Princeton/Stanford Working Papers in Classics

Approaching the Roman economy

Version 1.0

September 2010

Walter Scheidel

Stanford University

Abstract: This paper introduces current approaches to the study of the Roman economy. It discusses ways of measuring Roman economic performance, the uses of historical comparison, and competing models of economic behavior, and stresses the importance of ecological factors. It concludes with an appendix summarizing evidence for climatic conditions in the Roman period.

1 Defining the Roman economy

What was the "Roman economy?" In this volume, we apply this term to economic developments that occurred within the Roman Empire, a polity that evolved from an alliance system in peninsular Italy into a large empire that from the second century BCE onward came to dominate and then rule the most densely populated parts of western Eurasia and North Africa west of Mesopotamia and Iran before it eventually experienced substantial contraction in the fifth and seventh centuries CE. Although many of the following chapters devote particular attention to conditions in Roman Italy, the original core of the empire, coverage extends across the varied territories under Roman control. More specifically, this volume seeks to relate economic structures and processes to the formation of the imperial state.[1]

Thanks to its exceptional size and duration, the Roman Empire offers one of the best opportunities to study economic development in the context of an agrarian world empire. Moreover, the fact that the Roman period was the only time when the entire Mediterranean basin was contained within a single political domain raises the question of how much the specific characteristics of the Roman economy owed to imperial unification. At the same time, the Roman economy was a typical pre-modern economy in the sense that it depended on organic fuels and was dominated by agriculture and production within households. In developmental terms, it can be seen as the continuation and culmination of the expansion of the Hellenistic economies of the Eastern Mediterranean and Near East that in turn represented the mature phase of the political and economic recovery that had commenced in the Early Iron Age. The Roman period witnessed the extension of Near Eastern, Hellenic, and Hellenistic features such as urbanization, monetization, market exchange, taxation, and chattel slavery into the western peripheries of Eurasia.

Three things are necessary to understand Roman economic history: determine what happened, explain why it happened, and assess these developments comparatively by relating them to those of other times and places, thereby situating the Roman case in a global context of pre-modern economic performance. Explanations must be grounded in the empirical record but do not directly emerge from it: the evidence never speaks for itself. The study of causation benefits from an awareness of economic theory and from explicit comparison: both are vital tools in formulating logically coherent and historically plausible hypotheses that can be tested against specific data. Only an integrated approach that combines evidence, theory, and comparison has the potential to generate credible models of Roman economic development.

This paper will be published as Chapter 1 of W. Scheidel (ed.), *The Cambridge Companion to the Roman Economy*.

[1] The three classic works of the twentieth century are Rostovtzeff 1957 (originally published in 1926), still the most sweeping narrative account; Frank (ed.) 1933-40, a rich five-volume survey of economic development in different regions; and Finley 1999 (originally published in 1973), the most incisive analysis of the nature of the Greek and Roman economies. See also De Martino 1979-80, regrettably never made available in English. In addition, Jones 1964 covers the late Roman economy, and McCormick 2001 and Wickham 2005 trace and seek to explain post-Roman transitions. Chapters 18-28 of Scheidel, Morris and Saller (eds.) 2007 are devoted to the Roman economy, which will also be covered by many of the chapters in Bresson, Lo Cascio and Velde (eds.) forthcoming. There are no recent monographical surveys in English (but see Garnsey and Saller 1987: 41-103) or comprehensive systematic bibliographies; for introductory surveys in other languages, see most recently Drexhage, Konen and Ruffing 2002; Andreau 2010. Single-authored collected studies are a popular format: noteworthy examples include Jones 1974; Duncan-Jones 1982, 1990; Lo Cascio 2009; Harris forthcoming; Temin forthcoming.

For surveys of pertinent scholarship, see Harris 1993; Andreau 2002; Bowman and Wilson 2009. Scheidel, Morris and Saller (eds.) 2007: 769-917 gather a substantial bibliography, and see also Bowman and Wilson 2009: 69-84 for scholarship more specifically on the Roman economy.

2 Performance

Our appreciation of Roman economic performance and its change over time rests on careful study of its visible manifestations. At the most basic level this requires the collection, analysis, and standardization of relevant data. Material remains are of crucial importance: consumer goods, technical devices and containers, remains of settlements, evidence of land use, building materials, human bones, plant and animal remains, coins, shipwrecks, and even traces of air pollution preserved in ice and sediments all shed light on economic life in the Roman world. In addition, we derive textual information from literary accounts and legal regulations and from large numbers of stone inscriptions and papyri as well as graffiti and wax tablets. Even though the scarcity of a potentially decisive type of documentation – that of ancient statistics – inevitably inhibits our efforts, on the whole the main challenge lies not so much in the amount of evidence, which is abundant and keeps expanding, as in its interpretation. In the near-absence of records of how much was produced, traded, and consumed, modern observers commonly interpret different kinds of data (such as those listed above) as putative proxies of Roman economic development. Temporal or spatial variation in the quantity or quality of such proxies is taken to reflect economic change.

In practice, however, the meaning of such variations is often ambiguous, which can make it difficult to relate them directly to economic performance. For example, evidence suggestive of population growth might reasonably be interpreted as a proxy of growing economic output – but only if it was not offset by a reduction in per capita levels of consumption. To complicate matters, demographic change is an elusive issue. Field surveys trace objects and not people: variation in surface scatter primarily reflects variation in the incidence of datable objects, which represents a different proxy of economic development. Urbanization may be interpreted in different ways, which are by no means mutually exclusive: as a sign of population growth, as an indicator of intensive economic growth and division of labor that increased the relative share of the non-agrarian sector, and of nucleation driven by social and political factors such as the emergence of an empire-wide city-based ruling class. The scale and direction of long-distance trade is often inferred from the frequency of ceramic finds, above all shipping containers and tableware, and from the distribution of shipwrecks: yet changes in the use of barrels or sacks may obscure actual trends, and shipwrecks only remain visible if they contain durable cargo. Whereas it would be hard to dissociate the appearance of large numbers of elaborate *villa* estates in late Republican Italy from increasing wealth and rationalization of production, it remains much more challenging to make sense of the later reduction of their numbers. Technological progress may be measured by tracking novel installations such as water-mills, but such devices can be very rare in the material record. Monetization through coinage may have been an index of economic development or more mundanely a function of increasing mining activity in previously underdeveloped areas. Moreover, coinage does not tell us about the scope of credit money and how it changed over time. Isotopic evidence of lead pollution reflects mining output but does not show how changes in metal use were related to overall economic growth or decline.[2] Contextual incentives or disincentives to economic activity also merit attention, yet their impact is even more difficult to gauge. They include evidence of institutional arrangements, such as laws and tolls, or signs of literacy.[3]

[2] For the study of proxies, see esp. Bowman and Wilson 2009. A number of recent discussions reveal the range, potential, and problems of particular types of proxy data: King 1999; Greene 2000; Kron 2002; Wilson 2002; MacKinnon 2004; De Callataÿ 2005; Jongman 2007a, 2007b; Silver 2007; Scheidel 2009a; Wilson 2009a, 2009b, forthcoming; Launaro 2011.

[3] For institutions, see below, Section 4.2 and Chapter 4. For literacy, see Harris 1989; for human capital in general, see below, Chapter 5.

It is important to be specific about the limitations of the evidence. It would seem perverse to question the economic relevance of any given proxy individually, viewed in separation from others. In as much as different types of data converge in distinctive ways, we may reasonably assume that they indicate at least the general direction of economic development. Thus, the combination of more or higher-quality goods being more widely distributed, of more or costlier infrastructure, and of more archaeologically visible settlement points to economic growth, and *vice versa*. At the same time, it is much more difficult to distinguish between extensive (aggregate) and intensive (per capita) growth. Once again, massive congruent changes in different indicators may well be suggestive not just of the former but also of the latter. However, such broad clues do not clearly translate to estimates of economic output in terms of per capita product or real incomes.

Historians are unable to establish Roman GDP without relying on exceedingly schematic extrapolation from select data for prices and wages. More generally, GDP estimates are to a significant extent determined by what we expect to have happened rather than by empirical measurements. They are useful mostly in establishing boundaries that constrain modern conjecture but far less capable of supporting cross-cultural comparison, of distinguishing among regions, or of apprehending change over time.[4]

The distribution of GDP is at least as important as its size. Even if intensive economic growth could reliably be established, we would still need to ask how these gains were allocated. Indications of rising living standards in the general population are not logically incompatible with the notion of disproportionate elite enrichment: high-profile trade and urban monumentalization can easily be read in both ways. Slavery is an excellent example: just as it creates wealth by turning labor power into capital and is capable of increasing productivity, it is likely to exacerbate asset and income inequality within society. A wide range of material evidence, from house sizes to skeletal remains, can be marshaled to investigate such distributional effects.[5]

This raises an even bigger question, that of the relationship between economic development and human welfare. Information on real wages throws some light on the consequences of economic change but is relatively scarce and very unevenly distributed. Textual accounts, pollen data, and food remains can all help us obtain a better idea of Roman diets. The most immediately relevant evidence is preserved within the human body: stature and dental and bone health are powerful indicators of nutritional status and disease loads. Yet even physiological markers are by no means easy to interpret: economic growth may improve access to foodstuffs (thus favoring bodily wellbeing) but, by encouraging urbanization, may simultaneously increase the transmission of infectious disease (thereby causing the opposite effect).[6]

All this adds up to a thoroughly mixed picture of promise and limitations. On the one hand, the empirical record is abundant and continues to grow as new methods are developed: as always, natural science leads the way by enhancing our knowledge of the provenance of goods and people, of mineral extraction, and of human wellbeing. Not only will there be more data, existing data will yield more information. Systematic analysis, greatly aided by information technology, will further contribute to this process. A growing amount of information will be available to test hypotheses and undertake comparisons with other times and places. On the other

[4] The limitations of existing studies are underscored by their divergent results: see Hopkins 1980: 117-20; Goldsmith 1984; Temin 2006; Maddison 2007: 11-68; Milanovic, Lindert and Williamson 2007: 64-9; Bang 2008: 86-91; Lo Cascio and Malanima 2009; Scheidel and Friesen 2009.

[5] Work of this nature has mostly focused on ancient Greece: see Morris 2004, 2005; Ober 2010. Slavery and wealth in the United States: Wright 2006: 60. General changes in living standards at the end of the Roman period: Ward-Perkins 2005. For the complexities of measuring living standards in later periods, cf. Allen, Bengtsson, and Dribe (eds.) 2005. See also below, Section 4.3.

[6] Real wages: Allen 2009b; Scheidel 2010. Nutrition: e.g., King 1999; MacKinnon 2004; Vindolanda***. Physical wellbeing: see below, Chapter 16.

hand, some constraints will likely prove insuperable, as in the case of GDP estimates. But this focus on the level of economic performance and its consequences neglects what are perhaps the most interesting questions, those concerning the reasons for observed outcomes. Richer data help us address these questions but cannot answer them. The next two sections take a closer look at what is required to do so.

3 Comparison

The sheer size of the Roman economy creates a strong temptation to study it on its own terms by concentrating on conditions and developments within a clearly circumscribed space and period. This has always been and still is the dominant approach. Yet this exercise can only be a first step: by itself, it deprives Roman economic history of vital context. Comparison is not merely an optional bonus feature of historical inquiry: it not only gives us a better sense of how the Roman economy performed relative to that of other pre-modern systems, it also provides much-needed inspiration in the search for causation. Broadly speaking, comparison comes in three flavors: focusing on the same period, on the same space, or on the same type of social formation.[7]

The first kind of comparison would set Roman Italy against the Hellenistic East, or the mature Empire against economies in Iran, India, and China. This approach is particularly useful if we are looking for factors that may have affected different economies concurrently. Candidates include connectivity, as proposed in the more ambitious versions of world-systems theory, or, more plausibly, exogenous forces such as climate change that acted more globally and thereby influenced the course of otherwise largely separate economies.[8]

The second kind privileges space by situating the Roman economy within the *longue durée* of a particular region or eco-system. Two recent attempts warrant particular attention. Peregrine Horden and Nicholas Purcell have focused on the Mediterranean properties of the Roman economy, stressing the nexus between physical connectivity and diverse micro-ecologies that favored mobility and exchange, as well as long-term continuities underlying phases of intensification and abatement. This perspective, which seeks to build a history *of* and not merely *in* the Mediterranean by taking proper account of ecological circumstances and basic structures, provides an important counterweight to the otherwise dominant preoccupation with the specifics of particular social formations. In a nutshell, it may help us determine how "Roman" the Roman economy really was. Instead of making us lose sight of the potential significance of the institutions of Roman rule – a likely but by no means inevitable corollary of this perspective –, appreciation of the Mediterranean context ought to encourage explicit comparative analysis of different pre-modern economies in that region.[9] The other example is Willy Pleket's emphasis on continuities or rather functional equivalencies between the Roman economy and the later European economies of the Middle Ages and the *Ancien Régime*. This approach questions common notions that the structure of the Roman economy was substantially different from that of later periods of western history. Less interested in the ecological properties of a given region, it stresses similarities over discontinuities, assimilating the various economies of pre-modern Europe into a shared pattern of subsistence activities that were interspersed with niches of

[7] Work that puts the Roman economy in context includes Goldsmith 1987; Jones 2000; Maddison 2007; Milanovic, Lindert and Williamson 2007; Morris 2010. Among more technical studies, Geoffrey Kron's work stands out for its strong comparative dimension.

[8] See Frank and Thompson 2006 for a world-systems approach specifically to this period; but cf. Chase-Dunn, Hall and Turchin 2007. For exogenous forces, see below, Section 4.2.

[9] The work in question is Horden and Purcell 2000; for debate, see esp. Shaw 2001 and the contributions to Harris (ed.) 2005.

capitalist development tied to markets and long-distance trade. Once again, this perspective is useful in so far as it challenges preconceived notions of putatively "Roman" features but runs the risk of eliding potentially quite fundamental differences between the fusion of town and country or the dynamics generated by universal empire in the Roman period and contrasting conditions later on. As before, the principal value of this paradigm lies in providing a template for systematic diachronic comparison.[10]

The third and intellectually most stimulating kind of comparison transcends the constraints of time and space by focusing on institutional and organizational features. Thus, the Roman economy can fruitfully be compared to the economies of other large agrarian empires wherever and whenever they existed. This approach, still in its infancy, works best for formations that have generated comparable or, preferably, better data sets. Peter Bang's ongoing work on the Roman Empire and Mughal India is currently the most prominent example. China offers particularly rich opportunities: while the economy of the Han Empire has already begun to be considered in relation to that of the Roman economy, the economic efflorescence of the Song period (and its dramatic curtailment) may well constitute the closest analogy to Roman developments. In addition, the Umayyad and Abbasid Caliphates and especially the Ottoman Empire would also be suitable comparanda. But historical comparison is not merely about similarities: the study of contrasts can be instrumental in establishing the causal significance of specific variables in terms of observed outcomes. In the present case, the most obvious comparison is that between tributary integration in the Roman economy and the mechanisms of economic development in the very different political ecology of the Greek city-state culture.[11]

None of these different approaches are inherently superior to others, and all of them have something valuable to add. While consideration of concurrent developments may draw attention to otherwise obscure factors and the long-term study of the same environments may shed light on the influence of continuities or discontinuities, linkages are not necessary to justify comparison: temporally and spatially unrelated cases can equally be well be brought together as long as this exercise improves our understanding of causation. The latter is perhaps the single most important element of a comparative approach to the Roman economy: our goal is not to rank it in some imaginary global league tables but to explain why it developed the way it did.

4 Causation

4.1 Markets and violence

In their critique of academic models of medieval (English) economic development, John Hatcher and Mark Bailey remark on the dominance of three competing 'supermodels' that focus on the role of demography (a Malthusian perspective), class relations (a Marxist perspective), and commercialization and consequently seek to explain the same historical processes "in exclusive and starkly conflicting terms." The contrast to the study of the Roman economy is striking: not only is there no need to respond to and bridge the gaps between competing 'supermodels',

[10] Pleket 1990, 1993 stresses premodern continuities. For criticism, see Bang 2008: 34-6. Temin 2004; Rathbone and Temin 2008 compare Roman and early modern European financial institutions.

[11] Rome and India: Bang 2008. Han China: Scheidel 2009b. For the Song economy, see Elvin 1973: 111-99; Jones 2000: 73-84; and esp. Morris 2010 for the notion that premodern social development peaked in the Roman Empire and Song China, an observation that invites comparative analysis. For the inclusion of the Ottoman case in a three-way comparison with Rome and Mughal India, see http://tec.saxo.ku.dk/. Greek city-states: Ober 2010.

historical interpretation has, with very few exceptions, barely advanced to the stage of explicit model-building.[12]

Instead, much existing scholarship has primarily been concerned with establishing facts, or otherwise to account for them with the help of inchoate notions of plausibility that are heavily indebted to contemporary modes of economic behavior. In as much as analytical framing devices are employed, the debate continues to be dominated by the contrast between 'primitivist' and/or 'substantivist' perspectives on the one hand and 'modernist' and/or 'formalist' ones on the other. Dating back to the nineteenth century, they are concerned with questions of scale (positing more or less economic development) but also, and crucially, with the structure of ancient economies. Put in highly simplified manner, formalist positions stress similarities between ancient and modern economies by emphasizing the putative significance of price-setting markets, comparative advantage, and capitalist ventures, whereas substantivists emphasize discontinuities by focusing on how status concerns mediated economic behavior and generated specific dynamics that reflected elite preference for rent-taking and landownership and disdain for commercial enterprise that reinforced the fusion of political and economic power and marginalized independent merchants. De facto, if not in principle, these positions frequently tend to correlate with divergent assessments of the scale of economic development, with formalists keen to document growth and integration and with substantivists pointing out constraints.[13]

Both perspectives share a strong interest in the mechanisms and degree of economic integration, which is plausibly regarded as a yardstick of economic development in general: for economies to grow, they have to become more integrated.[14] Again very broadly speaking, the most generation of scholarship on the Roman economy has produced two competing visions of the underpinnings of its integration and hence the nature, scale, and sustainability of economic growth. Economic activities that extended beyond the household were framed by two types of relations, relations of the market and relations of domination. Historians of the Roman economy divide on whether they privilege market relations – characterized by trade driven by comparative advantage – or power relations such as tribute and rent-taking and slavery and their economic consequences.

According to market-centered narratives, Roman conquest created favorable preconditions for production and trade. Empire lowered transaction costs by reducing risk, easing the flow of information, and standardizing media of exchange at the same time as it facilitated an expansion of primary production (in farming and mining) that in turn encouraged urbanization, manufacturing, and production for the market. It enabled different regions to capitalize on their comparative advantage in producing goods for exchange. In this scenario, the imperial state plays an important role indirectly, by providing favorable framing conditions, and (in some versions) also directly, by issuing regulations or coins or by investing in infrastructure that was conducive to trade or, at a later stage, by throttling markets through deleterious intervention. For much of the Roman period, these processes are thought to have created a conglomeration of interdependent markets.[15]

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[12] Hatcher and Bailey 2001, esp. 11 for the three 'supermodels' and the quote. For the relative neglect of population in Roman economic history, see below, Section 4.2. The only recent Marxist approach is de Ste Croix 1981.

[13] For brief discussions, see Ian Morris in Finley 1999: XI-XXIII; Morris, Saller and Scheidel 2007: 2-5; Bang 2008: 17-36. Nafissi 2005 is now the most detailed general study.

[14] For integration and growth (including decline) as the central themes of Roman economic history, see the mission statement of the 'Oxford Roman Economy Project' in Bowman and Wilson 2009: 15-53.

[15] This perspective dates back, via Rostovtzeff 1957, to Eduard Meyer's work in 1896. Freyberg 1989 is the most sophisticated study in this vein, and while the most explicit recent statements are (not coincidentally) found in the work of two economists, Peter Temin and Morris Silver (most notably Temin 2001 and Silver 2007, and see more generally Temin forthcoming), a market-centered perspective is currently (at least

Others question whether market exchange and economic integration would automatically arise in that context. They assign critical importance to the need of the imperial state to process revenue and to the opportunities this created for political and landowning elites. From this perspective, integration was very much driven by tribute and rent collection and by the modes of exchange that it effectively supported. One of the most notable examples of this perspective is the Keynesian "tax-and-trade" model developed by Keith Hopkins: state demands for tax and elite demand for rent and their conversion and transfer impelled reciprocal flows of taxed and traded resources that encouraged urbanization, monetization, and the formation of exchange networks.[16] The counterpart to this model is Chris Wickham's account of the unraveling of the Roman economy, a process he explains with reference to the decline of the fiscal system and the elite network of market-oriented production and long-distance exchange that the state sector had sustained.[17] The most recent incarnation of this approach is Peter Bang's model of tributary surplus mobilization and portfolio capitalism (i.e., power elites' expansion of their economic activities into commercial ventures) that is based on both Roman evidence and explicit analogies to other agrarian empires where similar framing conditions prevailed.[18] In all these models, the Roman economy waxed and waned along with the power of the imperial state.

It would be a mistake to regard these perspectives as mutually exclusive causative interpretations.[19] In the most general terms, it is hard to see how Roman rule could have failed to lower transaction costs in ways that were, at least in principle, conducive to an increase in the volume of exchange. Yet this does not establish that any such development did not critically depend on the redistributive fiscal mechanisms of the state. At the same time, it is important to recognize that these two approaches do not merely represent two complementary sides of the same story. The question which type of relations was essential or dominant in bringing about observed outcomes is not merely of intellectual interest but of vital importance for understanding the dynamics of Roman economic development and especially of its limits and decline.

This debate underlines the pivotal role of comparison, theorizing, and model-building. Divergent modern reconstructions are ultimately shaped by analogies: with post-Roman Europe in the case of market-centered narratives or with other patrimonial empires in the case of coercion-based models. They are also indebted to different theoretical underpinnings and conceptualizations. One way forward that has the potential to bridge the gap between formalist or neo-classical notions of comparative advantage and a benign state and more substantivist or fiscalist models of commercial development is offered by the New Institutional Economics and Economic Sociology. By demonstrating how social and cultural features shape economic activity, they alert us the overriding significance of historically specific "rules of the game," the incentives and constraints that were instrumental in determining Roman economic development. Students of the Roman economy have recently begun to pay attention to these fields and one can only hope that this trend will continue.[20]

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implicitly) pervasive: see Bang 2008: 26-36 for discussion; and cf. also below, Chapter 15. For the underlying economics, see below, Chapter 3.

[16] Hopkins 1980, 1995/6, and see also 2009. For criticism, see, e.g., Duncan-Jones 1990: 30-58; Silver 2008. Cf. Jongman 2006: 247-50 for the possibility of an alternative mechanism of economic integration (i.e, the geographical expansion of elite holdings) that was likewise spurred by taxation.

[17] Wickham 2005, and see already Wickham 1994: 77-98; McCormick 2001: 25-119. Recent critiques include Haldon 2008 and Shaw 2008.

[18] Bang 2007, 2008. Compare Silver 2009 for a critique that fails to engage with the key positive claims of Bang's model.

[19] Lo Cascio 1991 seeks to combine both perspectives.

[20] See below, Chapter 4. For NIE and ancient economies, see Maucourant 1996; Lo Cascio 2006; Frier and Kehoe 2007; Bang 2009; for the economic sociology of the ancient world, see Morris and Manning 2005.

4.2 Ecology

Regardless of whether they emphasize markets and comparative advantage or tributary integration and coercion, currently dominant perspectives uniformly privilege human agency. However, economic behavior was embedded in a deep ecological context that constrained actors' choices and shaped outcomes. In marked contrast to the intensity of past and present debates about the institutional determinants of Roman economic development, historians have barely begun to take account of ecological factors. We have already noted recent work on the supposed commonalities of Mediterranean economies. Alternatively, one might focus on changes in the distribution and quality of crops and livestock, or explore the impact of soil erosion and deforestation. Due to constraints of space, this section will consider only two fundamental issues, namely the interaction of economy and demography and the role of climate change.[21]

Population is central to the economic history of later historical periods and despite its pervasive neglect by Roman economic historians can be expected to have played an important role in that period as well.[22] Both structural demographic features and population numbers are of great relevance. The former include low levels of overall and health-adjusted life expectancy that necessitated high fertility rates and thus restricted female labor participation, discouraged investment in human capital, and impaired asset management through the imposition of guardianship on orphans. Family and household structures mattered in as much as different patterns of marriage and residence – such as nuclear or extended families, age of first marriage, and levels of endogamy –conditioned economic behavior.[23]

The relationship between economic and demographic growth is perhaps the most important problem. If the Roman economy increased its output, it presumably also increased the number of consumers: the production and support of people is the core function of any economy. Although Roman natural population growth is not strictly speaking provable – in the technical sense that serial statistics referring to the same (breeding) population are lacking –, it is both logically compelling and made highly likely by the archaeological record that such a process occurred on a considerable scale. Being able to measure population growth would allow us to gauge extensive economic growth: unfortunately, scholars cannot even agree on the size of the population of Roman Italy, an uncertainty that has serious repercussions for any estimates of the demographic development of the Empire as a whole. Were Roman population numbers known even in bare outlines, we would have a much better sense of the scale and direction of economic development.[24]

The Roman economy would not have been immune to the basic Malthusian mechanisms that applied across pre-modern societies and are set out in Chapter 3. While intensive, per capita growth in output would have encouraged population increases, the latter would eventually have put pressure on scarce resources and may have reversed earlier productivity gains, resulting in a

[21] Sallares 2007 briefly introduces the ecological context of the Roman economy. Sallares 1991 is the most ambitious study, centered on ancient Greece but also touching on Rome. For the Mediterranean environment, see above, Section 3; for crops, see below, Chapter 9; for deforestation, see Harris forthcoming: ch.**.

[22] See now Scheidel 2007a; and cf. Saller 2007 on household and gender. See also Hin forthcoming.

[23] For living conditions, see below, Chapter 16. Demographic effects on households and investment: Saller 2007 and below, Chapter 5. Given that the intensity of infectious disease appears to be a determinant of cognitive ability (Eppig, Fincher and Thornhill 2010), the high disease loads documented for the Roman world can be expected to have had an adverse effect on human capital formation. Household types: Scheidel 2007a: 70-2. Evidence suggestive of relatively late Roman first marriage is relevant in this context but may be limited to urban settings: see Scheidel 2007c, qualifying work by Richard Saller and Brent Shaw.

[24] Scheidel 2008 critiques the debate about the size of the population of Roman Italy. See also Lo Cascio and Malanima 2005 for the relationship between population and economy in Roman Italy.

larger population that was not necessarily more affluent than at the beginning of the cycle. At the same time, population pressure would have been an incentive to develop adaptations that made it possible to sustain growth. Technological progress was vital for this latter process, as was the population's desire and capacity for fertility control.[25]

In the most general terms, Malthusian effects are well documented in post-ancient Europe, where we observe a demographic recovery led by economic growth in the High Middle Ages, rising population pressure that was alleviated by the Black Death, a plague-induced demographic contraction that raised real wages and allowed renewed population growth, a process that once again caused real incomes to decline until modern economic development and the fertility transition that uncoupled demographic from economic growth provided a final release. Perhaps the biggest unacknowledged question of Roman economic history is whether population pressure was already mounting before the imperial power structure started to unravel or whether the epidemics of the second and third centuries CE provided temporary relief (or instead made matters worse). Empirical data are consistent with the presence of Malthusian mechanisms: real wages rose in the wake of epidemics and body height, a marker of physiological well-being, declined under Roman rule but recovered afterward. This suggests that in the long run, the Roman economy was unable to overcome fundamental demographic constraints on intensive economic growth.[26]

Demographic developments were also sensitive to climatic conditions. Comparative evidence shows that population growth is correlated with climate change in terms of temperature, precipitation, and the overall stability of weather regimes. The current surge of interest in past climatic variation has already begun to generate a growing amount of data pertaining to the Roman period. Even so, for the time being the only thing that we say with confidence is that the complexity of the evidence does not support a single straightforward reconstruction.[27] With this caveat in mind, it nevertheless seems very likely that the Roman Empire matured during a warm period comparable to the so-called Medieval Climate Optimum that coincided with massive population growth. An enormous variety of proxies has been brought to bear on this question, including tree ring width, tree line movement, glacier movement, analysis of stable isotopes and mercury deposits as well as pollen, algae, and mollusks recovered from ice cores and stalagmites and from peat and lake sediment deposits. While no synthesis currently exists, a substantial series of data sets indicates an impressive convergence of trends all over Eurasia. These findings, summarized in the Appendix, reveal a warm period centered on the first century CE. Although the respective ranges vary by location and type of data, on average this period commenced in the second century BCE and ended in the third century CE.[28]

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[25] For the interrelation of demographic constraints and incentives, see Lee 1986a, 1986b; Wood 1998; and the summary in Scheidel 2007a: 50-66. For technology and the Roman economy, see Greene 2000; Wilson 2002; Lo Cascio (ed.) 2006; Schneider 2007. (The rate of diffusion of technological innovation is the critical variable: Persson 1988: 127-8.) For constraints on human capital formation, see below, Chapter 5. Scheidel 2007a: 66-74 considers fertility control. There was no Roman fertility transition: Caldwell 2004.

[26] Real wages were generally low for unskilled workers (Scheidel 2010: 427-36, 444-7, 453) but increased in response to demographic contractions: see Scheidel 2002, in press (Antonine Plague); Findlay and Lundahl 2006; Scheidel 2010: 448-9, 456-7 (Justinianic Plague). Cf. Pamuk 2007 for analogous effects of the Black Death. For trends in human stature, see below, Chapter 16. Epidemics as a source of problems: Zelener 2003; Little (ed.) 2007. For a tentative Malthusian model of the Roman imperial economy, see Scheidel 2009a: 67-70; and cf. also Malanima forthcoming for a simple model of Roman growth and its limits.

[27] Ljungqvist 2009, a survey of 71 studies of climatic variation from 1 to 2000 CE, conveys a good sense of the amount of variation among data samples.

[28] See Table 1 and the references in the Appendix.

By increasing cultivable land and yields, warming can be expected to have had a positive effect on population growth, especially in the continental European parts of the Roman Empire.[29] The overall picture was of course more complex: in the southern and eastern reaches of the Empire, precipitation levels would have played a more important role than temperature. Once again, conditions were mostly favorable: while the Iberian peninsula, North Africa, and the Levant appear to have been wetter than today, the central Mediterranean may have experienced more arid conditions.[30] Climatic instability has already been observed for the third century CE but became more widespread in late antiquity, whereas the late antique cooling trend peaked in the sixth and seventh centuries CE, thus coinciding with a nadir of economic development in Europe.[31] The significance of climate for the evolution of the Roman Empire and its economic basis must not be underrated. Without wishing to advocate environmental determinism, there can be little doubt that climate history ought to occupy a much more central role in the study of the Roman economy than it has done so far.

4.3 Understanding the Roman economy

Overdetermination of outcomes and divergence of outcomes are among the most serious challenges to our understanding of the Roman economy. As for the former, the Roman economy can readily be said to have expanded for multiple and largely interconnected reasons. In Republican Italy, empire created capital inflows, checks on natural growth that were counterbalanced by slave imports, and novel opportunities for commercial exchange, elite enrichment, and violent redistribution of assets to commoners. In the long run, empire also yielded benefits for subject populations: peace reduced transaction costs, turned the entire Mediterranean into an 'inner sea,' and improved the ratio of natural endowments to labor; tributary integration mobilized resources and enabled portfolio capitalism; knowledge transfers improved productivity; and previously underexploited mines produced bullion that not only supported monetization but also enabled imports from beyond the empire. All these developments coincided with a climate optimum that sustained production and productivity growth and, at least for a while, with an absence of pandemics that might have weakened state power or commercial connectivity. In view of all this, it is hard to see how a substantial economic expansion could possibly have failed to occur.

This outcome was overdetermined in the sense that it was favored by numerous convergent factors. Although it seems plausible that these factors interacted and reinforced one another, we cannot simply assume that each of them was necessary or significant in producing observed outcomes. A more parsimonious model would be desirable for a number of reasons. It would help us avoid a profusion of alleged causes, such as those invoked to account for the so-called "Great Divergence" between modern European economies and the rest of the world, all of which are superficially plausible but rarely measured in terms of their relative significance.[32] If we do not know which factors mattered most in making the Roman economy grow, we are also unable to understand the reasons for its abatement.

Just as in the case of economic growth, multiple factors may have precipitated decline. Demographic growth could have raised Malthusian pressures and curbed the potential for further

[29] For comparative evidence, see, e.g., Galloway 1986; Koepke and Baten 2005; Redman *et al.* 2007; Zhang *et al.* 2007.
[30] See the references in the Appendix.
[31] See Haas 2006 on the third century CE, n.30 above on late antiquity, and Table 1 in the Appendix for late Roman and post-ancient cooling.
[32] Allen 2009a exemplifies this approach: see esp. 106-31 for simulations of the relative significance of different variables.

intensive growth, creating involution and what has been called a "low-equilibrium trap." Conversely, epidemics, which would have mitigated population pressure, could have undermined state power, which would have adversely affected economic integration in as much as it was sustained by the fiscal sector. Challenges to imperial rule would have raised protection costs. Climatic conditions became less stable or favorable. Whole lists of possible causes come to mind, reminiscent of the 210 different reasons (in)famously proposed for the fall of the Western Roman Empire.[33]

In order to understand both the expansion and the abatement of the Roman economy, choices have to be made. Not all explanations are equally valid. Some of them may not be logically compatible with others; others still may converge but need not be similarly significant. Some may only be relevant in conjunction with others: for instance, a favorable climate was likely to sustain demographic growth even in the absence of an imperial state whereas certain forms of exchange may not have been feasible without it. Choices must be made on the basis of the empirical record but also, and critically, on the basis of what we expect to have mattered, an expectation that must be informed by historical analogies and social science theories to be at all defensible. Most important of all, explanations must ultimately cohere in logically consistent models. These requirements make for a challenging agenda, and go a long way in explaining the lack of recent syntheses that seek to take in the whole wide arc of Roman economic development.[34]

Diversity of outcomes poses another major challenge. Economic trends need not have coincided with trends in human welfare. Study of the Roman economy does not by itself reveal much about its impact on its participants unless we are prepared blithely to equate human wellbeing with mean income. Increasingly elaborate indices are being devised to measure human development in the world today, and historians need to be aware of these efforts if they want to make progress on their second key objective: not just to understand the dynamics of the Roman economy but also to understand what it accomplished and how it related to other forms of development.[35]

Roman economic history is rich in apparent contradictions. Violence, unleashed in campaigns of conquest and civil wars, was undeniably an evil that caused great suffering and dislocation, yet it also mobilized resources and protected real incomes by curtailing demographic growth. Slavery was another evil that fostered inequality but also spurred rationalization and productivity growth: it could simultaneously increase output and skew consumption, simultaneously benefit and harm society. The failure of the Roman Republic is usually viewed as a time of crisis: yet it also coincided with unprecedented economic development in the core of the Empire, and while the ruling class may have been the main beneficiaries of this process the wealthy also contributed to the coercive redistribution to commoners prompted by the exigencies of civil war. Conversely, the prolonged peace of the first quarter-millennium of the imperial monarchy is usually considered as a period of prosperity: yet stability also facilitated rising inequality by allowing elites to accumulate assets and depressed real incomes by encouraging demographic expansion. Epidemics interfered with economic activities by disrupting trust-based commercial networks but also alleviated population pressure. Urbanization was beneficial in that

[33] "High-equilibrium trap:" Scheidel 2007a: 55-6. 210 causes: Demandt 1984.

[34] Bang 2007 may be the most ambitious attempt since Hopkins 1980, 1995/6. Cf. also Banaji 2007 for late antiquity. The end of the Roman economy has been well explained by Wickham 2005. For a different perspective, cf. Schiavone 2000. Yet all of these works neglect environmental factors.

[35] Broader indices include the Human Development Index of the United Nations and the Gross National Happiness Index pioneered by Bhutan. Cf. also the 'Capabilities Approach' advocated by Nussbaum 2000.

it encouraged division of labor and human capital formation but also detrimental by boosting density-dependent diseases, which in turn could be beneficial by curtailing population growth.[36]

None of these events and trends are genuine contradictions: they simply add up to the intricate dynamics that are typical of all historical processes. Awareness of these natural complexities will help us overcome the all too common notion that different elements of human development move in tandem: that the Roman combination of imperial peace and a larger population and greater economic output somehow represented an optimal state of affairs. Comparative evidence is vital in suggesting that this was probably not the case: real incomes of workers could fall as GDP grew; people could shrink as the economy expanded. Tabulating the many ways in which the artifacts of the Roman economy were bigger, better, or more numerous than before or after is simply not sufficient to show that conditions were generally better: "intensification should not automatically and exclusively be identified with increasing prosperity and success." Conversely, evidence of abatement is not necessarily a sign of wholesale deterioration: it merely denotes change in the configuration of land and labor, of extraction and consumption, of local autonomy and interregional integration. The story of the Roman economy is not a simple story of rise and fall: it is a complex interplay of different determinants of human welfare in which economic output and its distribution played an important role. Economic history must be incorporated into the study of wellbeing to be at all worth doing.[37]

Parsimonious causal explanation and appreciation of diverse outcomes are basic requirements for being able to draw on Roman economic history to address bigger questions. Which kind of environment was more conducive to economic growth and human development more generally – large empires or fragmented political ecologies? And is this even a meaningful question? Much scholarship on the Roman economy conveys the impression that universal empire was a 'good' thing and its demise a 'bad' ending, whereas accounts of the ancient Greek economy or that of early modern Europe tend to reflect a rather different worldview. The study of the Roman economy as one of the most successful traditional imperial economies in history has a lot to contribute to our understanding of such broader issues. Current debates about the relative merits of the institutional foundations of Western economic development and the alternative "Beijing consensus" suggest that such questions are not of purely historical interest. Roman economic history stands to make a contribution well beyond the confines of a long vanished past.

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[36] Roman Republic: Scheidel 2007b. Demography: see above, Section 4.2 and below, Chapter 16. Turchin and Nefedov 2009 offer a wide-ranging survey of historical 'secular cycles' of peace and population growth that bred instability.

[37] For pertinent comparative data, see Allen, Bengtsson and Dribe (eds.) (2005), with Scheidel 2009a: 63-7. Intensification: Horden and Purcell 2000: 265 (quote). Intensification may well be interpreted as a response to pressures rather as evidence of net gains: note the contrasting perspectives of Chapters 9 and 16. For peace raising inequality, see Jongman 2006: 247-50.

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Appendix: Roman climate

Table 1 Cool and warm periods according to recent studies
(Italicized years = BCE)

Location	Cool	Warm	Cool	Warm	Cool
NW Iberia	*975-250*	*250*-450	450-900	950-1400	1400-1850
NW Iberia	*100*-100	100-500	700-900	900-1000	1400-
SC Iberia	*-150*	*150*-270	270-900	900-1400	1400-
NW Italy		*200*-100		1000-1200	
Switzerland	*1250-200*	*200*-50	50-800	800-1300	1300-1865
Switzerland	*450-50*	*50*-100		~700	
Switzerland	*~800*		~400		~1800
Austria	*500-300*	*300*-400	400-1000	1000-1600	
Georgia	*580-200*	*200*-500	500/600	650-1200	
Denmark		*400*-400	400-700	800-1350	1350-1900
Denmark		1-400			
Sweden		*100*-100	300-400	900-1000	1550-1900
Norway		1-400?	400-900	900-1550	1550-1900
Lapland		1-500?	500-900	1000	
Lapland		*750*-1		830-1260	
SW Ireland		*100-1*	400-700	~1200	1400-
Iceland		~500	~650	~1150	
Iceland		1-150	200-350 650-800	1000-1300	1350-
Iceland	*360-240*	*230*-40	~410	600-760 1120-1250	1380-1420
Greenland		-100	150-350		
Greenland		-150	500-900	900-1050	1200-1800
Greenland		-150			
Greenland		*50*-100		700-100	
(composite)		350-400			
China	*300-50*	*50*-200 300-400	450-550 750-850	900-1200	1450-1700
China		1-240	240-800	800-1400	1400-1820
China		~1(-200)	210-560 780-920	570-770 930-1310	1320-1910
China		*200*-200			
Central Asia		100-200	200-1000	1000-1200	1500-1700
Indo-Pacific		1-400?	400-950	900-1300	1550-1800

References (in order of tabulation): Desprat, Gõni, and Loutre 2003; Martinez-Cortizas *et al.* 1999; Garcia *et al.* 2007; Giraudi 2009; Holzhauser, Magny, and Zumbuhl 2005; Tinner *et al.* 2003; Chapron *et al.* 2005; Schmidt *et al.* 2008; Kvavadze and Connor 2005; Hass 1996; Rasmussen, Petersen, and Ryves 2008; Linderholm and Gunnarson 2005; Allen *et al.* 2007; Grudd *et al.* 2002; Hormes, Karlen, and Possnert 2004; McDermott, Mattey, and Hawkesworth

2001; Jiang *et al.* 2002; Sicre *et al.* 2008; Patterson *et al.* 2010; Vinther *et al.* 2006; Johnsen *et al.* 2001; Vinther *et al.* 2006; Tinner *et al.* 2003; Tan *et al.* 2003; Yang *et al.* 2002; Ge *et al.* 2003; Bao *et al.* 2004; Yang *et al.* 2009; Oppo, Rosenthal, and Linsley 2009.
See also, e.g., Alley 2000; Niggemann *et al.* 2003; Pla and Catalan 2005; Eiriksson *et al.* 2006; Liu, Henderson, and Huang 2006.

Not all studies have produced data that support the notion of a 'Roman Warm Period:' for important exceptions specifically from the area of the former Roman Empire, see Mangini, Spötl, and Verdes 2005; Lebreiro *et al.* 2006; Taricco *et al.* 2009. Even so, the use of literature in Taricco *et al.* 2009: 177-8 is misleadingly selective.

For the full range of results regarding temperature change, see Ljungvist 2009, a much richer survey than Mann *et al.* 2008.

There is no current synthesis of recent work on this topic. Röthlisberger 1986 and Lamb 1995 are still useful but predate much of the pertinent research. Fagan 2004 gives a wide-ranging popular account of the effects of climate on premodern history. For the Roman period, see also Heide 1997; Tainter and Crumley 2007.

The Roman period appears to have experienced elevated levels of precipitation on the Iberian peninsula, in North Africa and Egypt, and in the Levant. See Yakir *et al.* 1994; Besancon *et al.* 1997; Reale and Dirmeyer 2000; Reale and Shukla 2000; Migowski *et al.* 2006; Eastwood *et al.* 2007; Martin-Puertas *et al.* 2009; Leroy 2010. This weather pattern may have coincided with reduced precipitation in the central Mediterranean: see Reale and Shukla 2000; Magny *et al.* 2007. Actual outcomes were complex. For instance, increasing precipitation and/or climatic instability in late antiquity could have negative consequences in the southern and eastern Mediterranean: see, e.g., Casana 2008; Marquer *et al.* 2008; and cf. Blundell and Barber 2005.

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