Real Wages and Standards of Living in the Ottoman Empire, 1489–1914

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Utilizing a large volume of archival documents, this study establishes for the first time the long-term trends in real wages of skilled and unskilled construction workers in Istanbul and other Ottoman cities in southeastern Europe and the Middle East, from the second half of the fifteenth century until World War I. A detailed consumer price index and nominal wage indices are constructed for the city of Istanbul for this purpose. These price and wage series are then inserted into a larger framework of price and wage trends in European cities during the same period.

During the last two decades economists and economic historians have devoted much effort to estimating the per capita real product of different countries, and to analyzing trends in the gap between "leaders" and "followers."[1] We know that the gap is large today, and we can infer from the growth record of both groups of countries that it was smaller—or did not exist at all—prior to the onset of modern economic growth. Recent research by Angus Maddison and others has confirmed the existence of a gap as of 1820. We have also learned that the gap between developed and developing countries as a whole widened not only in the era of the Industrial Revolution from 1820 to 1914, but also from 1914 to 1950.[2] There is little information, however, about the period before 1820. How large was this gap in 1750, in 1600, or in 1500? These inquiries inevitably give rise to questions about the prevailing trends in per capita incomes, productivity, and institutions during the early modern era, not only in Western Europe but also in today's developing regions.

[1] Abramowitz, "Catching Up"; Barro, *Determinants*; and Maddison, *World Economy*. See also Hanson, "Third World Incomes"; and Crafts, "Gross National Product."

[2] Maddison, "Comparison" and *World Economy*.

With the possible exception of a handful of countries, estimates of per capita GDP for the period before 1820 are difficult to construct and unreliable. Moreover, it has not been possible to construct detailed estimates for any of the developing countries for any period before 1870. An alternative approach for studying the gap in levels of per capita income or standards of living has been to compare real wages in specific occupations, most often in skilled and unskilled construction work in urban areas. Real wage data are of far better quality than per capita GDP estimates especially for the period before World War I, and they are available for a wider range of countries. In fact, real wage series are virtually the only solid information we have on standards of living in the developing countries for the period before 1870, if not 1914. In short, real wages continue to be the most reliable source of information about living standards before the very recent past.

Although they cannot be described as "national" in any sense, urban real wage series exist for many regions, and large interregional differences within the same country are not apparent in these series. Nonetheless, real wage series are open to valid objections. Even if we accept the representative wage as an adequate proxy for the per capita *earnings* of labor, this does not make it a good proxy for per capita *income*, which includes the returns to capital and land; longitudinal and comparative studies are further complicated by the fact that factor shares have varied greatly over time and across societies. Moreover, households incomes were often determined by changes in employment levels, and in the participation rates of men, women, and children, and, above all, by nonmarket incomes.

Despite these qualifications, the historical link between wages and the standard of living remains. A decline in real wages did result in a decline in household welfare, because each unit of labor commanded fewer consumption goods—or, alternatively, because more labor had to be supplied to command the accustomed basket of goods. Either way, the household suffered by sacrificing consumption, nonmarket income, leisure, or some combination of the three.[3]

A large part of our knowledge about long-term trends in real wages during the late medieval and early modern periods goes back to the vast research effort undertaken by members of the International Scientific Committee on Price History (ISCPH), established in 1929. Most studies to date, including those of the ISCPH, have focused on western and central Europe.[4] Arguably, the most influential project in this respect has been that of E. H. Phelps Brown and Sheila Hopkins, who constructed price and wage series for southern England over seven centuries beginning in 1264. The Phelps Brown–Hopkins findings were notable for their pessimism. They confirmed

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[3] Van Zanden, "Wages"; and de Vries, "Between Purchasing Power."

[4] Amongst the classic studies were those by Beveridge ("Wages"), Hamilton (*American Treasure*), and Phelps Brown and Hopkins ("Seven Centuries" and *Perspective*). For an overview of the main results, see Allen, "Great Divergence."

long-term fluctuations, but did not reveal any secular improvement in urban real wages from the fifteenth to the mid-nineteenth century.[5] In recent decades, however, evidence has been accumulating that productivity, standards of living, and per capita GDP were rising in many parts of western Europe before the Industrial Revolution.[6] For this reason, researchers in recent years have been reviewing the old series and constructing new ones in order to reassess the history of real wages. They have also been debating how well the real wage of urban construction workers can serve as a proxy for the living standard of the population at large, and whether more representative indices can be constructed with the available data. Changes in occupational structure and income distribution may have been two important and related reasons behind the divergence of GDP per capita and real wages in western Europe. In other words, it is possible that the wages of construction workers declined relative to other incomes during this period. In addition, households may have increased their labor supply during this period.[7]

In contrast to our advancing state of understanding of Western Europe, only a few real wage series have been constructed to date for cities on the European periphery and in other continents. The Ottoman Empire stood at the crossroads of intercontinental trade, stretching from the Balkans and the Black Sea through Anatolia, Syria, Mesopotamia, the Gulf, Egypt, and most of North Africa from the early sixteenth century up to World War I. At its peak in the seventeenth and eighteenth centuries, its population exceeded 30 million. One might have expected that the economic institutions that sustained this large, multiethnic entity for so long would be of interest to economic historians. Unfortunately, mainstream economic historians have long neglected the land regime, manufactures, economic policies, and the daily existence of ordinary men and women. As a result, the longevity of the Ottoman Empire remains an anomaly and even a mystery for many.

For most of its six-century existence, the Ottoman Empire is best characterized as a bureaucratic, agrarian empire. Its economic institutions and policies were shaped to a large degree by the priorities and interests of a central bureaucracy. Recent literature has emphasized that the Ottoman empire did not simply and irreversibly decline after the sixteenth century. On the contrary, the Ottoman state and society showed considerable ability to adapt to changing circumstances in Eurasia from the seventeenth through the nineteenth centuries. The central bureaucracy managed to contain the many challenges it faced with pragmatism, flexibility, and a tradition of negotiation to co-opt and incorporate into the state the social groups that rebelled against it. The Ottoman state also showed considerable flexibility

[5] Phelps Brown and Hopkins, "Seven Centuries" and *Perspective*.

[6] Maddison, *World Economy*; Persson, *Pre-Industrial Economic Growth*; and de Vries and van der Woude, *First Modern Economy*.

[7] Van Zanden, "Great Convergence," p. 12; and de Vries, "Industrious Revolution."

not only in military technology, but also in its fiscal, financial, and monetary institutions. Despite wars and internal conflict from the 1770s through the 1830s, the Ottomans managed to regroup and survive into the modern era with a strong central state and many of their central institutions intact, while many of their contemporaries in both Europe and Asia collapsed.

Even before the nineteenth century, the Ottoman economy was well linked to Europe via trade across the Mediterranean and the Balkans. Thanks to research in recent decades, we now have a reasonably good picture of the long-term trends in economic activity in the Ottoman Empire. Most economic historians agree that the sixteenth century was a period of demographic and economic expansion, at least in the core regions of the empire. In contrast, the seventeenth century has been characterized as a period of "crisis and partial recovery" when population and economic activity stagnated (or worse) in many parts of the empire. Contrary to earlier assumptions, it has been shown that the eighteenth century was a period of relative peace, stability, and economic expansion that came to an end with the decades of war, fiscal difficulty, and inflation after 1770. Between 1850 and 1914, the overall trend was once again towards limited increases in average incomes. Despite the accumulation of valuable evidence for different time periods, we are still unable to compare levels of per capita income in 1914 with those in 1750 (or 1600 or 1500), for different regions of the Ottoman Empire or for the empire as a whole.[8]

Utilizing a large volume of archival documents, this study will establish the long-term trends in wages of skilled and unskilled construction workers in Istanbul and other Ottoman cities (including Belgrade, Salonika, Edirne, Bursa, Damascus, and Jerusalem) from the late fifteenth century up to World War I. These trends will offer important insights into the long-term performance of the Ottoman economy. The price and wage series will then be inserted into a larger framework of price and wage trends in European cities during the same period. This comparison will provide new and important evidence regarding standards of living and growth in the early modern era. It will also shed light on the origins and evolution of a gap in real wages between developed and developing countries.

PRICES

Sources and Methods

We begin with a summary presentation of the results of a study of prices in Istanbul and other leading cities of the Ottoman Empire from the fifteenth to the twentieth centuries. Additional details about the indices are presented in Appen-

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[8] Inalcik and Quataert, *Economic and Social History*; for a recent overview see Pamuk, *Monetary History*, pp. 228–29.

dix 1. Our study utilized data on the prices of standard commodities (food and nonfood items) collected from more than 6,000 account books and price lists located in the Ottoman archives in Istanbul. The first step was to construct three separate food-price indices. One of these was based on the account books and prices paid by the many pious foundations (*vakıf*), both large and small, and their soup kitchens (*imaret*); another index was based on the account books of the Topkapı Palace kitchen; a third utilized the officially established price ceilings (*narh*) for the basic items of consumption in the capital city.[9]

To the extent possible, standard commodities were used in constructing the indices in order to minimize the effects of quality changes. The food indices included the prices of ten leading items of consumption: flour (mostly wheaten), rice, honey, cooking oil, mutton, chickpeas, lentils, onions, eggs, and fuel-grade olive oil. Among these, flour, rice, cooking oil, mutton, olive oil, and honey provided the most reliable long-term series and carried the highest weights in our food budget. In cases where the prices of one or more of these items were not available for a given year, missing values were estimated by an algorithm that applied regression techniques to the available values.

The medium- and long-term trends exhibited by the three food-price indices are quite similar. In addition, account books showing the private purchases by the households of high-ranking bureaucrats also point to similar long-term trends in food prices at the retail level.[10] The fact that *narh* prices closely approximated prices paid by the palace, pious foundations, and private individuals suggests that government intervention did not alter prices, especially in the medium and long term. It also points to a high degree of government pragmatism in economic affairs. Historians have long argued that the permanent application and enforcement of *narh* in urban areas was a typical example of Ottoman interventionism and rigidity in defense of a traditional order. There is, however, a good deal of evidence that the Ottomans became increasingly conscious, after 1600, of the limitations of interventionism in economic affairs. They learned that price ceilings

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[9] Most of the account books of the pious foundations used in this study are available from the Maliyeden Müdevver (MM), Bab-ı Defteri, Başmuhasebe Kalemi (BŞM), Evkaf Defterleri (EV), and Evkaf Nezareti, Haremeyn Muhasebeciliği (EV.HMH) Collections at the Prime Ministry Ottoman Archives (Başbakanlık Osmanlı Arşivleri [BOA]) in Istanbul. The account books of the Topkapı Palace kitchen are available from the Bab-ı Defteri, Matbah Emini (D.BŞM.MTE), Bab-ı Defteri, Başmuhasebe Kalemi (D.BŞM) Maliyeden Müdevver (MM), Kamil Kepeci (KK), Cevdet Saray (CS), Maliye Nezareti, Mesarifat Muhasebesi (ML.MSF), Bab-ı Defteri, Odun Emini (D.BŞM.ODE) and Bab-ı Defteri, İstanbul Ağası (D.BŞM.ISA) Collections also at the BOA, and the Dosya (D) Collection at the Topkapı Palace Archives. The *narh* lists were approved by the local judges (*kadi*) and were taken from the Istanbul, Üsküdar and Galata Islamic court archives in Istanbul. A complete list of all archival documents used in this study is presented on year-to-year basis in the appendices of Pamuk, *Istanbul*.

[10] Annual values of these four food-price indices are not provided here due to limitations of space. For further details see Pamuk, *Istanbul*, figures 2.2 and 2.3.

that diverged substantially from the underlying market realities could not be enforced over long periods of time. For this reason, interventionism became increasingly selective. It was used primarily for the provisioning of the capital city and the army, and for selected commodities. Perhaps more importantly, after 1650 the *narh* came to be considered not as permanent policy but an instrument reserved for extraordinary conditions such as wars, exceptional difficulties in the provisioning of the capital city, or periods of monetary instability. With increasing fiscal and monetary difficulties and growing price instability, the price ceilings once again became a regular feature of Ottoman urban life from 1789 to 1850.[11] Because the palace and *narh* prices might be considered official or state-controlled prices, this study gives greater weight to the prices paid by the soup kitchens and the pious foundations. The *narh* prices and the retail prices paid by the households of high-level bureaucrats were not included in the final index.

Since the availability and quality of price observations varied over time for most of the foodstuffs in our list, the period 1460–1860 was divided into five subperiods and indices were calculated separately for each. In each subperiod some commodities had to be excluded from the index due to the unavailability of price observations.

Based on the available evidence regarding the budget of an average urban consumer, the weighting of food items in the overall indices was fixed between 75 and 80 percent. The weighting of each commodity in the overall index was then based on the shares of each in total expenditures of the respective institutions. To cite two prominent examples, the weighting of flour varied generally between 32 and 40 percent of food expenditures and 24 to 32 percent of overall expenditures, depending on the fluctuations in prices. Similarly, the weight of mutton varied between 5 and 8 percent of the overall budget. Diets of private households in the capital city probably differed from those offered by the soup kitchens. At this stage, however, it is not possible to approximate the private diets more closely.

The following commodity basket was used most frequently in the food price index:

    11 *kile* of flour (288.6 kg)
    4 *kile* of rice (51.2 kg)
    9 *okka* of animal-based cooking oil (11.5 kg)
    13 *okka* of honey (16.6 kg)
    40 *okka* of mutton (51.2 kg)
    0.2 *kile* of chickpeas (2.56 kg)
    5 *okka* of olive oil (6.4 kg).

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[11] Pamuk, *Monetary History*, pp. 9–19.

One important reason why the weightings of the individual commodities was kept constant over time was the unavailability of consumer budgets for different points in time. It is likely, however, that changes in the commodity composition of the consumer budget were small, in part because increases in average incomes were limited during these centuries. On the other hand, some substitution must have occurred over time, away from commodities whose prices rose faster towards those whose prices declined in relative terms. It is thus reasonable to expect that our fixed-weights index overstates the long-term price increases somewhat, as will be further discussed below.

In the second step, various nonfood prices (of soap, wood, coal, and nails) obtained from a variety of sources, most importantly the palace account books, were added to the price indices. From the various account books of the imperial palace it was possible to obtain long-term price series on two types of woolen cloth: the locally produced *çuha*, and the *çuha Londrine* imported from England. However, because the woolen cloth described in palace sources belonged to more expensive varieties, cloth prices were not included in the overall index until 1860.[12] Price data for many other types of cloth have also been collected, but none of these are available for long periods of time. A cost-of-living index should also include the rental cost of housing, but an adequate series for standard housing is not available.

It is well known that premodern prices exhibited wide short-term fluctuations due to harvest conditions, difficulties in transportation, wars, and other causes. In the case of our indices, however, a number of factors worked to reduce such fluctuations. First, the capital city was subject to a higher degree of government involvement in price formation. Secondly, it is likely that soup kitchens and the imperial palace were subject to a lesser degree of price variation than were private households. Thirdly, in processing price observations from archival documents we excluded prices more than 100 percent higher or more than 50 percent lower than the value of the previous year, unless the new price level was observed again in later years. Although most of the excluded observations reflected errors in the original document, some of them must have represented actual prices. As a result we do not have a high degree of confidence in the year-to-year fluctuations of our indices, but we are quite confident about the level of prices in the medium and longer term.

For the period 1860–1914, data from the palace, *vakıf*, and *narh* sources are very limited. For this reason we used the detailed quarterly wholesale prices of the Commodity Exchange of Istanbul, covering about two dozen commodities, and a separate series for imported cotton textiles. Indices based on these prices were then linked to those for the earlier period, with

[12] We compared the woolen cloth prices paid by the palace with the prices of more ordinary varieties worn by the janissaries, as given in Sahillioğlu, "Yeniçeri Çuhasi."

the help of detailed data for both retail prices of individual commodities and prices at the Commodity Exchange for 1860–1862 and 1913–1914.

Results

We have thus obtained, for the first time for southeastern Europe and the Near East, detailed and reliable price series for these four-and-a-half centuries (Table 1). The indices show that consumer prices in Istanbul increased by a total of about 300-fold from 1469 until World War I. This overall increase corresponds to an average increase of 1.3 percent per year, endpoint-to-endpoint, and 1.1 percent per year for the fitted line. They also indicate that Istanbul experienced a significant wave of inflation from the early sixteenth to the late seventeenth century, when prices increased sevenfold. This is the period usually associated with the Price Revolution. The indices also show, however, that there occurred a much stronger wave of inflation beginning in the 1770s and lasting into the 1860s, when prices rose as much as 25-fold. Most of the latter increases were associated with the debasements that began in the 1780s and accelerated during the reign of the reformist sultan Mahmud II (1808–1839). In contrast, prices were relatively stable from the 1690s to the 1760s, and from the 1860s to 1914. (For a period-by-period review of the price trends, see Appendix 1.)

Obviously there were many causes of inflation during the early modern period, as evidenced by the large literature and the extensive debates on the subject. From the *long-term* perspective offered by these price indices and by Şevket Pamuk's recent study of the Ottoman currency, however, it is clear that debasements or the reduction of the silver content of the unit of account by the monetary authorities were the most important cause of Ottoman price increases.[13] In fact, even though nominal prices increased about 300-fold over these four-and-a half centuries, prices expressed in grams of silver rose less than threefold (Table 1). There were medium-term movements in the latter series: it increased from 1500 until 1640 during the period of the Price Revolution, declined until the early decades of the eighteenth century, and increased again until the middle of the nineteenth century. These fluctuations occurred, however, around a secular trend that was rising only modestly. The so-called silver inflation thus contributed to the changes in the overall price level, but its impact paled in relation to that of debasements.

Istanbul was chosen primarily because price data are most detailed for the capital city.[14] However, price data from the account books of pious foundations

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[13] Pamuk, *Monetary History*.

[14] Detailed indices on the prices of basic foodstuffs expressed in grams of silver, and the terms of trade between foodstuffs and manufactured goods, have also been calculated from the Istanbul data (Pamuk, *Istanbul*, ch. 2).

TABLE 1
PRICES AND WAGES IN ISTANBUL, 1469–1911
(decennial averages)

| Period | Consumer Price Index (1469 = 1.0) | | Nominal Daily Wages | | | | Real Daily Wages (1489/90 = 1.0) | |
| | | | Unskilled Worker | | Skilled Worker | | | |
	In *Akçe*	In Silver[a]	In *Akçe*	In Silver[a]	In *Akçe*	In Silver[a]	Unskilled	Skilled
1469–1479	1.20	1.17	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1480–1489	1.30	1.02	4.9	3.3	9.8	6.6	0.93	1.04
1490–1499	1.09	0.85	4.7	3.1	7.7	5.2	1.06	0.96
1540–1549	1.60	1.00	5.3	3.5	9.6	6.3	0.86	0.92
1550–1559	1.64	1.25	5.0	3.3	9.7	6.4	0.78	0.86
1560–1569	1.86	1.32	5.9	3.8	9.3	6.0	0.83	0.73
1570–1579	1.99	1.41	5.6	3.4	9.9	6.0	0.68	0.66
1580–1589	3.35	1.47	8.1	3.5	12.4	5.4	0.65	0.53
1590–1599	4.45	1.46	11.7	2.6	20.7	4.6	0.51	0.50
1600–1609	5.43	1.81	13.9	4.0	22.5	6.5	0.62	0.56
1610–1619	4.44	1.47	14.2	4.1	22.8	6.6	0.76	0.67
1620–1629	5.56	1.54	15.0	3.4	18.3	4.1	0.84	0.57
1640–1649	4.37	1.34	15.2	4.2	29.5	8.2	0.79	0.84
1660–1669	5.82	1.56	19.5	4.4	29.9	6.8	0.81	0.69
1670–1679	7.06	1.69	18.0	3.7	23.0	4.8	0.71	0.50
1680–1689	7.46	1.79	21.8	4.5	33.4	6.9	0.73	0.62
1690–1699	7.96	1.21	26.2	3.4	36.9	4.8	0.78	0.61
1700–1709	6.05	0.92	23.8	3.1	38.0	5.0	1.02	0.90
1710–1719	6.87	1.03	25.2	3.3	38.2	5.0	0.92	0.77
1720–1729	6.98	1.06	26.4	3.5	42.3	5.6	0.97	0.85
1730–1739	7.62	1.10	30.6	3.8	44.8	5.6	0.94	0.76
1740–1749	9.93	1.39	32.5	3.9	51.1	6.2	0.91	0.79
1750–1759	10.1	1.30	32.4	3.6	58.6	6.6	0.76	0.75
1760–1769	11.1	1.23	30.3	2.9	50.8	4.8	0.70	0.64
1770–1779	17.8	1.93	38.7	3.6	71.2	6.7	0.52	0.51
1780–1789	17.2	1.58	56.9	4.7	113.4	9.4	0.86	0.94
1790–1799	24.5	1.50	80.2	4.1	148.4	7.7	0.84	0.84
1800–1809	34.7	1.91	114.4	5.3	217.7	10.0	0.84	0.88
1810–1819	49.5	1.86	202.6	6.9	401.2	13.7	0.95	1.04
1820–1829	62.8	1.26	275.9	5.0	475.4	8.9	1.13	1.10
1830–1839	130.1	1.12	608.8	4.5	1,054	7.8	1.11	1.05
1840–1849	181.0	1.70	717.2	5.9	1,238	10.1	0.99	0.95
1850–1859	240.5	2.32	935.3	7.8	1,599	13.3	1.38	1.30
1860–1869	285.7	2.76	964.7	8.0	1,716	14.3	0.81	0.80
1870–1879	265.6	2.56	941.4	7.8	1,989	16.6	0.86	0.99
1880–1889	238.1	2.30	944.0	7.9	2,061	17.2	0.91	1.04
1890–1899	235.6	2.27	1,063	8.9	2,308	19.2	1.12	1.35
1900–1909	220.9	2.13	993.5	8.3	2,150	17.9	1.10	1.31
1910–1914	294.2	2.84	1,861	12.6	3,450	26.6	1.30	1.51

[a] Grams.
Sources: See the text.

(similarly obtained from the account books of pious foundations in the Ottoman archives in Istanbul) are available for other cities of the empire as well. Observations for a shorter list of commodities were used to construct sepa-

rate series for the cities of Edirne, Bursa, Konya, Trabzon, Damascus, and Jerusalem. In these cities, both the overall change in the price level from 1490 to 1860 and the two major jumps in the price level that occurred in the late sixteenth and early nineteenth centuries were comparable to the price trends in Istanbul.[15] Price data gathered by Ljuben Berov indicate that the Balkans experienced similar increases in prices during the sixteenth and seventeenth centuries.[16] The evidence thus points to similar price trends for the *akçe* zone as a whole, stretching from the Balkans through Anatolia to Syria. In Egypt the local currency was the *para* or *medin*, whose silver content and rate of debasement differed from those of the *akçe*. Nonetheless, it is possible to construct real price indices for Cairo on the basis of data supplied by Andre Raymond from the court records of that city.[17] These indices indicate that Cairene prices (expressed in grams of silver) moved in line with prices in the *akçe* region from 1624 to 1800, the period for which comparable data is available.[18] The well-developed maritime transportation and commerce networks around the eastern Mediterranean must have ensured the broad convergence of the price levels and trends in different Ottoman cities.

Alternative Specifications

As pointed out earlier, some commodities were excluded from our index because of the unavailability or poor quality of data. It would be useful to see how sensitive our long-term results are to the insertion of these commodities into our consumer price index. Cloth prices were excluded from the index for the period before 1860 due to their poor quality. Nonetheless, since long-term trends in the available Istanbul cloth price series broadly paralleled those in western Europe, these latter can be added to the index.[19] Prices of woolen cloth decreased by about 80 percent relative to our overall consumer price index from 1700 to 1860. The inclusion of cloth prices thus decreases the overall index by a total of 5 percent between these two dates.

Another relatively important item excluded from our index is rents on residential housing. In view of this item's importance in urban consumer budgets, some allowance can perhaps be made for this item by studying

[15] For details see Pamuk, *Istanbul*, figure 3.1 and appendix tables 5.1–5.6.

[16] Berov, *Prices in the Balkans*; a summary is available in Berov, "Changes."

[17] Pamuk, *Istanbul*, appendix table 5.7; Raymond, *Artisans et Commerçants*, pp. 17–80; for these calculations the silver content of the *para* of Cairo is taken from Pamuk, *Monetary History*, pp. 95–101, 172–78.

[18] Pamuk, *Istanbul*, figure 3.2.

[19] As a measure of cloth prices in western Europe in the early modern era, we have used here the textile price index for Netherlands constructed by Jan Luiten van Zanden. This index is available in both nominal and silver terms from the International Institute of Social History website, www.iisg.nl/hwp/.

long-term trends in rental prices of residential housing elsewhere in European cities for which data are available. In view of Istanbul's growth as an urban center, one should expect rents on residential housing to have risen over time. Taking into account patterns in housing ownership, we assumed as a first approximation that rent payments on urban housing doubled in relation to the overall index, and that the share of rents in the average urban budget rose from about 5 percent to about 10 percent, between the sixteenth and early twentieth centuries. The inclusion of rents in our index under such an assumption would increase the overall index by 5 percent, thereby offsetting the inclusion of cloth prices. In the absence of any meaningful time series data on rents, it is difficult to be more specific on this issue.

Finally, we consider the inclusion of sugar and coffee in our price index. Istanbul sugar prices declined by about 50 percent relative to the overall index during the sixteenth century, and by an additional 50 percent during the period 1820–1860. The available price series for coffee in Istanbul tracked the overall index until the nineteenth century, but declined by about 60 percent relative to the index during the period 1820–1860.[20] Since the share of these two items in the average consumer budget was limited until 1860, however, our overall results would not change significantly. We estimate that the inclusion of these two items in the consumer budget would reduce the terminal value of the index in 1914 by no more than 1 percent.[21]

Relative Costs of Living

Thus the cumulative impact of including cloth, sugar, coffee, and rents in the consumer budget would be quite small. The impact would be much greater on the relative costs of living of lower- and higher-income consumers, however. Since cloth, sugar, and coffee had larger shares in the budgets of higher-income consumers, the decline in their prices reduced their cost of living in particular. On the other hand, the inclusion of rent payments would tend to raise the costs of living of lower-income groups more than those faced by higher income groups, since the latter were likelier to own their dwellings. We thus estimate that the inclusion of these four items would shift relative prices in favor of higher-income consumers. With respect to the two groups whose incomes will be examined in the next section, for example, we expect that the expanded price index would widen the

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[20] Before the eighteenth century, sugar and coffee were brought to Istanbul from Egypt. It was the arrival of imports from Atlantic sources that led to the sharp decline in the prices of both commodities during the nineteenth century.

[21] For the period 1860–1914 our index includes prices of imported cotton cloth, sugar, and coffee. All price observations used in this study, as well as the indices constructed with them, are presented in Pamuk, *Istanbul*.

difference between the purchasing power of skilled and unskilled workers by about 10 percent for the entire period.

One important and related characteristic of the Istanbul price series is the important divergence in relative prices over the course of these four-and-a-half centuries. Prices of some foodstuffs (meat, flour, milk, eggs) rose 400- to 600-fold in nominal terms (and four- to sixfold in silver terms) during this period, while prices of other foodstuffs (olive oil, honey, coffee, onions) and all manufactured items for which price series are available rose less than 200-fold. Since the commodities with higher rates of price increases were essentials, they had a higher share in the budgets of lower-income consumers. Even after allowing for some substitution away from commodities with more rapid price increases, we estimate that as a result of these relative price movements the overall rate of inflation faced by lower-income consumers was higher, and the overall inflation faced by higher-income consumers was lower, than the averages provided by our index. If we had adopted separate consumer budgets for skilled and unskilled workers, for example, these movements in relative prices would have led, roughly, to cumulative price increases that were 5 percent higher for unskilled workers and 5 percent lower for skilled workers.

When we combine these different effects, we arrive at a cumulative difference of about 20 percent between the prices faced by skilled and unskilled workers during these four-and-a-half centuries. In other words, we estimate that the overall rate of inflation faced by unskilled workers was 10 percent higher, and by skilled workers 10 percent lower, than the averages reported in our consumer price index in Table 1.[22]

WAGES

For the second part of this study, daily wage data were gathered from more than 5,000 account books for construction and repair projects in Istanbul and other cities. These account books contain daily wages for both unskilled and a variety of skilled construction workers. Urban construction work was a relatively homogeneous category of labor over time and space. Moreover, in contrast to the payments made to other employees, urban construction workers received much of their pay in cash rather than in shelter, food, and clothing. As a result, their wages permit comparisons with other preindustrial societies.

The construction account books prepared by the state or by pious foundations usually consisted of a series of attendance records listing the work-

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[22] A recent study of prices and inequality in Europe since 1500 (Hoffman et al., "Real Inequality") similarly argues that relative price movements favored higher-income groups and increased income inequality in Western Europe from 1500 to 1800.

man's name, his craft, his rank (master, common laborer, etc.) and his wages. Sometimes the accounts provide a separate record for each day; sometimes several days or weeks are covered by a single attendance sheet.[23] Information about the length of the workday is rare in these records, as is information on the provision of meals. For that reason, we have chosen to ignore those aspects of the daily wage. We have also decided to ignore the seasonal variations in daily wages. In any case, the overwhelming majority of the available observations belong to the construction season (April through October in Istanbul).

The wages for unskilled workers referred mostly to one type of worker, called *ırgad* in the early period and *rençber* after about 1700. In contrast, the account books reveal daily wage rates for more than a half-dozen categories of skilled construction workers. In order to utilize additional information, an index was constructed including the wages of carpenters, cabinetmakers, masons, stonecutters, ditch-diggers, plasterers, and others. Based on its predominance in the account books, the share of carpenters (*neccar*) in the index fluctuated between 50 and 60 percent.

Figure 1 and Table 1 present real daily wage series for skilled and un-skilled construction workers in Istanbul, obtained by deflating the nominal daily wage series by the consumer price index. It is not easy to judge to what extent daily wages were influenced by institutional factors, and to what extent by market forces. However, the fact that during periods of rapid debasement real wages initially declined, but soon were adjusted upwards, suggests that the process of wage formation was open to market forces.

Our indices indicate that real wages of unskilled construction workers declined by 30 to 40 percent during the sixteenth century. They then re-mained roughly unchanged until the mid-eighteenth century, after which they increased by about 30 percent up to the mid-nineteenth century, and then by another 40 percent during the late nineteenth and early twentieth centuries. On the eve of World War I, real wages of unskilled construction workers were about 20 percent above their levels in 1500. But because relative prices had shifted in favor of goods consumed by higher-income consumers during these centuries, and because the skill premium had begun to rise late in the nineteenth century, by 1914 the real wages of skilled work-ers stood at more than 50 percent above their levels in 1500.

[23] Most of the account books of the pious foundations and the state used in this study are available from the Maliyeden Müdevver (MM), Evkaf Nezareti, Haremeyn Muhasebeciliği (EV.HMH), Evkaf Defterleri (EV), Bab-ı Defteri, Başmuhasebe Kalemi (D.BŞM), Bab-ı Defteri, Bina Emini (D.BŞM.BNE) and Maliye Nezareti, and Mesarifat Muhasebesi (ML.MSF) collections in the BOA archives in Istanbul. Pamuk (*Istanbul*, appendices 7–10) provides a full list of the archival sources on an annual basis, as well as the nominal daily wages for each wage category in the form of annual averages for Istanbul and other cities. Many of the account books also included lists and prices of materials purchased, such as iron, lime, and nails, the last of which was utilized in the construction of the price indices.
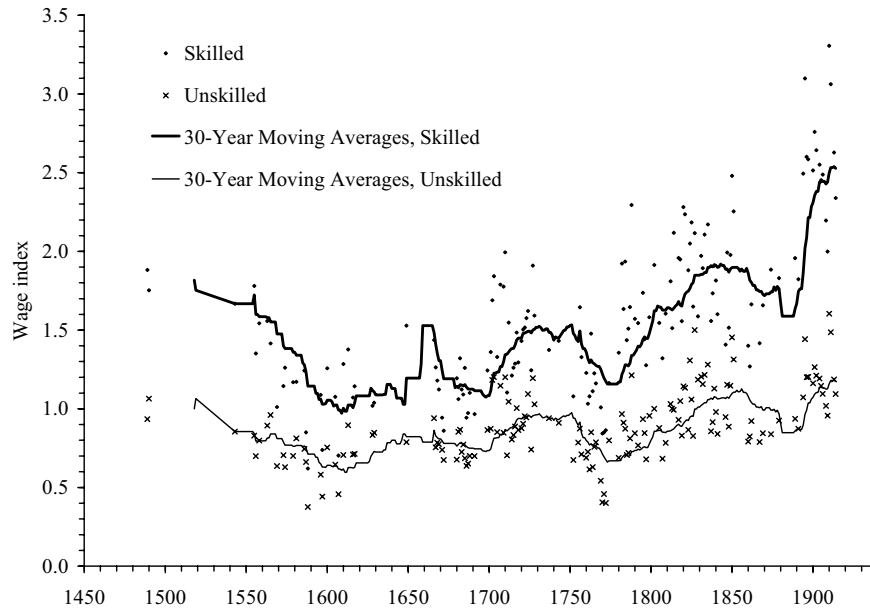
Özmucur and Pamuk

FIGURE 1
REAL DAILY WAGE OF CONSTRUCTION WORKERS: ISTANBUL, 1489–1914
(1489/90 [unskilled] = 1.0)

Sources: See the text.

When we take into account the differential impact of the items excluded from our price indices, as well as the differential impact of the more rapid rise in the prices of essentials, we must adjust the cumulative costs-of-living increases of skilled and unskilled workers by a further –10 and +10 percent, respectively. (See Appendix 1 for a period-by-period analysis of the trends in real wages.) These adjustments to the series in Figure 1 and Table 1 give a better view of trends in the wage premium for skilled labor. After declining during the sixteenth and seventeenth centuries, the wage differential began to increase in the second half of the eighteenth century, reaching its peak on the eve of World War I. Not only changing demand but also decline in supply (due to the emigration of skilled construction artisans) must have contributed to this trend.

The purchasing power of the daily wages of both classes of worker were reasonably high during these four-and-a-half centuries. During the sixteenth century an unskilled construction worker could purchase with his daily wage 8 kg of bread, or 2.5 kg of rice, or more than 2 kg of mutton. The daily wages of skilled workers were 1.5 to 2 times higher. At these levels of pay, skilled construction workers must have enjoyed standards of living well above the average for the population as a whole, and also above the average

of the urban areas, even if they worked fewer than 200 days per year. For purposes of international comparisons, it is also possible to express daily wages in Istanbul and other Ottoman cities in grams of silver simply by multiplying the nominal wages by the silver content of the Ottoman *akçe*. Around 1500, for example, daily wages of unskilled construction workers in the capital city equaled 3.4 grams of silver; those of skilled construction workers equaled 6.6 grams of silver (Table 1).

Data were also collected on the daily wages of construction workers, both skilled and unskilled, in other Ottoman cities around the eastern Mediterranean and the Balkans for the same period 1490–1914. These observations were obtained from the account books of pious foundations operating in these cities, and are available from the Ottoman archives in Istanbul. They show clearly that nominal wages in other Ottoman cities also increased by more than 300-fold during this period.[24]

In order to establish whether there was any relationship between daily wages in the capital city and those in second-tier urban centers of the empire (Bursa, Edirne, Belgrade, Salonika, Damascus, Jerusalem, and a few others), we regressed w_I / w_O (the ratio of nominal wages in Istanbul to nominal wages in other cities) on the time trend, using data for each year in which observations were recorded for both Istanbul and any other city. Our separate regressions for the wages of skilled and unskilled workers, as well as a composite wage defined as a weighted combination of the two, indicate that the null hypothesis of an intercept of 1.0 for w_I / w_O cannot be rejected. Moreover, the slope coefficient is not significantly different from zero, indicating no discernible time trend in this ratio.

SHORT- AND LONG-TERM DETERMINANTS OF REAL WAGES

In the short and medium term, the most important determinants of Ottoman real wages were changes in prices and the speed with which nominal wages adjusted to them. Because this adjustment was slow, price shocks led to fluctuations in real wages. Consumer prices exhibited large short-term fluctuations due to harvest conditions, difficulties in transportation, wars, and other causes. The most important cause of changes in the price level, however, was debasement. Even if prices did not rise quickly, because of a specie shortage or some other reason, long-distance trade acted as the ultimate equalizer. Price adjustments after a debasement tended to be more rapid the more open the economy, and the more frequently debasement was resorted to.

Recent research has shown that the urban population and some segments of the countryside were already part of the money economy by the end of the fifteenth century. Even more significantly, there occurred a substantial in-

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[24] Pamuk, *Istanbul*, figures 5.1–5.4 and appendix table 9.

crease in the use of money during the sixteenth century, because of both the increased availability of specie and the commercialization of the rural economy. The evidence for this important development comes from a number of sources. First, recent research has pointed out that population growth and urbanization during the sixteenth century were accompanied by the growth of economic linkages between urban and rural areas. As a result, there emerged in the Balkans and in Anatolia an intensive pattern of periodic markets and market fairs, where peasants and larger landholders sold part of their produce to urban residents. These markets also provided an important opportunity for nomads to come into contact with peasants and townspeople. Large sectors of the rural population came to use coinage, especially the small denominations of silver *akçe* and the copper *mangır*, through their participation in these markets.[25]

Secondly, small-scale but intensive networks of credit relations developed in and around the urban centers of the Balkans, Anatolia, and probably elsewhere during the same period. Evidence from thousands of court cases in these towns and cities involving lenders and borrowers leave no doubt that the use of credit, small and large, was widespread among all segments of urban society and parts of the countryside. It is clear that neither the Islamic prohibitions on usury nor the absence of formal banking institutions prevented the expansion of credit in Ottoman society during the sixteenth and seventeenth centuries. Thirdly, the provincial law codes, most of which were issued between the mid-fifteenth and the mid-sixteenth centuries, show very clearly that for every province the Ottoman state issued a long list of activities that were subject to taxation, and the rate to be assessed on each of them. These codes point to an economy with strong urban and rural linkages, considerable market orientation, and frequent collection of small amounts of cash taxes from artisans, merchants, nomads, and peasants. The availability and use of coinage declined during the second half of the seventeenth century, but increased again during the eighteenth.[26]

As a result, debasement had an impact on virtually all groups in Ottoman society; and each group, in turn, adapted to it. Court records make clear that most men and women, both urban and rural, were clear about the distributional consequences of different ways of dealing with the coinage. In general, all persons facing future obligations expressed in the unit of account—most importantly, borrowers and tenants paying fixed rents in cash—stood to gain from debasement. Conversely, those who expected to be paid fixed sums—notably bureaucrats, janissaries, and wage earners—stood to lose from debasement.[27]

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[25] Faroqhi, "Early History," "Sixteenth Century Periodic Markets," and "Rural Society."

[26] Pamuk, *Monetary History*, pp. 74–82.

[27] There existed a large overlap between the guild members who were wage earners and the janissaries, after the latter began to moonlight as artisans and shopkeepers in the seventeenth century (ibid., pp. 55–58, 193–200).

We examined the short- and long-term changes in real wages through a time-series analysis of our price and wage indices. For the purposes of this analysis (the more technical aspects of which are presented in Appendix 2), we utilized a composite wage defined as

$$C = \frac{1S + 2U}{3} \tag{1}$$

where S is the daily wage of a skilled construction worker and U is the daily wage of an unskilled construction worker. Our results indicate that in response to debasements, both prices and nominal wages adjusted with a lag. However, because the adjustment of nominal wages was slower than that of prices, debasements led to declines in real wages in the short and even the medium term. These results help explain the unpopularity of—and the often strong political opposition to—debasements among the urban population, especially in the capital city.

For the longer term, it would be best to investigate the determinants of real wages within the framework of supply and demand for labor and a real wage equation. One would expect that changes in the size of the labor force would be an important determinant of the long-term changes in the real wage rate, especially in the early modern period.[28] Specifically, one would expect that strong population growth during the sixteenth century would tend to depress real wages, whereas the depopulation of the seventeenth century would have the opposite effect. Yet none of the dummy variables we employed to reflect these demographic trends were statistically significant when inserted into the real-wage equation. It is of course possible that our knowledge of the prevailing population trends in different subperiods is faulty.[29] It is likelier, however, that the population variables were overwhelmed by the powerful price and inflation variable.[30] It is also possible that our regression model is misspecified in some way, or that changes in population did not have any impact on Ottoman real wages; but we do not attach high degrees of probability to these explanations. (Further details of the real-wage equation are presented in Appendix 2).

The only other variable that is statistically significant in our real-wage equation is the time trend (t). Its coefficient indicates a long-term upward

[28] We are inspired here by a similar study of the long-term trends in English real wages undertaken in Lindert, "English Population."

[29] Annual population series are not available for the Ottoman Empire, or for any part of it, for the period before 1850. Instead, we have some estimates of questionable quality for different points in time. On the basis of the latter, we are certain that the sixteenth century was a period of relatively high population growth. In contrast, 1580–1700 was a period of stagnation or, more probably, decline in population. Trends for 1700 to 1840 are also not entirely clear. They may have varied from region to region; a modest upward trend is our best guess at the moment.

[30] In his study of long-term trends in English wages, Lindert ("English Population") similarly found that short-term price movements overwhelmed the population variable in the real-wage equation.

trend of 0.3 percent per annum, suggesting a modest but steady rise in the demand for labor. We tried to separate the time trend into two subperiods at 1770, hypothesizing that growth in labor demand may have accelerated after the Industrial Revolution. However, *t* in two subperiods did not perform differently than a single *t* for the entire period. It is not easy to interpret the performance of *t*, because even though there is considerable evidence for increases in per capita income after 1880, the existing literature does not suggest a long-term growth trend for the Ottoman economy for the period before 1850. Nonetheless, one now has to consider the possibility that some modest trend for productivity increases did exist in the eastern Mediterranean before the Industrial Revolution. Learning by doing, or the diffusion of new technology from Western Europe, may help explain this trend.[31]

<div align="center">COMPARISONS ACROSS EUROPE</div>

In a recent study of prices and wages in European cities from the Middle Ages to World War I, Robert Allen has utilized a large body of data most of which was compiled under the aegis of the International Scientific Committee on Price History.[32] In order to facilitate comparisons, he converted all price and wage series into grams of silver, and chose as a base the index of average consumer prices prevailing in Strasbourg during the period 1700–1749.[33]

Allen has argued that even though wages in a single city may be accepted as a barometer of wages in the whole economy, international comparisons must be made between cities at similar levels in the urban hierarchy. Since his study uses data from cities at the top of their respective urban hierarchies—such as London, Antwerp, Amsterdam, Milan, Vienna, Leipzig, and Warsaw—it would make sense to insert Istanbul, another city at the top of the urban hierarchy of its region, into this framework. It is not very difficult to do so, since we have already expressed prices and wages in grams of silver. It remains now to express Istanbul prices in terms of the Allen base (i.e., Strasbourg, 1700–1749). For this purpose, Ottoman commodity prices for the interval 1700–1749 were applied to Allen's consumer basket with fixed weights. A second and equally useful method of linking Istanbul's price level to those of other European cities in the Allen set was to employ the detailed annual commodity-price series gathered by Earl Hamilton for Valencia and Madrid over the period 1500–1800 and compare them with the Istanbul prices for the same commodities.[34] Since Valencia and Madrid prices were already calibrated into the Allen set, it was then possible to

[31] Persson, *Pre-Industrial Economic Growth*.
[32] Cole and Crandall, "International Scientific Committee."
[33] Allen, "Great Divergence."
[34] Hamilton, *American Treasure* and *War and Prices*.

determine the Istanbul price level vis-à-vis European cities for each interval. The price series for flour, mutton, olive oil, cooking oil, onions, chickpeas, pepper, sugar, and wood were used in these calculations. The two procedures produced very similar results.

One revision in the Allen series concerns price levels during the 1850–1899 and 1900–1913 intervals. In order to remain consistent throughout, Allen continued to express all prices and wages in grams of silver even after 1870, when silver prices declined sharply and most European countries abandoned bimetallic standards in favor of gold. While technically correct, this procedure gives the impression that most European cities experienced high rates of inflation during this period, when in fact nominal prices and wages remained quite stable. We chose to express all price and wage levels in gold after 1870 by deflating the Allen series by 1.3 and 2.1 for 1850–1899 and 1900–1913, respectively.

One of Allen's major findings is that real (i.e., purchasing-power-parity [PPP] adjusted) wages in these European cities diverged strongly between 1500 and 1914. He shows that the dispersion of real wages was lowest in the early part of the sixteenth century. This picture changed after 1600 as real wages in northwestern Europe (London, Antwerp, and Amsterdam) remained steady, while Italian and Spanish as well as central and eastern European real wages declined until 1850. Allen's study thus suggests that the emergence of a North–South gap within Europe was not the product of developments after the Industrial Revolution, but resulted from long-term trends during the seventeenth and eighteenth centuries.

Our indices show that daily wages in Istanbul and other eastern Mediterranean cities expressed in grams of silver were comparable to those in many other locations in northern and southern Europe in the early part of the sixteenth century. However, because Istanbul prices were higher than those of all other cities in Allen's sample, real wages in Istanbul varied between 60 and 90 percent of real wages in other cities during that period (Figures 2 and 3). It is interesting that while real wages continued to decline after 1600 in many parts of Europe, they remained little changed in Istanbul until late in the eighteenth century. While Istanbul wages approached those elsewhere in Europe, a wage gap of one-third to one-half between Istanbul and the leading cities in northwestern Europe continued until the Industrial Revolution.

Wage and price indices for the western Netherlands recently constructed by Jan Luiten van Zanden present another opportunity to investigate the real wage gap between the eastern Mediterranean and northwestern Europe before the Industrial Revolution.[35] Measured in grams of silver, the nominal

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[35] The van Zanden indices are available from www.iisg.nl/hwp/; for prices and real wages in Netherlands during the early modern era, see also de Vries and van der Woude, *First Modern Economy*, pp. 607–54.
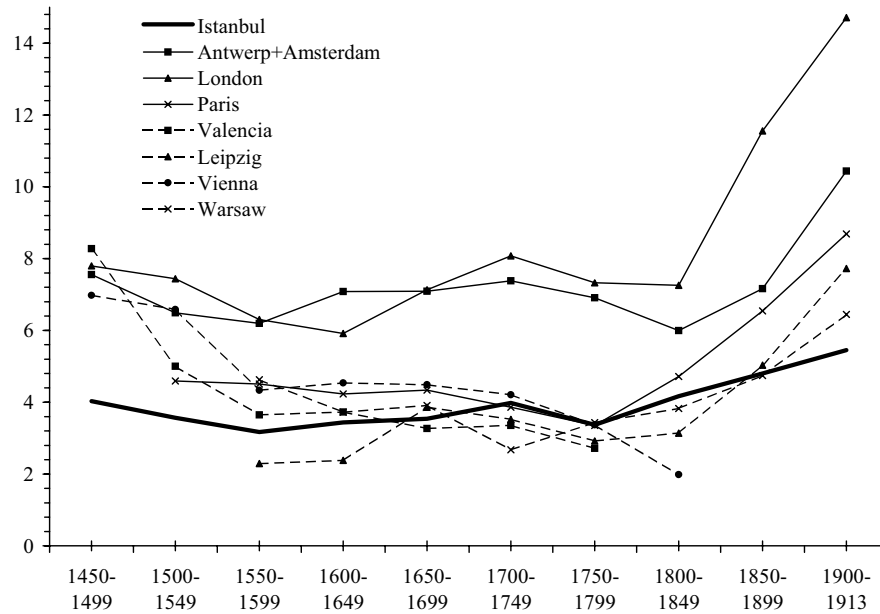
FIGURE 2
REAL WAGE OF UNSKILLED CONSTRUCTION WORKERS IN EUROPEAN CITIES,
1450–1913
(wages [in grams silver] divided by CPI [in grams silver])

Sources: Istanbul: see the text. Other cities: Allen, "Great Divergence."

wages of skilled and unskilled construction workers were quite comparable
in the two regions during the first half of the sixteenth century. However,
our direct comparison of consumer price levels (based on the prices of more
than half a dozen commodities which are available for both regions) indicate
that in silver terms Istanbul prices were about 60 to 80 percent higher during
the same period. During the next two centuries, or until about 1750, prices
and nominal wages in the western Netherlands measured in grams of silver
rose by about 250 percent, with the latter lagging somewhat behind the
former. In Istanbul, on the other hand, prices in grams of silver remained
roughly unchanged while real wages declined slightly. Our preliminary
comparison of the two series thus suggests that real wages in Istanbul re-
mained one-third to one-half below real wages in the western Netherlands
until the era of the Industrial Revolution. Finally, comparing our Istanbul
data to Hamilton's wage and price series for Madrid and Seville reveals real
wage trends over the periods 1500–1550 and 1700–1750 that are also simi-
lar to those outlined in Figures 2 and 3.[36]

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[36] Commodity-price and nominal wage series for Spain are available from Hamilton, *American
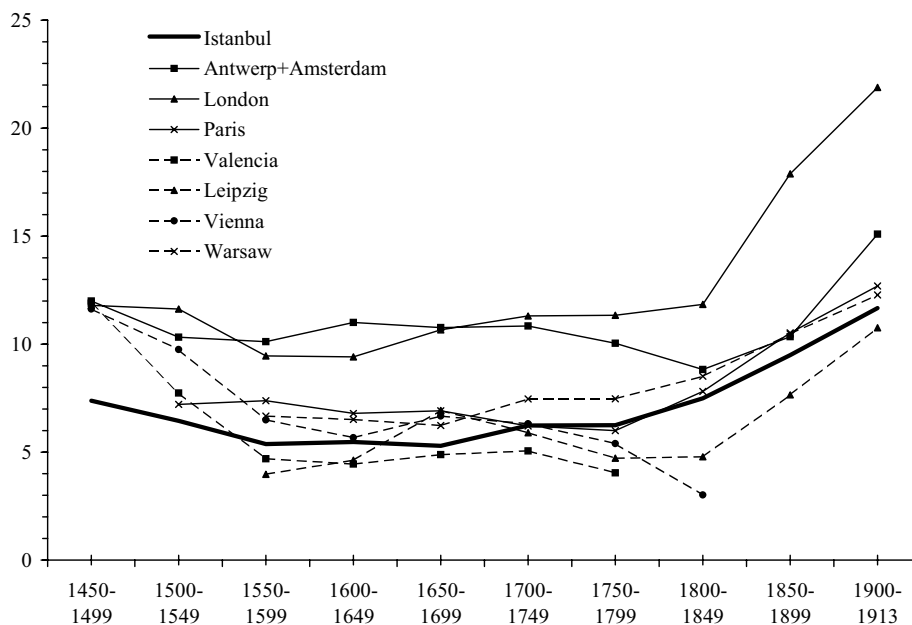Treasure* and *War and Prices*, appendices.

FIGURE 3
REAL WAGE OF SKILLED CONSTRUCTION WORKERS IN EUROPEAN CITIES,
1450–1913
(wages [in grams silver] divided by CPI)

Sources: Istanbul: see the text. Other cities: Allen, "Great Divergence."

WAGES AS AN INDICATOR OF THE STANDARD OF LIVING

Istanbul real wages increased by about two-thirds from the last quarter of the eighteenth century until World War I (Figure 1). As a result, while the gap in real wages between Istanbul and cities in northwestern Europe (London, Antwerp, Amsterdam, and Paris) widened after the Industrial Revolution, that gap was lesser than one might have expected. On the eve of World War I, real wages of unskilled workers in London were 2.7 times as high as in Istanbul; the corresponding ratio for Amsterdam and Antwerp was 1.9, and for Paris 1.6 (Figure 2).

While these results are broadly in line with our expectations, a comparison with the PPP-adjusted per capita GDP series recently constructed by Maddison reveals differences that are not insignificant. The Maddison series show that per capita GDP differences between Turkey and each of four western European countries (the United Kingdom, France, the Netherlands, and Italy) were wider than the differentials in the real wages of unskilled construction workers in the leading cities of each pair of countries.[37]

[37] Maddison, *World Economy*.

Maddison's PPP-adjusted per capita GDP estimates for 1913 point to a 1:5 gap between Turkey and the United Kingdom, a 1:3.8 gap between Turkey and the Netherlands, a 1:3 gap between Turkey and France, and a 1:2.3 gap between Turkey and Italy. In short, the gap in PPP-adjusted per capita GDP between Turkey and these European countries on the eve of World War I appears, on the average, to be twice the real wage gap between Istanbul and the leading cities in these countries. (Indeed, Istanbul real wages were slightly higher than those of Florence and Milan.) This is an interesting and potentially important divergence that needs to be examined further.

Part of this divergence may be due to errors of measurement in the available series. For example, there may be errors in our real wage series for Istanbul. We are aware that most of our knowledge about the wages of construction workers has been based upon state records and records of the middling and larger pious foundations. These larger institutions could seek out the best craftsmen and pay higher wages than smaller employers. Clearly, this bias exists in most wage series but it might be greater the in the case of Istanbul than for other European cities. Otherwise, we believe that our wage series are quite reliable, especially since they are based on large numbers of observations. In fact, the London–Istanbul real wage gap implied by our series is actually larger than the wage gap estimated by earlier studies by Korkut Boratav, Gündüz Ökçün, and Pamuk on Turkish urban wages, and by Berov on Balkan wages. These studies pointed to a gap in nominal wages converted at the prevailing rate of exchange of about 1:2.5.[38]

Secondly, there may be errors in the way our Istanbul prices have been inserted into the Allen framework. We doubt, however, that these can be significant, since our price series was linked to the Allen base by comparing a number of independent price series. In addition, since our real wage series for Istanbul show a 20 to 30 percent overall increase over the four centuries to 1914, raising the nominal price level and lowering real wages for 1900–1913 would not only bring Istanbul prices uncomfortably close to those of London at the endpoint, but it would also raise Istanbul prices across time and thus widen the Istanbul–London real wage gap to more than 1:2 for the early part of the sixteenth century.

Thirdly, there may be room for improvement in the way the Maddison series measure the differences in per capita GDP between high- and low-income countries. In a recent study, Leandro Prados de la Escosura has provided an alternative set of GDP series for the United States and Europe since 1820. While the Maddison series were derived by working backwards from a recent benchmark year on the basis of growth rates, Prados de la Escosura used a short-cut method to obtain current price estimates, also adjusted for PPP. His estimates indicate that the use of current prices reduces considerably

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[38] Boratav, Ökçün, and Pamuk, "Ottoman Wages"; and Berov, "Wages in the Balkans."

the gap in per capita income between the high- and low-income countries: specifically, the gap between Turkey and the United Kingdom in 1913 would be reduced from 1:5 (as estimated by Maddison) to approximately 1:3.[39]

Despite these potential sources of error, we still doubt that improvements in the available series can eliminate altogether the divergence between the urban real wage and per capita GDP series. We think there are a number of other factors which may have also contributed to this divergence. First, there had emerged by the nineteenth century important differences between the nominal wages of construction workers in Istanbul and those of other Ottoman cities. Between 1850 and 1914 nominal wages were, on average, 40 to 50 percent higher in Istanbul than in other cities within the borders of modern Turkey. In contrast, official data indicate that in 1913/14 the prices of essential commodities purchased by consumers appeared to be lower in Istanbul than the average of the 20 leading cities within Turkey.[40]

Secondly, there is evidence for a growing scarcity of labor in urban areas from the mid-nineteenth century until World War I. Anatolia was a labor- and capital-scarce, land-abundant region until the middle of the twentieth century; these factor proportions supported peasant ownership and production. The availability of land and the prevalence of small peasant production may have slowed rural–urban migration and contributed to labor shortages in the urban areas. In a recent study of nineteenth-century Anatolia, Boğaç Ergene has provided evidence for the growing scarcity of labor in the urban areas and the increasing gap between urban and rural wages. He also argues that increases in urban real wages must have exceeded increases in per capita GDP during the nineteenth century.[41]

These urban–rural differences combined with the regional differences mentioned above to create large differences between per capita nominal income levels in the Istanbul region and the rest of the country. Vedat Eldem's estimates indicate that on the eve of World War I, per capita income levels in the Istanbul region, which was mostly urban, were twice as high as the average for the Ottoman Empire as a whole.

All this suggests that the daily wages of urban construction workers in the Ottoman Empire may have been high in relation to the underlying per capita income. In a recent study, Jaime Reis encountered similar difficulties in his attempt to use urban wages as a proxy for per capita GDP. While comparing two groups of countries in the European periphery during the first half of the nineteenth century, he observed that daily wages of construction workers in the capital cities of Spain and Italy were at the same level as comparable wages in Scandinavia; but all other indicators suggested that per capita

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[39] Prados de la Escosura, "International Comparisons."
[40] Turkey, State Institute of Statistics, *Ihsai Yıllık.*
[41] Ergene, "Wages."

income levels were considerably higher in the northern countries.[42] At the other end of the spectrum, the real wages of construction workers in Milan and Florence during the nineteenth century appear unusually low in relation to the available series for per capita GDP in Italy during the same period.[43]

CONCLUSIONS

One of the more important questions regarding the world economy in the early modern era concerns the emergence and evolution of the gap in levels of real income between today's developed and developing countries. Utilizing a large volume of archival documents, this study has established for the first time the long-term trends in wages of skilled and unskilled construction workers in Istanbul and other Ottoman cities in southeastern Europe and the Near East from the second half of the fifteenth century until World War I. These price and wage series were then inserted into a larger framework of price and wage trends in European cities during the same period. One needs to be cautious about using the daily wages of urban workers as indicators of the standards of living for an entire country. Nonetheless, in the absence of reliable information about production and income, real wage series still serve as the best indicator available for long-term trends in standards of living.

The Ottoman indices indicate that the real wages of unskilled urban construction workers declined by 30 to 40 percent during the sixteenth century. After remaining roughly unchanged until the middle of the eighteenth century, they increased by about 20 to 30 percent from the late eighteenth until mid-nineteenth centuries, and then by another 40 percent during the late nineteenth and early twentieth centuries. On the eve of World War I, the real wages of unskilled construction workers were about 10 to 20 percent above their levels in 1500. Because the skill premium rose during the nineteenth century, real wages of skilled workers in 1914 were 50 percent or more above their levels in 1500.

Comparing these results with Allen's findings for other European cities reveals three basic results. First, real wages in Istanbul and other Ottoman cities remained close to urban wages in many other parts of Europe until the mid-eighteenth century. Real wages in Ottoman cities were lower in 1750 than in 1500, but the decrease was probably not as large as in many other parts of Europe. Secondly, our comparisons suggest that real wages in northwestern Europe (Amsterdam, Antwerp, and London) were already higher than in Istanbul at the beginning of the sixteenth century, and that this gap remained roughly unchanged up to the Industrial Revolution. It would be

[42] Reis, "How Poor?"
[43] Allen, "Great Divergence."

useful to check this result with additional research. Thirdly, the trend was upwards for real urban wages in most regions of Europe in the wake of the Industrial Revolution, especially after 1850; real wages in western Europe increased more than in the eastern Mediterranean during this period.

Our real wage series also point to the existence of a modest but statistically significant upward trend in Ottoman urban wages dating back to the sixteenth century, suggesting a modest but steady rise in demand for labor. It is not easy to interpret this result, because the existing literature does not point to the existence of long-term growth trend, especially for the period before 1850. In light of the new evidence, we now need to consider the possibility of a slow and modest rise in productivity around the eastern Mediterranean in the era before the Industrial Revolution. Learning by doing or the diffusion of new technology from Western Europe may help explain this trend.

Our overall results thus amount to a guardedly optimistic revisionism regarding Ottoman standards of living, both in the early modern era and in the wake of the Industrial Revolution. This picture is consistent with the recent arguments in Ottoman historiography to the effect that the Ottoman empire did not simply and irreversibly decline after 1600. Recent literature has emphasized that Ottoman state and society showed considerable ability to reorganize as a way of adapting to changing circumstances from the seventeenth through the nineteenth centuries. With pragmatism and flexibility, the Ottoman state adapted not only the military technology but also its fiscal, financial, and monetary institutions during this period. This pragmatism and flexibility may help explain the surprising longevity of the so-called "sick man of Europe."

Appendix 1: Long-Term Trends in Indices

Based on trends in money, prices, population, and real wages, it is best to examine these four-and-a-half centuries in *five* distinct subperiods. Separate regressions are used to estimate trend lines for each one.[44]

The first period, 1469–1585, is characterized by stable money, rising population, and rising prices expressed in grams of silver. The trend lines indicate that the silver content of the *akçe* declined at an annual rate of 0.52 percent, prices rose at an annual rate of 1.13 percent, and real wages declined at an annual rate of 0.64 percent during this period.

During the second period, 1585–1690, there was a high degree of monetary and price instability together with declining population. The silver content of the currency fluctuated wildly around a trend of 1.05 percent per annum, prices rose at an annual rate of 0.67 percent, and real wages rose at annual rate of 0.29 percent.

The third period, 1690–1768, was once again a period of monetary and price stability. The silver content of the currency declined at an annual rate of 0.30 percent, prices rose at an annual rate of 0.44 percent, and real wages declined at an annual rate of 0.15 percent.

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[44] Poirier, *Econometrics of Structural Change*; and Greene, *Econometric Analysis*.

The fourth period, 1769–1843, is characterized by the most rapid rates of debasement and inflation in Ottoman history, and by rising real wages. The silver content of the currency declined at an annual rate of 3.49 percent, prices rose at an annual rate of 3.81 percent, and real wages rose at an annual rate of 0.49 percent. Frequent wars may have contributed to the rising trend in real wages.

The fifth period, 1844–1914, witnessed stable money under bimetallism, rapidly expanding international trade, stable prices, and rising real wages. The silver content of the currency remained unchanged, prices increased at an annual rate of 0.67 percent, and real wages rose at 0.21 percent per annum. Most of the price increases occurred early in the period and were the lagged result of debasements in the previous period.

Appendix 2 : Determinants of Real Wages

This appendix presents the details of our time-series analysis regarding the determinants of real wages. In the short and medium terms, the most important determinants of Ottoman real wages were changes in prices and the manner in which nominal wages adjusted to them. Because nominal wages were slow to adjust, price shocks led to fluctuations in real wages. The most important determinant of the price level, in turn, was debasements. Ottoman prices almost always rose in the aftermath of debasements because a debasement typically increased the nominal value of coinage in circulation. In order to study the lag structure with which prices and wages adjusted to debasements, we have developed a distributed lag model that relates nominal wages (W) and the consumer price index (P) to present and lagged values of silver content of coinage (S). All variables included in the equation are expressed in logarithms. Using the general-to-specific methodology,[45] equations are estimated with lags up to 10 years; only lags with significant coefficients are included in the final equation. This approach has the advantage of not placing any restrictions on the lag structure, but it has the disadvantage of possible multicollinearity among explanatory variables. The model is of the following form[46]

$$Y_t = \sum \beta_i S_{t-1} + u_t, \quad i = 1,2,...k \qquad (A1)$$

where k is the number of lags.

The mean lag indicates the average number of years needed to see the effect of the independent variable on the dependent variable, while the median lag gives the number of years during which half of the effect has occurred. The mean lag can be calculated as

$$\frac{\sum_{i=0}^{k} i\beta_i}{\sum \beta_i}$$

and the median lag can be calculated with the formula

$$\sum_{i=0}^{k^*} \frac{\beta_i}{\sum \beta_i}$$

The median lag is the first k^* value that gives the sum 0.5.

[45] Hendry, *Dynamic Econometrics*.
[46] Greene, *Econometric Analysis*.

Regression results indicate that the impact of a change in the silver content of the currency was quicker on prices than on wages. When prices are used as the dependent variable, the lags that are significantly different from zero are: zero, one, four, six, and eight. The total effect is –1.088 (sum of coefficients). At equilibrium, a 1-percent decrease in the silver content of coinage causes a 1.088-percent increase in the consumer price index. Furthermore, almost half of the total effect is felt in that year and the year following. *Ceteris paribus*, a 1-percent decrease in the silver content of coinage thus causes a 0.236-percent increase in the price level in that year, and a 0.261-percent increase the following year. The mean lag is 3.59 years, and the median lag is 4 years.

$$P_t = 0.113 - 0.236\ S_t - 0.261\ S_{t-1} - 0.207\ S_{t-4} - 0.129\ S_{t-6} - 0.255\ S_{t-8}$$
$$(0.86)\ (-3.60)\quad (-4.03)\quad (-3.33)\quad (-1.87)\quad (-3.92)$$

$$R^2 = 0.993,\ SEE = 0.1327,\ F = 6814.8,\ \text{Durbin–Watson} = 2.30,\ AR(1) = 0.874$$

The impact on wages of a change in the silver content of the currency occurred more slowly. When nominal wages are used as the dependent variable, zero-, one-, two-, and three- period lags are not significantly different from zero. However, coefficients associated with four-, six-, seven-, and eight-period lags are significantly different from zero. The total effect is –1.323 (sum of coefficients). At equilibrium, a 1-percent decrease in the silver content of coinage causes a 1.323-percent increase in wages. A 1-percent decrease in silver content of coinage causes a 0.232 percent increase in wages after four years, and 0.402 percent after six years. The mean lag is 6.43, and median lag is seven years.

$$W_t = 0.973 - 0.232\ S_{t-4} - 0.402\ S_{t-6} - 0.339\ S_{t-7} - 0.350\ S_{t-8}$$
$$(4.19)\ (-2.43)\quad (-2.99)\quad (-2.57)\quad (-2.47)$$

$$R^2 = 0.995,\ SEE = 0.1378,\ F = 3630.3,\ \text{Durbin–Watson} = 2.73,\ AR(1) = 0.871$$

Our distributed-lag model thus indicates that in response to debasements, both prices and nominal wages adjusted. However, because the adjustment of nominal wages was slower than that of prices, debasements led to declines in real wages in the short and even medium term.

This interaction between prices and real wages can be examined further within the broader framework of a real-wage equation. We have employed two models, one with adaptive expectations in prices, and another one with partial adjustment in real wages.[47] In both models real wages are expressed as a function of inflation and real wages in the previous year. By appropriate substitution, it is not difficult to see that real wages are determined by the present and past inflation rates. In this respect our model is similar to that used by Peter Lindert.[48]

In our regressions, however, only the inflation of the present and past four years appear to be statistically significant. The estimated equation's regression coefficients and determination coefficient are statistically significant; the Durbin–Watson statistic indicates that there is no serial correlation. This was achieved by using generalized least squares, which is indicated by the AR(1) coefficient. It is noteworthy that the time-trend variable t, used to capture the effect of other variables such as population and technological change, is statistically significant. Other things being constant, real wages increased at 0.34 percent per year in this equation:

$$RW_t = -4.496 - 0.900\ P_t - 0.773\ P_{t-1} - 0.649\ P_{t-2} - 0.513\ P_{t-3} - 0.451\ P_{t-4} + 0.0034\ t$$
$$(-2.51)\ (-6.45)\quad (-4.42)\quad (-3.20)\quad (-2.41)\quad (-2.65)\quad (8.23)$$

$$R^2 = 0.808,\ SEE = 0.140,\ F = 40.95,\ \text{Durbin–Watson} = 2.31,\ AR(1) = 0.777$$

[47] Greene, *Econometric Analysis*.
[48] Lindert, "English Population."

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