹²²While it appears that interregional trade increased considerably between 200 BC and AD 200 (Hopkins, 105, 1980), a development which should have increased the degree of monetization and probably also national product, there do not seem to be data which make it possible to quantify or date this development, or even to make sure that the increase was not only one in absolute terms, but also one in relation to national product.

Of course if attention is limited to periods of the order of one to two centuries then it will hardly be possible to find any one with growth rates of population or product per head of, say, even as much as one percent per year before the 19th century.

This is evident in the case of population. The average annual rate of growth of world population was in the order of 0.05 percent both from 400 BC to AD 400 and from AD 400 to AD 1000. It remained below 0.01 percent for the following five centuries. In the 18th and 19th centuries it still averaged less than 0.4 percent and not much over 0.5 percent per year. The 20th century is the first century, and may be the last, in which world population will have increased at an average rate of over one percent, viz by about 1.3 percent.¹²³

No comparable calculations are possible for real national product per head. But the simplest compound interest calculation shows how minimal the rates over long periods must have been. At one percent per year income would grow in a century by 2.7 times, in five centuries by 145 times, in a millennium by 20,000 times. Even at the rate of 0.25 percent the growth is 28 percent a century and nearly 1100 percent for a millenium. The longest period for which comparisons can actually be made covers the nearly three centuries between 1700 and 1982. For this long stretch which includes the full period of modern economic growth the average rate of growth of real national product for the only three countries for which such calculations can as yet be made are 1.0 percent for Great Britain as well as for France and 0.8 percent for the Netherlands. Much of the growth, moreover, was concentrated in the last two decades. For the two and one half centuries between 1700 and 1949 the rates are only 0.8 percent for Great Britain, 0.7 percent for France and less than 0.6 percent for the Netherlands.¹²⁴ These rates, low as they may now seem, are still far ahead of those that may be found for similar periods in any country. Thus, if we assume, as is not unlikely, that the real income per head of India was the same at the time of Akbar as in 1860 the average growth rate for the nearly four centuries since 1600 would be below 0.25 percent.

The absence of a noticeable continuous rate of growth of real national product per head, i.e. of intensive economic growth, thus is not a specific characteristic of the early Roman Empire, but seems to have been shared by several other premodern empires, including those in India and China. The absence of a substantial growth of population, on the other hand, is rarer, though not unique. The population of China, for example, does not seem to have increased in the first eight centuries AD while the average rate for India has been put at less than 0.2 percent per year for the same period.¹²⁵

¹²³Derived from population estimates of McEvedy and Jones, 342.

¹²⁴Derived from estimates of real gross national product per head and population in A. Maddison, *Phases of Capitalist Development*, 169ff, 1982.

¹²⁵Derived from population estimates of McEvedy and Jones, 167, 183.