Real wages in Roman Egypt:
A contribution to recent work on pre-modern living standards

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Abstract: Price and wage data from Roman Egypt in the first three centuries CE indicate levels of real income for unskilled workers that are comparable to those implied by price and wage data in Diocletian's price edict of 301 CE and to those documented in different parts of Europe and Asia in the eighteenth or early nineteenth centuries. In all these cases, consumption was largely limited to goods that were essential for survival and living standards were very low.

Real incomes are a critical measure of human well-being.[1] As the focus of the debate about the nature of the Greek and Roman economies has begun to shift from structures and mentalities to questions of performance and distribution, ancient historians have surveyed an increasingly wide range of indicators of commodity consumption and physiological well-being that are thought to shed some light on overall living standards.[2] While this approach has yielded interesting and in some cases comfortingly convergent findings, it cannot change the fact that representative serial data on prices and wages are necessary to establish absolute and relative levels of real income and track trends over time. In recent years, historians of the more recent past have made great progress in the comparative study of real wages around the world. As a result, for the period from the fourteenth century onward, we are now in a position to compare real wages in several European countries as well as in China, India, and Japan.[3]

As is well known, little comparable evidence has survived from the ancient world. In a recent pilot study, the British economic historian Robert Allen has made an attempt to study the price and wage figures recorded in Diocletian's 'Edict on Maximum Prices' of 301 CE in the same way as early modern data.[4] Using two different 'consumption baskets' that reflect the likely consumption requirements of a 'respectable' and a poor working family, he relates the aggregate cost of obtaining the required goods to the mandated maximum income of an unskilled laborer in order to ascertain what proportion of a particular 'consumption basket' this worker would have been able to afford.[5] Despite some difficulties in matching the configuration of goods that were used to construct 'consumption baskets' for the last few centuries, the results for the late Roman tariff are

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[1] Per capita GDP at purchasing power parity (i.e., real income) is one of the three key indices of the *Human Development Index* of the United Nations (http://hdr.undp.org.).

[2] I. Morris, 'Economic growth in ancient Greece', *Journal of Institutional and Theoretical Economics* 160 (2004), 709-42, and 'Archaeology, standards of living, and Greek economic history', in J. G. Manning and I. Morris (eds.), *The ancient economy: evidence and models* (Stanford 2005), 91-126; F. de Callataÿ, 'The Graeco-Roman economy in the super-long run: lead, copper, and shipwrecks', *Journal of Roman Archaeology* 18 (2005), 361-72; N. Koepke and J. Baten, 'The biological standard of living in Europe during the last two millennia', *European Review of Economic History* 9 (2005), 61-95; G. Kron, 'Anthropometry, physical anthropology, and the reconstruction of ancient health, nutrition, and living standards', *Historia* 54 (2005), 68-83; P. Temin, 'Estimating GDP in the early Roman Empire', in E. Lo Cascio (ed.), *Innovazione tecnica e progresso economico nel mondo romano* (Bari 2006), 31-54; W. Jongman, 'The early Roman Empire: consumption', in W. Scheidel, I. Morris, and R. Saller (eds.) (2007), *The Cambridge economic history of the Greco-Roman world* (Cambridge 2007), 592-618, and 'Gibbon was right: the decline and fall of the Roman economy', in O. Hekster, G. de Kleijn, and D. Slootjes (eds.), *Crises and the Roman empire* (Leiden 2007), 183-199; M. Silver, 'Roman economic growth and living standards: perception versus evidence', *Ancient Society* 37 (2007), 191-252.

[3] J. L. van Zanden, 'Wages and the standards of living in Europe, 1500-1800', *European Review of Economic History* 3 (1999), 175-98; R. C. Allen, 'The great divergence: wages and prices from the Middle Ages to the First World War', *Explorations in Economic History* 38 (2001), 411-47, and 'Real wages in Europe and Asia: a first look at the long-term patterns', in R. C. Allen, T. Bengtsson, and M. Dribe (eds.), *Living standards in the past: new perspectives in well-being in Asia and Europe* (Oxford 2005), 111-30; R. C. Allen, J.-P. Bassino, D. Ma, C. Moll-Murata, and J. L. van Zanden, 'Wages, prices, and living standards in China, Japan, and Europe, 1738-1925', GPIH Working Paper No. 1 (October 2005).

[4] R. C. Allen, 'How prosperous were the Romans? Evidence from Diocletian's Price Edict (301 AD)', University of Oxford, Department of Economics, Discussion Paper Series No. 363 (October 2007).

[5] Allen, 'How prosperous', 4-8, and see in the text below. For an earlier attempt to use these data to study living standards, see E. Frézouls, 'Prix, salaires et niveaux de vie: quelques enseignements de l'Edit du Maximum', *Ktèma* 2 (1977), 253-268, and 3 (1978), 289-300.

prima facie plausible in that they are consistent with those obtained for more recent pre-modern economies. More specifically, a Roman unskilled worker's ability to purchase a given baskets of goods was similar to that of his counterparts in Florence, Vienna, Beijing, and Delhi in parts of the eighteenth or nineteenth centuries but fell far short of that of workers in early modern Amsterdam or London. At the same time, implied late Roman real wages were much lower than they came to be in both Europe and Asia during the fifteenth century.[6] Thus, in the most general terms, the evidence of Diocletian's price edict puts late Roman 'lower class' living standards on a par with those attained by workers in much later societies that experienced growing inequality and immiseration.[7]

At the end of his paper, Allen proposes 'to use actual wages and prices (rather than legal maxima) to measure real wages in the Roman period and to do this for different regions of the empire and different time periods'.[8] In practice, however, Egypt appears to be the only part of the Roman world that can be studied in this way. It is only in this region that a sufficiently large number of records of commodity prices and wage payments have survived to support an attempt to establish the aggregate cost of a specific 'consumption basket' and relate it to incomes.[9] The present survey focuses on price and wage data from the first through third centuries CE which have received a considerable amount of scholarly attention and are readily accessible in synthetic surveys.[10] The distribution of prices of particularly well-documented goods – wheat, wine, and donkeys – points to the existence of two distinct periods of price stability, from the late first century CE to the 160s CE or a bit later and from the 190s to the early 270s CE. In both periods, prices for these commodities tended to fluctuate within fairly narrow bands. These two bands are separated by a sudden doubling in prices between the 160s and 190s CE. For this reason, I provide separate estimates of price and wage levels for each of these two periods (henceforth labeled 'Periods 1' and '2').

In order to ensure direct comparability with existing indices, I use the two 'consumption baskets' devised by Allen with only very minor alterations.[11] This is not to say that the suggested configuration of consumption needs is necessarily fully applicable to conditions in Roman Egypt: these two 'budgets' are simply meant to serve as heuristic devices that represent different levels of living standards.

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[6] See Allen, 'How prosperous', 14-15 figs. 2-3.

[7] See esp. P. T. Hoffman, D. S. Jacks, P. A. Levin, and P. H. Lindert, 'Sketching the rise of inequality in early modern Europe', in Allen, Bengtsson, and Dribe (eds.), *Living standards*, 131-72; and cf. now also B. Milanovic, P. H. Lindert, and J. G. Williamson, 'Measuring ancient inequality', NBER Working Paper No. 13550 (October 2007).

[8] Allen, 'How prosperous', 9.

[9] Epigraphic records from the Aegean island of Delos preserve large numbers of commodity prices but cannot easily be used to reconstruct real wages: see G. Reger, *Regionalism and change in the economy of independent Delos, 314-167 B.C.* (Berkeley 1994), esp. 9 and n.19, and cf. also 'The price histories of some imported goods on independent Delos', in J. Andreau, P. Briant, and R. Descat (eds.), *Prix et formation des prix dans les économies antiques* (St-Bertrand-de-Comminges 1997), 53-72.

[10] H.-J. Drexhage, *Preise, Mieten/Pachten, Kosten und Löhne im römischen Ägypten bis zum Regierungsantritt Diokletians* (St Katharinen 1991) (marred by errors by still the most comprehensive survey); D. W. Rathbone, 'Monetisation, not price-inflation, in third-century A.D. Egypt?', in C. E. King and D. G. Wigg (eds.), *Coin finds and coin use in the Roman world* (Berlin 2006), 321-39, and 'Prices and price formation in Roman Egypt', in Andreau, Briant, and Descat (eds.), *Prix*, 183-244.

[11] The only addition is lentils, which happen to be relatively well attested in Period 1, to provide an alternative to the poor price data for beans. The *chiton*, a dress-like garment worn by men and women, has been substituted for cloth. See the note for Table 1.

Table 1 prices the goods in Allen's so-called 'respectability basket' which was 'inspired by English and Dutch studies of working class budgets and suggests the spending pattern of 'respectable' workers' but adjusted to reflect the absence of New World foods such as sugar and potatoes and substituting wine for beer to account for Mediterranean tastes.[12] This particular configuration of goods was used to calculate real incomes according to Diocletian's price edict and in eighteenth-century Strasbourg and Naples.[13]

A glance at Table 1 is enough to show that this exercise entails a considerable amount of uncertainty. Despite the relatively large overall number of surviving price data, different commodities are very unequally represented in the papyrological record. Thus, while a recent survey gathered no fewer than 150 price points for wine alone, the prices of many other products are only rarely or never attested in ways that would permit us to utilize them for this kind of investigation.[14] For example, records of the sale of (fire)wood and cloth consistently fail to specify the amount of these materials that was exchanged for the stated price. Even the price of a very basic commodity such as bread can be surprisingly difficult to ascertain: most extant records refer to unmilled grain. For all these reasons, the best we can hope for is *range* of probable costs in each of the two periods.

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[12] Allen, 'How prosperous', 4, 10-11 tables 1-2.
[13] Ibid. 11 table 2. See above, n.11, for my marginal alterations.
[14] See Rathbone, 'Prices', 185 for the number of wine prices.

Table 1   Mediterranean respectability basket

	Quantity per person per year	Price in drachms Period 1	Period 2
Bread	182 kg	(?)47.3- >63.4	((?)106- >143)
Beans	52 l	(?)3.8	(?)27.5
or lentils	(52 l)	6.2	?
Meat	26 kg	51-102	(102-204)
(Olive) oil	5.2 l	18.5	39.3
Cheese	5.2 kg	?	?
Eggs	52 pieces	8.8	(17.7)
Wine	68.25 l	24.9	46.3
Soap	2.6 kg	-	-
Linen	5 m	40	90
Candles	2.6 kg	-	-
Lamp oil	2.6 l	9.3	19.7
Fuel	5.0m BTU	?	?
Gross total		204- >273	449- >588
Adjusted total		236- >316	521- >681
Household requirement		743- >995	1,641- >2,145
Annual wages (daily pay)		250	571
Annual wages (monthly pay)		288	708 (768)
Welfare ratio (daily pay)		<0.25 – 0.34	<0.27 – 0.35
Welfare ratio (monthly pay)		<0.29 – 0.39	<0.33 (0.36) – 0.43 (0.47)

Note: Figures prefaced by (?) are based on a single recorded price for a particular good, and figures in parentheses for Period 2 are extrapolated from reports from the preceding period. Moreover, the cost of some goods is completely unknown or these goods did not exist: hence '?' or '-'. The median price of an *artaba* of wheat (38.8 liters or 30.3kg) was 8 drachms in Period 1 and 18 drachms in Period 2 (W. Scheidel, 'A model of demographic and economic change in Roman Egypt after the Antonine plague', *Journal of Roman Archaeology* 15 (2002), 103, based on Rathbone, 'Prices'). Drexhage, *Preise*, 27-33 discusses the cost of flour and bread. Milling costs of 0.43-0.57 drachms per *artaba* are reported, and one record from the second century CE prices 2 *artabas* of bread at 21 drachms. If this means that 2 *artabas* of grain produced bread worth 21 drachms, 1kg of bread would have cost 0.26-0.29 drachms: if milling resulted in a weight loss of 0-10 percent and bread was 1.33 times as heavy as the flour it was made of, 1 *artaba* of wheat would have yielded somewhere around 36 to 40kg of bread. Thus, 182kg of bread may have cost between 47.3 and 52.5 drachms. An alternative method of estimating the price of bread yields a somewhat higher total. Allen's 'bread equation' ('How prosperous', 6) assumes that the price of bread (in grams of silver per kilogram) equals 0.063 + 1.226 times the price of wheat (in grams of silver per liter) + 0.014 times the daily wage of a skilled laborer (in grams of silver). In the case of Roman Egypt in Period 1, equating the drachma to one-quarter of an imperial *denarius* with a mean silver content of 3.076g in the

mid-second century CE (cf. R. Duncan-Jones, *Money and government in the Roman empire* [Cambridge 1994], 227 table 15.6), this works out at approximately 0.268g of silver per kilogram of wheat – or 63.4 Egyptian drachms for 182kg of wheat – if we use the wage of an *unskilled* rural laborer. Since skilled workers would have earned more (but we cannot tell by how much), the actual amount would have been larger, i.e., >63.4 drachms. The bread prices for Period 2 are extrapolated from the estimates for Period 1 by multiplying the latter by 2.25 to reflect the 125 per cent increase in the median wheat price from 8 to 18 drachms between Periods 1 and 2. For beans and lentils, see Drexhage, *Preise*, 34-5. Meat prices are particularly poorly known: the estimate for Period 1 rests on only two price points (ibid. 54-5) and there is no independent information for Period 2. Oil and wine: Scheidel, 'A model', 103, based on Drexhage, *Preise*, 43-50 and Rathbone, 'Prices'. Eggs: Drexhage, Preise, 55-8. In the textile category, I have arbitrarily substituted 2 *chitons* (dresses) for 5 meters of linen, each priced at 20 drachms (the lowest price in Period 1) and 45 drachms (based on two prices for Period 2), respectively: see Drexhage, *Preise*, 354-63. Olive oil is assumed to have been used as lamp oil. There are no usable price data for cheese, soap, candles, or firewood (cf. Drexhage, *Preise*, 58, 112-8). Wages: Scheidel, 'A model', 104-5, based on Drexhage, *Preise*, 402-39. Following Allen, 'How prosperous', 6, I assume that day-laborers worked 250 days per year. For the adjusted totals, household requirements, and welfare ratios, see in the text below.

The gross results in Table 1 were adjusted by filling the gaps with the help of comparative evidence. In the three 'respectability baskets' drawn up using data from Diocletian's price edict and from eighteenth-century Strasbourg and Naples, aggregate expenses for cheese, soap, candles, and fuel account for between 12.7 and 13.9 percent of the total budgets. The internal consistency of these findings encourages extrapolation to Roman Egypt. Conjecturing that these four categories may have made up 13.7 percent of total spending (the mean for Strasbourg and Naples), I raised the gross tallies by 15.875 percent.[15] In keeping with Allen's own calculations, I increased the resultant totals by 5 percent to account for housing and then multiplied them by three to scale them up to the requirements of a family.[16] Once again, these overly schematic adjustments are undertaken simply to ensure comparability with Allen's results.

Even allowing for wide margins of error, the overall picture is clear. Workers could not expect to earn more than a relatively modest fraction of this notional 'respectability basket'. The 'welfare ratio', which equals annual earnings divided by required expenditure, ranges from less than 0.25 to less than 0.5. By comparison, according to Diocletian's Price Edict, a day laborer could expect to be able to afford approximately half (51 percent) of this 'consumption basket'.[17] Unskilled workers in

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[15] This method exposes me to the charge of circular reasoning. However, given the small share of these expenses in the total budget, this adjustment does not greatly affect the outcome. I believe that the benefit of being able to account for these items outweighs the hazard of circular reasoning. Alternatively, it would be possible to substitute oil for soap and candles.

[16] Allen, 'How prosperous', 5. For the cost of housing, see ibid. (5-10 percent of household spending in later periods); Drexhage, *Preise*, 78-91, 450-2 (14 to 25 days' worth of wages sufficient to rent a home for a year).

[17] Allen, 'How prosperous', 3 calculates the daily silver wage of an unskilled laborer by adding a monthly allowance of 5 Italic *modii* (43.1 liters, equivalent to 3.33 *modii castrenses*) of wheat that is prorated by dividing it by 30 to estimate the daily amount. This leads to a 'welfare ratio' of 0.56 for the 'respectability basket' (ibid. 7). There are two problems with this approach. First of all, the price edict does not specify the daily food allowance that was to accompany the stated maximum cash wage of 25 *denarii*: 1.1 kilograms of wheat would have provided 3,670 calories, (at least) equal to the total caloric requirement of a physically hard-working adult man. Actual wheat allowances may well have been smaller. Secondly, since Allen reckons with only 250 work-days per year, the daily food allowance would only have been available 68.5 per cent of the time. Therefore, the monetary value of a properly prorated monthly food allowance of 3.33

Roman Egypt were as far removed from a 'respectable' lifestyle as their peers in Delhi, Beijing, and Florence in the early nineteenth century.[18]

The requirements set out in this particular 'consumption basket' deliberately exceed those for bare subsistence by a considerable margin. For instance, it seems a priori unlikely that more than a relatively small proportion of all pre-modern Egyptian households could ever have hoped to spend more money on meat than on bread. In reality, many workers and their families would seek to control costs by reducing expenditure on non-food items, alcohol, animal protein, and even grain processing. This approach underlies Allen's aptly named 'bare bones subsistence basket' that ensures the same caloric intake (of 1,920 calories per day) as the 'respectability basket' but at much lower cost (Table 2).[19]

Table 2   Bare bones subsistence basket

	Quantity per person per year	Price in drachms Period 1	Period 2
Wheat	172 kg	45.4	102.2
Beans	20 kg	(?)4.9	(?)27.4
or lentils	(20 kg)	3.9	?
Meat	5 kg	(?)9.8	((?)19.6)
(Olive) oil	5 l	17.8	37.8
Soap	1.3 kg	-	-
Linen	3 m	20	45
Candles	1.3 kg	-	-
Lamp oil	1.3 l	4.6	9.8
Fuel	2.0m BTU	?	?
Gross total		102-103	242
Adjusted total		112-113	266
Household requirement (mean)		355	838
Annual income (daily pay)		250	571
Annual income (monthly pay)		288	708 (768)
Welfare ratio (daily pay)		0.7	0.68
Welfare ratio (monthly pay)		0.81	0.85 (0.92)

modii castrenses (43.1 liters) of wheat priced at 100 *denarii* per *modius* would have been 7.6 rather than 11.1 *denarii*, for a daily wage of 32.6 instead of 36.1 *denarii*. In this case, the 'welfare ratio' would have been 0.51 instead of 0.56.

[18] Allen, 'How prosperous', 14 fig. 2.

[19] Ibid. 7-8.

Table 2 suggests that by himself, an unskilled worker could expect to earn somewhere between 70 and 90 percent of a 'bare bones subsistence basket' for the whole family. This real income is some 20 to 40 percent lower than in the simulation based on Diocletian's price edict (which yields a 'welfare ratio' of 1.04).[20]

It is worth stressing that these indices relate the needs of an entire family to the income of a single adult male worker. If the worker is viewed in isolation, his income considerably exceeds the costs associated with the 'bare bones subsistence basket' and under all but the most pessimistic assumptions meets the requirements of the 'respectability basket'. The present calculations adopt Allen's focus on the contribution of a single breadwinner for the sole purpose of ensuring cross-cultural comparability. In order to get a better idea of actual real income levels we have to consider the earnings potential of adult women and children. The papyrological record provides us with some relevant information. Wet-nurses are by far the best-documented group of female workers in Roman Egypt. Contracts from Period 1 report monthly wages of 5, 6, or 7 drachms, in each case supplemented by 0.5 liters of oil, as well as an average monthly wage of 6.67 drachms without food.[21] Long-term employment was common: 2 and 2.5 years were the most popular periods.[22] Under full employment, an average monthly wage of 6 drachms plus 0.5 liters of oil works out at 93 drachms per year, equivalent to about one-third of a male wage-laborer's annual pay in Period 1.[23] Children could contribute as well.[24] Documents from Period 1 record a number of daily wages for a *pais* (child) ranging from 0.57 to 1.14 drachms.[25] The median wage in this sample, of 0.86 drachms per day, would have enabled a *pais* to earn 108 drachms per year even if he or she had found employment on only half as many days per year as an adult worker. This suggests that a de facto annual household income of around 450 to 500 drachms may be a more realistic estimate. By improving the 'welfare ratio' to 1.27 to 1.41 times the total cost of the 'bare bones subsistence basket' for Period 1, this would have provided extra revenue for tax payments and modest non-essential expenses. At the same time, even if a less meat-rich 'respectability basket' need not have cost more than 600 drachms per year, this standard

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[20] Adjusted from Allen, 'How prosperous', 8 (who gives a ratio of 1.16) according to my calculations in n.17.

[21] Drexhage, *Preise*, 437-9.

[22] M. M. Masciadri and O. Montevecchi, *I contratti di baliatico* (Milan 1984), 32-5.

[23] For women's labor more generally, see W. Scheidel, 'The most silent women of Greece and Rome: rural labour and women's life in the ancient world', *Greece and Rome* 42 (1995), 202-17, and 43 (1996), 1-10.

[24] Child labor was common from an early age: see K. R. Bradley, *Discovering the Roman family* (New York 1991), 103-24; W. Petermandl, 'Kinderarbeit im Italien der Prinzipatszeit: ein Beitrag zur Sozialgeschichte des Kindes', *Laverna* 8 (1997), 113-36.

[25] Drexhage, *Preise*, 413-22.

would nevertheless have remained beyond the reach of most unskilled workers and their families.[26]

Table 3 compares several of the caps on prices and wages imposed by the price edict of 301 CE with actual prices and wages from Roman Egypt. To facilitate comparison, all amounts are expressed in fractions or multiples of the price of 1 liter of wheat.

Table 3 Price and wage ratios in Egypt and Diocletian's price edict

	Price edict (301 CE)	Roman Egypt Period 1	Period 2
Wheat (1 liter)	**100**	**_100_**	**_100_**
Beans (1 liter)	60	(?)36	(?)89
Lentils (1 liter)	100	57	?
Wine (1 liter)	192-720	_200_	_146_
Olive oil (1 liter)	576-960	_1,728_	_1,629_
Salt (1 liter)	100	?	(?)56
Honey (1 liter)	576-960	(?)18,772	?
Meat (1 kilogram)	641-1,922	952-1,904	?
Cloak	51,720	(?)19,417	(?)21,552
Shirt/dress	16,162-25,860	11,650	(?)<13,362
Adult slave (generic)	258,600-387,900		
Adult slave (skilled)	517,200-775,800		
Adult slave (all)		533,980	
Daily wage (unskilled)	**467**	**_485_**	**_493_**

Note: See the references in the note for Table 1, with Drexhage, *Preise*, 41-2 (honey), 351-70 (garments), and W. Scheidel, 'Real slave prices and the relative cost of slave labor in the Greco-Roman world', *Ancient Society* 35 (2005), 1-17 (slaves). Well-attested Egyptian prices and wages are underlined. Bold typeface highlights the stable ratio of wheat prices to wages.

The price ratios in the price edict tend to resemble the Egyptian ones for wine, a commodity that is frequently attested in the papyrological record,[27] as well as for meat, shirts, and slaves. The 'soldier's mantle as in the *indictio* [i.e., as tax in kind], best

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[26] Based on different assumptions about household composition and consumption needs, Drexhage, *Preise*, 454 estimates that anywhere from 800 to 1,500 daily (unskilled labor) wages were necessary to support a six-person household in Roman Egypt. In Allen's terminology, this translates to a 'welfare ratio' of 0.17 to 0.31.

[27] Egyptian wine was more likely to resemble the cheap *vinum rusticum* of the Price Edict than pricier Italian varietals that account for the price spread in Table 3.

quality' mentioned in the price edict was probably of higher quality than the cloaks mentioned in the papyri, and the isolated Egyptian price points for legumes, salt, and honey need not be representative. Only the discrepancy in the relative price of oil – a good that is repeatedly priced in Egyptian documents – arguably reflects reality: olive trees may well have been more abundant in the coastal regions of the Mediterranean than in Egypt proper. Most importantly, the 'wheat wage' for unskilled labor was the same in Egypt and in the price edict. This suggests that in real terms, subsistence wages were indeed quite similar – and therefore similarly low – across the Roman world.