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## Subsisting or Succumbing? Falling Wages in the Era of Plague

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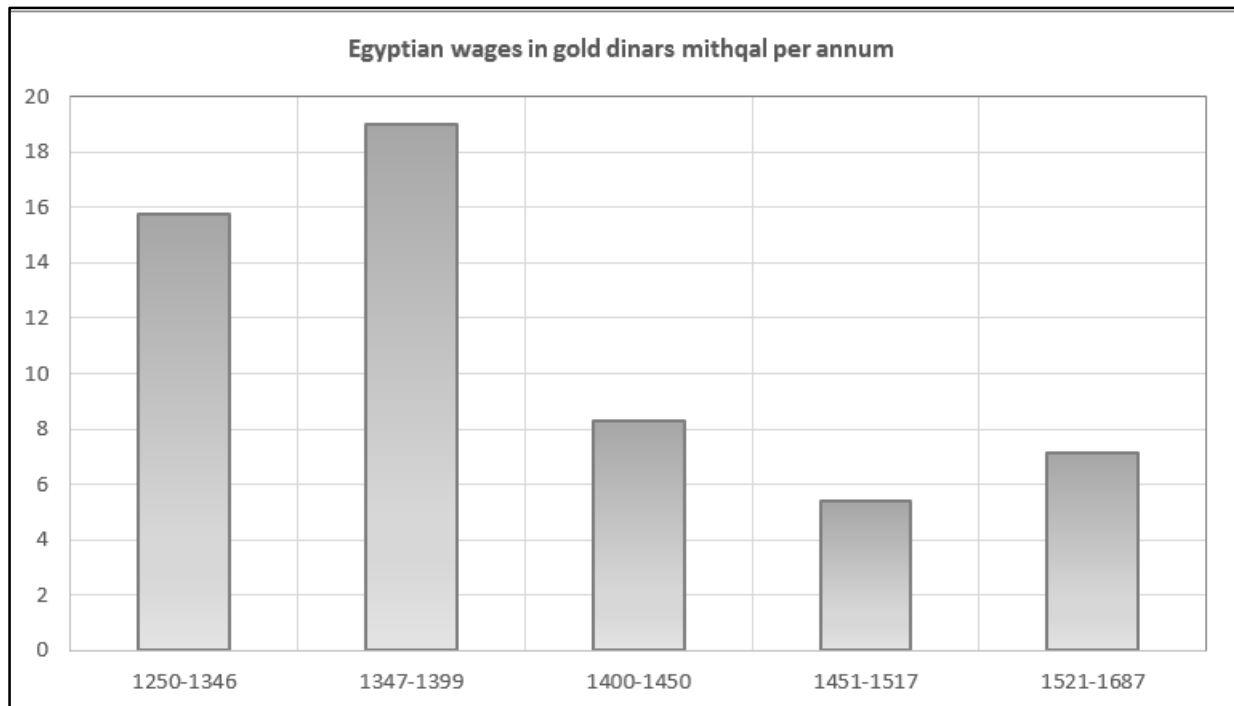
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**Abstract**

This article reexamines wages in Egypt using new evidence not analyzed in my previous study of the late Mamluk economy (Borsch, *The Black Death in Egypt and England*, 2005). The results show that wages for unskilled labor fell precipitously from the 1300s to the 1400s and stayed at a very low level thereafter. Shown in the figure below are the primary quantitative results from approximately 300 wage listings from the late thirteenth century to the late seventeenth century.



### *Egypt and Wage Trajectories during the Second Plague Pandemic (1347-1500)*

Plague depopulation in Mamluk Egypt (from 1347 to 1517 CE) had a powerful long-term impact on Egypt's economic system; by the early 1400s, Egypt's economy had gone into depression, a depression that lasted through the course of the fifteenth century and well into the 1500s.<sup>1</sup> Egypt's reaction to plague depopulation seems to have been special – perhaps even unique; this was so because wages fell in response to depopulation, rather than rising, as they did elsewhere.<sup>2</sup>

The classic historical pattern of rising wages has been charted for Western Europe, c. 1350-1500 CE. In Western Europe, labor scarcity caused real wages to rise, in some case to levels two or more times their pre-plague values.<sup>3</sup> That labor scarcity should cause wages to rise seems axiomatic and the standard trajectory is shown in the figure below: the shift in the supply of labor (from curve  $s_1$  to  $s_2$ ) causes an increase in real wages. The case of England for example manifests this trend in a rather dramatic fashion: the rise in wages was such that, “by the final decade of the fourteenth century the real wages of both building and farm workers had doubled and by the third quarter of the fifteenth century they had risen to levels that would not be bettered for another five centuries.”<sup>4</sup>

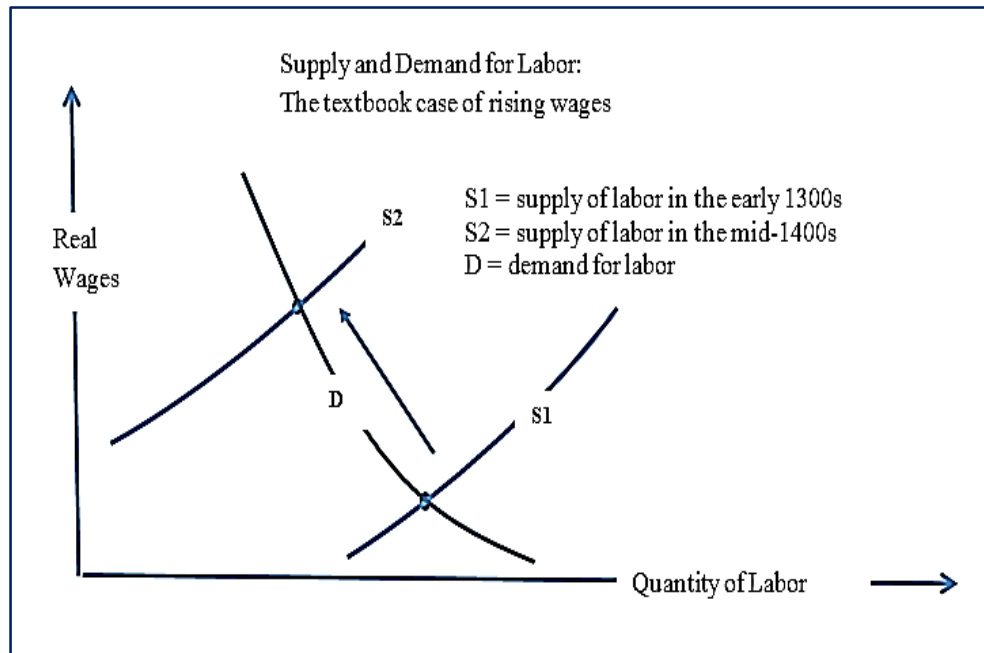
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<sup>1</sup> Stuart Borsch, “Environment and Population: The Collapse of Large Irrigation Systems Reconsidered,” *Comparative Studies in Society and History* 46, no. 3 (2004): 451–468; idem, *The Black Death in Egypt and England* (Austin: Texas University Press, 2006); Michael Dols, *The Black Death in the Middle East* (Princeton, Princeton University Press, 1977) devoted one chapter to the plagues' economic impact; Robert Lopez, Harry Miskimin, and Abraham Udovitch, “England to Egypt, 1350-1500: Long Term Trends and Long Distance Trade.” in *Studies in the Economic History of the Middle East*, ed. Michael Cook (London, 1970): 93-128; commentary on “England to Egypt,” by Stuart Borsch, “Thirty Years after Lopez, Miskimin, and Udovitch, *Mamluk Studies Review* VIII (2004): 191-201; Julien Lousseau's two-volume *Reconstruire la maison du sultan, 1350-1450: Ruine et Recomposition de l'ordre urbain au Caire*, (Cairo, IFAO, 2010), which maps Cairo's economic landscape in the aftermath of the Black Death (for the plagues' impact, see 1: 113-140.) *Studies in Arabic: Muhammad Faṭḥā al-Zāmil* (Mohammed Fateh al-Zamil) *Economic Change in Late Medieval Egypt* (2008) *al-Taḥawwālāt al-'Iqtisādīya fī Miṣr 'Awākhir al-‘Uṣūr al-Wuṣṭā*; For perspective on decline in the rural economy, ‘Amr Nagīb Mūsā Nāṣir, *al-Ḥayyāt al-Iqtisādīya fī Miṣr* (Ramallah, Dār al-Shurūq, 2003); ‘Imād Abū Ghāzī, *Tatawwūr al-hiyāza al-zirā'iyya fī Miṣr: zaman al-Mamālīk al-Jarākisa: dirāsa fī bay' Bayt al-Māl* (Cairo, `Ayn lil-Dirāsāt wa-l-Buḥūth al-Insāniyya wa-l-Ijtimā'iyya, 2000).

<sup>2</sup> Stuart Borsch, “Standards of Living in East and West,” in Yavari, Nequin, Lawrence G. Potter, and Jean-Marc Ran Oppenheim eds.. “Views from the Edge.” (2004), 27-44 (wage tables on 37-8).

<sup>3</sup> For the case of England, see Bruce Campbell, “Nature as historical protagonist: environment and society in pre-industrial England.” *The Economic History Review* 63 (2010): 281-314, 285-6; Borsch, *Black Death*, 103-112; see perspective offered by Bas van Bavel et al. “The jump-start of the Holland economy during the late-medieval crisis, c. 1350–c. 15001.” *The Economic History Review* 57.3 (2004): 503-532, 511-16.

<sup>4</sup> Campbell, “Nature,” 285-6.



**Depopulation and Labor Scarcity in Western Europe (1350 -1500)**

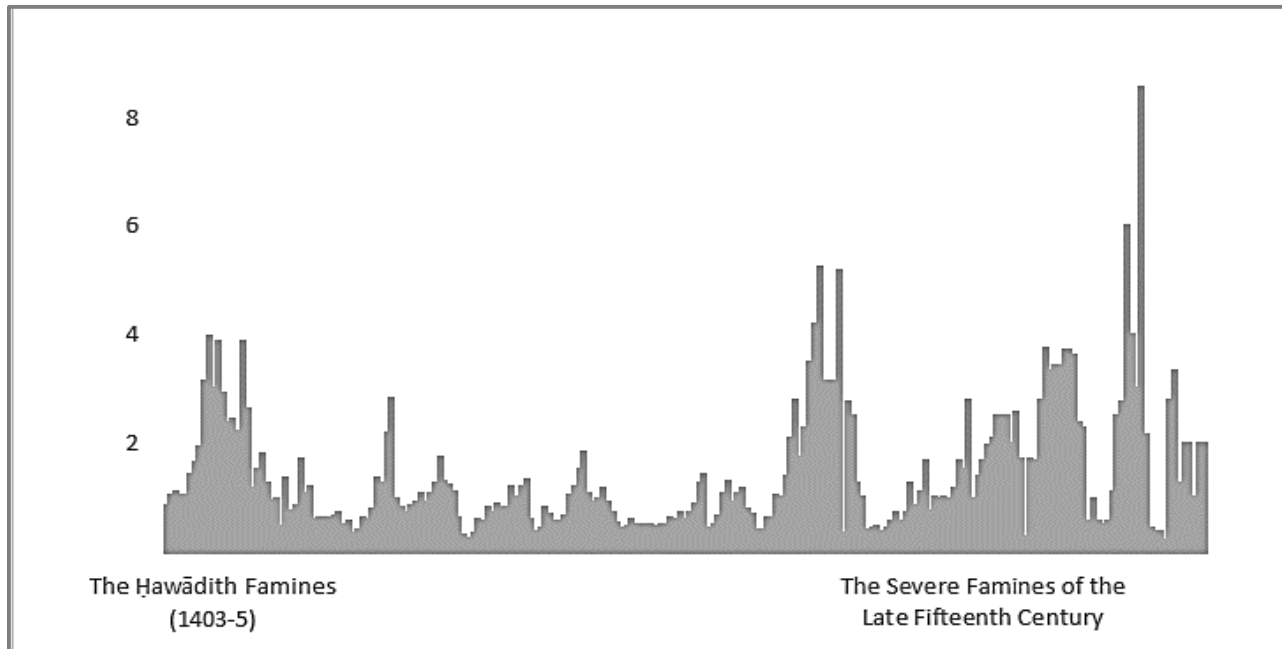
However, from the relatively plentiful wage evidence that we have from Cairo’s archives, and from the price data that we have from narrative sources, it is clear that in Egypt the opposite happened: real wages fell and fell sharply.<sup>5</sup> There were several reasons why this happened, but of prime importance was the highly precarious relationship between rural labor and Egypt’s irrigation system. For the rain-fed economies of Europe, depopulation meant land abundance and land abundance meant liberation from the Malthusian trap of overpopulation and hunger: the type of crowding that had aided and abetted natural disasters like the Great Famine of 1315-1317 England.<sup>6</sup>

For Egypt the evidence does not indicate overpopulation before the arrival of plague pandemic; however, Malthusian conditions ironically did prevail in the wake of depopulation. In Egypt, irrigation system collapse deprived the economy - once the bread-basket of the Mediterranean world - of so much of its productive capacity that per-capita incomes shrank to a fraction of their former levels; wages came down along with per-capita incomes as terrible episodes of famine and inflationary episodes of spiking grain prices punctuated the waves of plague depopulation.<sup>7</sup>

<sup>5</sup> Borsch, *Black Death*, 91-112. Adam Sabra’s *Poverty and Charity* (2000) has the most extensive data stream for Egyptian wages. His evidence definitively confirms the pattern of falling wages, though he himself drew a different conclusion based on his system of averaging wages as aggregates for each period interval.

<sup>6</sup> William Chester Jordan, *The great famine: northern Europe in the early fourteenth century* (Princeton University Press, 1997); Borsch, *Black Death*, 57-61; See Campbell’s perspective on the early fourteenth century; Campbell, “Nature as Historical Protagonist,” 281-7.

<sup>7</sup> Borsch, *Black Death*, 47-54, 91-112.



Seasonal Grain Prices in Fifteenth Century Egypt  
(70 kg irdabbs of wheat priced in 4.25 gram gold dinars equivalent)

### *The Thorny Issue of Wages*

This article is a reanalysis of the wage trajectory in Egypt, examining all the available sources and evidence that we have in hand – some 300 data points for the 1250 to 1517 CE period of Mamluk rule in Egypt. There have to date been several attempts to identify the trend of wages and incomes in Mamluk Egypt – and much discussion of the role that plague depopulation played in the evolution of wages over time. Research was first conducted by Ashtor whose publications on wages date back to the 1940s.<sup>8</sup> As Ashtor continued his work through the 1950s and 1960s, his publications gradually became a common resource used by scholars studying the economic history of Mamluk Egypt.<sup>9</sup> Ashtor analyzed wages by examining copies of charitable foundations deeds (*waqfiyyāt*) available in published sources – as well as wages in other sources such as the Cairo Geniza collection.<sup>10</sup> Ashtor's broad conclusion was that wages rose in the wake of the Black Death and continued to rise, at least up to the end of Mamluk rule in Egypt.<sup>11</sup>

<sup>8</sup> Eliyahu Strauss (Ashtor), "Prix et salaires à l'époque mamloque: Une Etude sur l'état économique de l'Égypte et de la Syrie à la fin du Moyen Âge." *Revue des études islamiques*. 17 (1949): 49-94.

<sup>9</sup> Ashtor, *Histoire des prix et des salaires dans l'Orient médiéval*. Ecole pratique des hautes études, Centre de recherches historiques, 8 (Paris: S.E.V.P.E.N., 1969) ; idem, "The Diet of the Salaried Classes in the Medieval Near East." *Journal of Asian History*. 4 (1970): 1-24; idem, *A Social and Economic History of the Near East in the Middle Ages*. Berkeley and Los Angeles: University of California Press, 1976.

<sup>10</sup> See Ashtor, *Histoire*, 372-81.

<sup>11</sup> Ashtor, "Prix et Salaires," 88-90.

In his work on the Black Death in the Middle East, Michael Dols briefly discussed the issue of wages generally following Ashtor's approach, though differing with respect to rural labor, for which he argued that wages and incomes fell in the wake of depopulation.<sup>12</sup> My own research included an examination of waqf data in Cairo's Ministry of Pious Endowments (the *Wizarat al-Awqaf*) from which I made the conclusion that wages fell over the course of the 1250-1517 period.<sup>13</sup> Meanwhile, Adam Sabra's research was conducted in this archive but he also accessed extensive material from Cairo's National Archive (the *Dar al-Watha'iq al-Qawmiyya*). More recently, Sevket Pamuk and Maya Shatzmiller have endorsed Ashtor's conclusions in their analysis of Egypt's wage trajectory (as included in their discussion of Middle Eastern wage trends in very broad perspective, 600s to 1800s, including Turkey and Iraq.)<sup>14</sup>

### *The Wage Data*

The central data analysis for the graphs and tables are taken from wages listed in the foundation deeds of pious endowments (waqf) established in the medieval period.<sup>15</sup> These deeds survive as archival records and are for the most part to be found in (1) the Ministry of Pious Endowments (*Wizārat al-Awqāf*) and (2) the Egyptian National Archives (*Dār al-Wathā'iq al-Qawmiyya*). I have integrated my own field research in the Ministry of Pious Endowments (1997-8) with the source work of others, particularly the data collection by Adam Sabra (*Poverty and Charity*, 2000). Wherever possible, I have attempted to cross-check these figures with data from the historical narratives, which give isolated and anecdotal references to wages. The narratives are limited in quantitative scope but can nonetheless be useful, particularly for getting a wider perspective on the circumstances of employment and the contemporary perception of trends.<sup>16</sup>

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<sup>12</sup> Dols, *Black Death*, 268-271.

<sup>13</sup> Borsch, *Black Death*, (PP); Borsch, "Standards of Living in East and West," in Yavari, Nequin, Lawrence G. Potter, and Jean-Marc Ran Oppenheim eds.. "Views From the Edge." (2004), 27-44.

<sup>14</sup> Şevket Pamuk and Maya Shatzmiller. "Plagues, Wages, and Economic Change in the Islamic Middle East, 700–1500." *The Journal of Economic History* 74, no. 01 (2014): 196-229.

<sup>15</sup> Waqf were a form of charitable trust used to provide a wide array of social services including what would today be called public utilities (e.g. potable water). Supported by the donation of profitable ventures in agriculture, commerce, and handicraft industry, waqf were used both as bona fide public charity and for sheltering funds from state taxation and extractive authority. The growth and spread of waqf were in many ways a natural reaction to the insecurity of hereditary tenure in preindustrial Middle Eastern economies. For the data in this study, the social services in question are generally one of either a mosque or a mosque complex – i.e. a mosque that adjoins a mausoleum, a madrasa (school), an elementary school for reading the Quran (*kuttāb*) a water supply (*sabīl*), or a hospital (*bīmaristān*) – though some of these are found in isolation. In the context of this study, Adam Sabra has the most suitable introduction to the subject; Sabra, *Poverty and Charity*, 69-100.

<sup>16</sup> The dozen or so references in question for the late medieval period are scattered throughout a number of narratives including Ibn Iyās, *Badā'i' al-zuhūr fi-waqā'i' al-duhūr*, Aḥmad ibn 'Alī Ibn Ḥajar al-'Asqalānī, *Inbā' al-ghumr bi abnā' al-'umr*, Maḥmūd Badr al-Dīn al-'Aynī, *Iqd al-jumān fi ta'rīkh ahl al-zamān*, Aḥmad ibn 'Alī al-Maqrīzī, *Kitāb al-sulūk li-ma'rīfat duwal al-mulūk*, Yūsuf Ibn Taghrī Birdī, *Hawādith al-duhūr fi madā al-ayyām wa-l-shuhūr*, Aḥmad ibn 'Alī al-Qalqashandī, *Subḥ al-a'shā fi sinā'at al-inshā*, Khalīl bin Shahīn Al-Zāhirī, *Kitāb zubda*

### *Prices and Normal Prices*

Analyzing real wages entails the study of prices as well. The price data for this study includes the data sets of Ashtor, my 2005 price data set, that of Boaz Shoshan, ‘Āmr Neguib Mūsā Nāṣir, Adel Allouche, and William Popper.<sup>17</sup> As an integral part of the analysis of prices, an attempt has been made to deal with the issue of the so-called “normal prices.” For the Middle East, William Popper was the first modern-era scholar to apply the concept of a normal price.<sup>18</sup> The normal price (as opposed to the abnormally high – or less often abnormally low price) would be the price that prevailed outside of exceptional crisis. The argument is that abnormal prices are reported by the chroniclers more often than the normal prices and that they can distort the true picture of day-to-day market activity.<sup>19</sup> Popper’s hesitant reaction to this thorny issue was to quote what Mamluk-era Egyptians called a normal price: about  $\frac{3}{4}$  of a gold dinar mithqal for a 70 kg irdabb of wheat; barley and broad beans (ful) were about two-thirds the price of wheat.<sup>20</sup> As a matter of fact, the entire payment system for the Mamluk regime was in a sense based upon this concept, as the *dinar jayshi*, the regime’s money of account, rested upon the foundation of normal prices for wheat, barley, broad beans, and their ratios with one another.

Absent using normal prices as reported by Mamluk-era observers, how is one to calculate the true average? One promising solution is offered by the economist Johan Söderberg, who includes data for the median, the trimmed mean, and Huber’s M-estimator to correct for extremes.<sup>21</sup> The resulting figures run anywhere from 75% to 92% of the raw average, which Söderberg quotes in grams of silver per hectoliter.<sup>22</sup> What Söderberg finds via his methods, when variance is taken into account, is that there was no significant decline in grain prices over the long-term, as against

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*kashf al-mamālik wa bayyān al-ṭuruq wa al-masālik*; Aḥmad Ibn ‘Abd al-Wahhāb Nuwayrī, *Nihāyat al-‘Arab fī funūn al-‘adab*.

<sup>17</sup> Shoshan, Boaz. "Money Supply and Grain Prices in Fifteenth-Century Egypt," *The Economic History Review* 36.1 (1983): 47-67; ‘Āmr Nagīb Mūsā Nāṣir, *al-Ḥayyāt al-‘Iqtisādiyya fī Miṣr*, Ramallah, Dār al-Shurūq (2003): 234-53; Ashtor, *Histoire*, 283-312; Borsch, *Black Death*; Popper, *Systematic Notes*, 81-93; Adel Allouche, *Mamluk Economics*, 99-117.

<sup>18</sup> Popper, *Systematic Notes*, 1957, 93-106.

<sup>19</sup> Popper, *Systematic Notes*, 93-106. Elsewhere Popper argued that since demand for grain is inelastic in nature, this logically leads to a bias of readings away from the mean. This though wouldn’t strictly be true if abundant supply led to low price extremes that balanced out the high prices extremes of scarcity. A more effective conclusion would be that the extreme lows did not as often attract the attention of chroniclers.

<sup>20</sup> al-Qalqashandi (*Subh* 3: 514) refers the reader to a list of normal prices for the fourteenth century where wheat is priced at 15 silver dirhams when the silver dirham (2.92 grams of  $\frac{2}{3}$  silver) was valued at 20 to the one gold dinar mithqal (4.25g high-purity gold). This normal price is in fact not so far from the statistical average found below.

<sup>21</sup> Soderberg, “Grain Prices in Cairo and Europe in the Middle Ages,” *Research in Economic History* 24 (2007), 192-5.

<sup>22</sup> Using silver in the place of gold presents some problems as most transactions in the 1400s were by gold or copper, something that Soderberg duly notes but employs nonetheless for the sake of comparisons between regions, i.e. comparisons with Europe in this case. Soderberg, “Grain Prices,” 192.

Ashtor's contention that prices fell (and in accord with my own model from 2005).<sup>23</sup> The long-term in this case is Egypt's history through the late 1400s, a period in which, Söderberg notes, Mamluk elites' extreme revenue extractions and neglect of the irrigation system led to a decrease in the cultivated area, a decrease was registered in terms of higher prices.<sup>24</sup>

While this study does not employ Söderberg's quantitative method of price averaging, there has been an attempt to correct for Nile flood irregularities. It has been pointed out that these can distort price analysis and makes it difficult for us to discern the true mean.<sup>25</sup> What seems particularly important is that we distinguish between high prices caused by weather and climate, and high prices caused by fundamental long-term problems with the Egyptian economy. We can try to filter out some of the vagaries of climate and weather and so get a better quantitative picture of prices as driven by changes in the Egyptian economy itself.

The method employed here is an attempt at eliminating the price extremes caused by irregular Nile floods: irregular floods that were too low and left agrarian flood basins dry, or too high, thus swamping basins and damaging the irrigation system. This study employs a quantitative filter that eliminates extreme Nile floods. Extreme floods are identified in this study as those with flood crests (maxima) that deviated by more than .91m from the mean.<sup>26</sup> The price averages for extreme flood years were eliminated from the interval averages of the 1250-1517 period.

The research for this filter consisted of a reexamination of the Nile flood data. In addition to correcting the maxima data sets of Toussoun and Popper, the research for this filter also involved identifying aberrant floods with irregular profiles that did not register as deviant maxima. That is to say that there was a search for floods that were extreme for reasons other than an unusually low or high crest: i.e. a late rise of the Nile, the early recession of the flood, and/or other problems that to either insufficient floodwater or too much floodwater. The corrected maxima data stream for 1250 to 1517 is included in the appendix below. The maxima data also contains a small modicum of years not listed by either Popper or Toussoun.

The results of the filter are depicted in the following graph, wherein one can see the price years (in red) that were removed due to extreme flood conditions.

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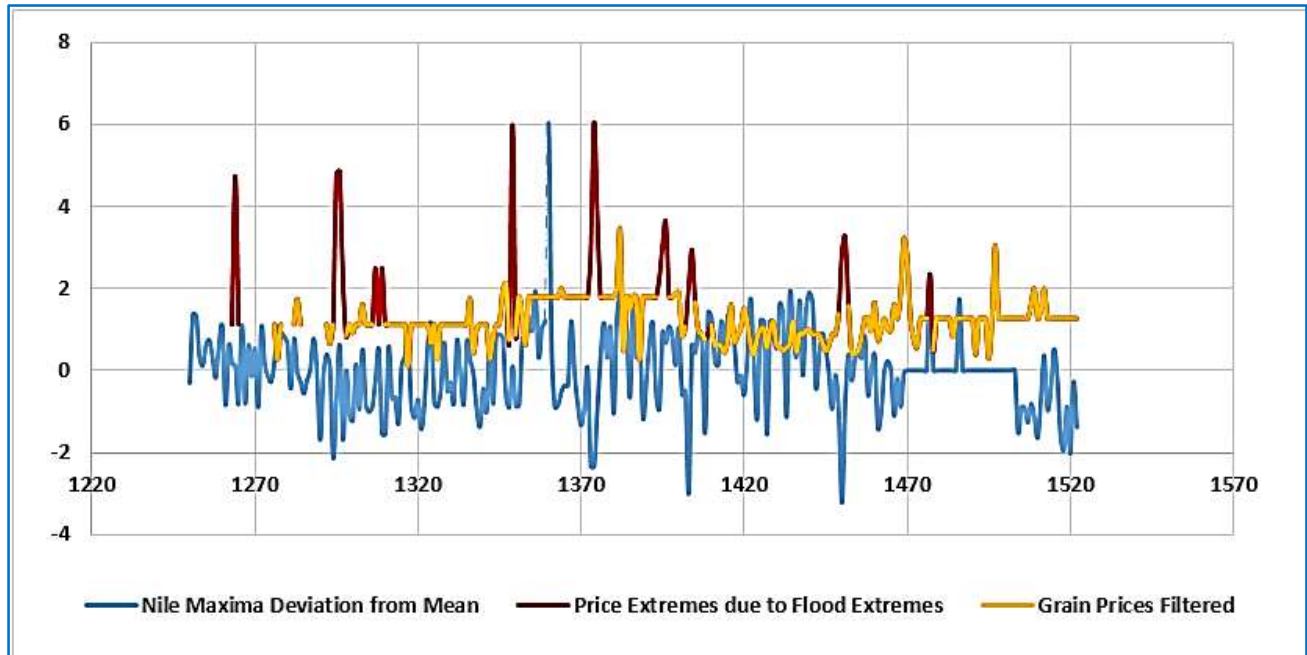
<sup>23</sup> Borsch, *Black Death*, 91-5; Soderberg, "Grain Prices," 195.

<sup>24</sup> Soderberg, "Prices," 195.

<sup>25</sup>

<sup>26</sup> This is in approximate accord with Popper's methods for identifying extreme floods; Popper, *Cairo Nilometer*, 169-181.





Price Filter for Nile Flood Deviations and Grain Prices  
 (Red peaks show price years eliminated by extreme Nile flood conditions)

With this filter applied to years of extreme floods, the following averages were obtained.

PERIOD AVERAGE INTERVALS	Grain prices, irdabbs(70kg) in dinars mithqal (4.25g gold) equivalent
1250-1346	0.90
1347-1399	1.48
1400-1450	0.89
1451-1517	1.43
1250-1517 Average	1.12

## REAL WAGES

The resulting real wages – for the 1400s, and especially for the late 1400s, are extremely low, seemingly well below subsistence. The economist Sevket Pamuk has made the case to me that this data set – essentially our entire record for wages in the era of plague depopulation – is invalid because these workers would not have been able to support themselves. He argues that they must have had alternate means of support, or more Egyptians would have died from starvation than from plague outbreaks.<sup>27</sup>

<sup>27</sup> A series of personal communications from Sevket Pamuk (from fall 2005 to spring 2014).

This argument is certainly not without merit and deserves consideration. My counter-argument is two-fold: one, that there are a number of means by which fifteenth century Egyptians were able to hold these positions as full-time jobs and survive and two, that it follows from the historical record that survival – in the late 1400s at least – was challenging in the extreme; many Egyptians in this interval died of starvation – and that is a fact of history that merits further investigation.

The text that follows makes the case that:

1. Waqf workers were employed full time and did not have secondary jobs
2. Waqf workers were supported by payments in kind (bread rations) and free housing
3. Alternate foodstuffs – cheaper grains – account for much of the apparent survival gap
4. Survival needs were supplemented by female and/or child labor

### **Labor at the foundations was full-time in nature**

Evidence indicates that the labor of the waqf worker was full-time in nature. As a matter of fact, waqf documents that address the subject insist that this labor be not only full-time, but exclusive of other activities. Indeed what some of these documents mandate, for unskilled labor at least, is that workers must reside at the waqf in which they were employed. The text of a waqf from the early 1300s clearly illustrates this: waqf workers, even those receiving very low wages, were required by contract to work full time and to reside at the waqf on a permanent basis. In the case of this document workers were paid little more than 7 gold dinars per year.<sup>28</sup> By the standards of subsistence, this was low pay indeed; seemingly this wage would not have provided enough for the needs of a family.

The text of a waqf from the late 1400s is particularly relevant as it was a small waqf with a modest endowment at a time when wages were at their very lowest.<sup>29</sup> If ever there were a case in which we might expect labor to have been part-time, this would be it, as wages were particularly low at a time of economic hardship. In fact, a number of terrible famines faced Egypt in the twenty years following this text – and thus this document from 1470 CE can serve as a primer for the other cases. In this waqf, the unskilled workers with the titles of *bawwāb* (door-keeper) and *farrāsh* (janitor) received low wages and were required to work full-time and to reside at the waqf. For the door-keeper, the contractual clause (*shart/shurūṭ*) reads:

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<sup>28</sup> Fernandez, "The Foundation of Baybars," 26-7.

<sup>29</sup> Hani Hamza, "Some Aspects of the Economic and Social Life of Ibn Taghribirdi Based on an Examination of his Waqfiyah," *Mamluk Studies Review* XII (2008): 159-72 contains the text of this waqfiya contract (*Dār al-Wathā'iq al-Qawmiyya* 23/147) The wages and stipends at this waqf were very low indeed: there are even 10 students paid a mere 150 dirhams *min al-fulūs* each for a total of 1,500 *dm*. The legal witness, *shāhid*, was paid only 200 dirhams *min al-fulūs* – and so to the book-keeper, (*khāzin al-kutub*).

The door-keeper for this tomb foundation must reside at his place of employment and is not to leave his workplace unless there are circumstances of utmost necessity. In such cases he must return to the foundation as quickly as possible. If he fails to do so he thereby forfeits his right to employment at the foundation and in such case the nāzir (manager of the waqf) will pick someone else to take his job.

Inna bawwāb at-turba yuqīm bi-l-turba al-madhkura wa yaskūn bi-hā wa ‘an lā yakhruj illā li-l-ḡurūra wa ya`ūd bi-sur`a wa inn ikhtār al-bawwāb al-madhkūr `adam al-sakanī bi-l-turba al-madhkuura saqaṭa haqquhu fi waḡīfatihi wa la ya`ūd alayhi wa yuqarrar al-nāzir fihā ghayrihi.<sup>30</sup>

A similar clause applies to the farrāsh (janitor) as well as to the worker employed as a reader of the Qur`ān (qāri'). Finally, the muzammalātī (the custodian of water supply) who was responsible for providing water from the cistern was also required to work full-time and live at the waqf. The same clause that applied to the door-keeper applied to this water-worker as well: it is stipulated in the text of the foundation that if he leaves the foundation without good reason, he is thereby to forfeit the right to his job and the nāzir (manager) should appoint someone in his place.<sup>31</sup> So what we can see from these waqf documents is that these worker were committed full-time to their jobs and that they resided at their place of employment. It seems clear therefore that if these instances of employment at such low pay levels mandated exclusive full-time labor, then there must have been the means by which these workers subsisted and survived. The next task is then to account for and quantify the survival and subsistence of these full-time workers who received such dismally low wages.

### **Waqf workers were supported by payments in kind (bread rations and free housing)**

Even if some waqf workers preferred to live and work at more than one place, the residence clause had its advantages: free housing, which covered a substantial part of their subsistence. This 1470 waqf that mandates residence also allows that they have the right to live at the waqf.<sup>32</sup> Free housing is quantified as part of the calculations below, but what is clearly far more important from the perspective of subsistence was the bread rations that workers received. The ration of wheat bread, as the critical supplement to these workers' wages, accounts for most of

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<sup>30</sup> Hamza, "Some Aspects," 171.

<sup>31</sup> Hamza, "Some Aspects," 168-9.

<sup>32</sup> Hamza, "Some aspects," 167 text line 309.

the apparent gap between wages paid out in coin and the survival needs of the waqf worker and his family.<sup>33</sup> The section below makes the following cases

1. This bread ration was more than enough for one and thus at least partially for the worker's family as well
2. The bread ration was ubiquitous, feeding most waqf workers and a substantial minority of the urban population

### **The Bread Ration: more than enough for one**

Bread rations were in fact a regular and expected part of waqf labor, as will be seen below. An important point to clarify at the outset is that these rations were intended for more than one person. These rations were therefore a crucial part of the family's means of survival. Quantification of the bread dole makes this clear.<sup>34</sup> The sources make it clear that four loaves per week was considered sufficient and sustaining for one person – and this can be seen in evidence for more than one period of Egyptian history.<sup>35</sup> This can also be seen also via comparisons with

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<sup>33</sup> Wheat was of course a big part of the diet: some 30 to 60 percent of the salary (see Ashtor "Diet" 9) and bread rations were a well-established in medieval Islam – with a long history. Testimony from the early medieval period includes documents in which those at the waqf assert that, "My bread is bought and my house rented" so both housing and food were taken care of by the waqf: Tritton, A. S. "Muslim Education in the Middle Ages (circa 600–800 AH)." *The Muslim World* 43, no. 2 (1953): 82-94; also, Goitein, "The Social Services of the Jewish Community as Reflected in the Cairo Geniza Records." *Jewish Social Studies* (1964): 3-22; Tucker, Judith. "Decline of the Family Economy in Mid-nineteenth-century Egypt." *Arab Studies Quarterly* (1979): 245-271; Cohen, Mark R. "Feeding the poor and clothing the naked: the Cairo Geniza." *Journal of Interdisciplinary History* 35.3 (2005): 407-421. Lapidus, Ira M. *Muslim cities in the later Middle Ages*. CUP Archive, 1984; Gesink, Indira Falk. *Islamic reform and conservatism: Al-Azhar and the evolution of modern Sunni Islam*. Vol. 10. IB Tauris, 2009; Richards, D. S. "Arabic Documents from the Karaite Community in Cairo." *Journal of the Economic and Social History of the Orient/Journal de l'histoire économique et sociale de l'Orient* (1972): 105-162;

<sup>34</sup> Mark Cohen's book on poverty and charity in the medieval Egyptian Jewish community (160) explores the quantitative aspects of those he calls the "chronically destitute," which would clearly apply to the waqf workers at the lowest wage levels: Cohen, *Poverty*, 510. Cohen discusses the case of an Ottoman soup kitchen and its ration of two (270g) loaves of bread per day – i.e. 540g of bread per day in total: Cohen, *Poverty*, 160 citing Singer's, *Constructing Ottoman Beneficence*. This amount is close to one loaf of the standard one raṭl (450g) loaf of Mamluk Egypt's bread. Cohen also notes cases where the destitute survived on a mere two half-loaves per day – or a single 450g loaf per day: Cohen, *Poverty*, 162.

<sup>35</sup> See Goitein, "Daily Life" 236, where he notes that the indigent got four loaves of bread per week from Jewish communal charity; Cohen (in "Feeding" 412) employs Ashtor's estimate of 2 kg of bread each day for a family of five, which comes out to 3.5 (1 raṭl) loaves for a family of four; that four loaves per week were sufficient for one person is supported by documents cited in Cohen, "Introduction: Poverty and charity in past times." *Journal of Interdisciplinary History* 35.3 (2005): 347-360. The Cairo Geniza collection documents that a working husband would give to his wife 4 loaves a week for the family's needs; see also Lewicka (*Food*, 160), and Devendra Chhertry for her study of poverty in present-day Nepal ("Practices of Poverty") Appendix Technical Notes) 15 where she estimates a daily caloric requirement of 2,265 kcal per capita as equivalent to 605 grams of cereal and 60 grams of pulses.

bread consumption in medieval Europe.<sup>36</sup> And while bread rations often consisted of three loaves a day rather than four, this more than what was needed by one person. In fact even two loaves a day was more than the usual consumption level for one person. It seems a bit absurd then to imagine that these rations were somehow hoarded by one individual and not shared with his family. While in most cases not accounting for the entire subsistence equation, bread rations were an important part of a family's subsistence. Furthermore, that the subsistence equation could hinge upon this supplement seems altogether proven by instances in which the bread ration was in fact the only form of wage that the worker received.<sup>37</sup> If some survived on the bread ration alone, it seems unlikely that it was not a critical factor for a family's subsistence needs.

### **The Bread Ration: sustenance for a multitude**

The next point is that this bread ration was truly widespread in nature: most workers had rations – rations were the norm, and waqf wages without rations the exception. That this ration was widespread is proven in part by the volume of incoming bread supply that was specifically earmarked for those paid via charitable foundations or government departments (dīwān/dawāwīn) for which al-Maqrīzī uses the term “arbāb al-jawāmik.”<sup>38</sup> What we will see here is that it is hardly possible to explain the volume of bread imported by the government warehouses without concluding that the vast majority of foundations distributed bread.

The fifteenth century text of the Egyptian bureaucrat al-‘Asadī gives quantitative evidence of incoming wheat supplies, and clarifies just how much of that went to those on salaried incomes, like the waqf workers, as well as those in the government departments (diwans). Muḥammad al-Asadī was an obscure bureaucrat of the Mamluk government who in the mid-fifteenth century wrote a monograph entitled *al-Taysīr wa-al-I‘tibār*. In this monograph he covered many topics from his unique perspective. When not detailing Egypt's miserable fate during this period, which was in his mind due to the rural flight of peasants to the cities, the incursions of Bedouin tribes on agrarian lands, the corrupt nature of the Mamluk regime and its extractive apparatus for revenue collection.<sup>39</sup> It is clear in the text that when al-‘Asadī discussed the bread ration, he paid

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<sup>36</sup> Cohen also says that Aix charity gave out a weekly ration that for families might have been at maximum some 12-14 loaves (2 loaves a day times 7 is 14) and Cohen suggests I think (413) that poor might live on only 1 loaf a day (that would be 165 kg of bread per year)

<sup>37</sup> Examples include an early 1300s waqf in Fernandez, 25, and, from outside the waqfs, the instance of a servant or groom (ghulām) who was paid in bread only. See al-Maqrīzī, *Sulūk*, 4: 504, where a ghulām is paid 2 loaves of bread per day without any wage in coinage.

<sup>38</sup> Al-Maqrīzī uses this term in his discussion of inflation and how it has harmed the livelihoods of those on waqf salaries. See al-Maqrīzī, *al-Sulūk*, 4: 27-9.

<sup>39</sup> In discussing the causes of Egypt's economic decline, al-‘Asadī lists as the major influences, the failure of the regime to maintain the irrigation system, 91-2, Bedouin incursions, 93-4, and (94-5) the regime's (the provincial governors [wulāt] and inspectors [kushshāf]) looting of the rural economy through mechanisms like the infamous ḥimāya (which can perhaps be translated as “protection payments). Regarding the irrigation system, he notes that this entailed the failure to repair/maintain (iṣlāh) the dikes (jusūr) and the weirs (qanāṭir) and straighten (tadīl) the

attention to detail and he included quantitative estimates which, though rounded off, give a real indication as to the scale and scope of the bread ration.<sup>40</sup> Al-‘Asadī discussed supply in the context of Cairo’s needs as a whole. What he makes clear that at least *half* of this incoming supply went to those on salaries and stipends, which included those at the waqfs.<sup>41</sup>

ذكروا – في ما يقال – إن مصر و القاهرة المحروسة يكفيها في كل يوم ألف أردب من القمح, منها:  
خمسمائة أردب لأصحاب المؤن و الرواتب السلطانية و الأمرانية و غيرهم من المدارس, و  
الخوانق و غيرها, و منها خمسمائة أردب متعلقة بالدواليب, و الطواحين و الأفران و القاعد التي  
يباع فيها الخبر في الشوارع و كل مكان.

“It has been said that what is sufficient for Miṣr (i.e. Fuṣṭāṭ, the old city and southern suburb of Cairo) and Cairo is one thousand irdabbs of wheat per day (1000 irdabbs was equivalent to 70,000 kilograms of wheat) 500 for the assistance dole, government departments, Mamluk officers (amirs), and the colleges (madrasas), sufi hospices (khānqas) and the like (i.e. the waqfs) – and 500 for the wheel presses, the bread mills, and the bread ovens, together the base from which (this wheat) is sold as bread in the streets and at every location.”<sup>42</sup>

A series of calculations show that the half of this ration allotted to the government and the waqf workers was enough to feed up to 100,000 people.<sup>43</sup> Though the scale and scope of this allotment

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drains (maṣārīf al-mā’) and (musaylāt) “as it always has been in the Islamic era – as it was until these days of corruption and injustice began.” Muḥammad ibn Muḥammad al-‘Asādī, *al-Taysīr wa-l-i’tibār wa-l-tahrīr wa-l-ikhtibār fīmā yajibū min ḥusn al-tadbīr wa-l-taṣarruf*, ed. ‘Abd al-Qādir Aḥmad Ṭulaymāt, Cairo, Dār al-Fikr al-‘Arabī, 1968.

<sup>40</sup> Al-‘Asadī, *al-Taysīr* 142..

<sup>41</sup> Al-‘Asadī, *al-Taysīr*, 142. This allotment was for diwans and mamluks as well as the waqf, but clearly this amount was enough to support all of those who received a salary (or the arbāb al-jawāmik as al-Maqrīzī categorized them, but we can also use the term “dependent sector” as juxtaposed to the “independent sector” of those outside the regime’s pay structure) As far as the numbers themselves are concerned: 129 kg times 300,000 is Al-‘Asadī, *Taysīr* 14238.7 million kg or 552,857 irdabbs which can be compared with a 300,000 ird Sultanic grain reserve but 1000 ird/day for Cairo as a whole (from Asadi) gives you a measly 365,000 irdabbs (this would equal about 200,000 people) . Actually, it might work for plague struck Greater Cairo, but I think there was more: check out Asadi. Look at where Eman and I were reading Asadi and quote him a lot. Think about his 500/500: 500 for the dependent sector (arbāb al-jawāmik from Sulūk 4: 27-9) which is diwan/awqaf/iqtā’ and note that that is a lot (100,000 people via 129 kg) and then note that the second 500 ird/day is probably not meant to cover everyone. I think it is not.

<sup>42</sup> Al-‘Asadī, *al-Taysīr* 142.

<sup>43</sup> The Fatimid period uses the measure of the tallis, which was some ¾ of an ardabb. In this case the allotment was divided between Fatimid Cairo (then quite small) and Fuṣṭāṭ, with 300 going to Fatimid Cairo (then quite small) and 700 to Fuṣṭāṭ. See Shoshan, “Grain Policy” ()But anyway, try 129 kg times 300,000 is 38.7 million kg or 552,857 irdabbs which can be compared with a 300,000 ird Sultanic grain reserve but 1000 ird/day for Cairo as a whole (from Asadi) gives you a measly 365,000 irdabbs (this would equal about 200,000 people) . Actually, it might work for plague struck Greater Cairo, but I think there was more: check out Asadi. Look at where Eman and I were reading Asadi and quote him a lot. Think about his 500/500: 500 for the dependent sector (arbāb al-jawāmik from

cannot compare with Rome's bread dole in Antiquity, it is clear that at a very minimum, waqf workers were covered by this import of wheat. Indeed it seems absurd to suppose that such an enormous allocation of supply did not include the vast majority of those who worked at the waqfs.

### **The Bread Ration: available at waqfs, in the majority of cases**

It is clear from the evidence that the bread ration was a regular and expected part of the salary for waqf labor. This is a fact indicated by a number of sources – for both theory and practice.<sup>44</sup> Theory means discussions of what one should expect for a waqf. For example, it is al-Nuwayrī's early fourteenth century discussion of madrasa endowments, in which he makes it clear that the bread ration was an expected feature of a madrasa. A model waqf document provided by the fifteenth century legal expert al-Suyūfī also makes the general point with a model contract for a madrasa.<sup>45</sup> The model contract was designed for illustrating methods for judges, notaries, and witnesses, in his fifteenth century *shurūṭ* (contract) manual – and reflected the standard of practice.<sup>46</sup> As part of the standard expectations of a madrasa, al-Suyūfī includes a stipulation that both staff and student are to receive the bread ration – and it is clear from this language that this is indeed an expected norm.<sup>47</sup> While other items are subject to diverse arrangements (clothing, festival allotments, and salary, for example), the bread ration is clearly a minimum expectation.

When we turn to the cases of actual waqfs, we find that this bread ration was indeed widespread practice. Even in one of the few instances of rural waqfs for which documents survive, it seems clear that workers - and other permanent residents – were entitled to rations. This example of a rural waqf is a late 1400s foundation in the north-west Nile Delta town of Disūq. In the case of this waqf it is clear that the bread ration was more important than the monetary compensation.<sup>48</sup> The average pay of the staff at this waqf was less than half a dinar per month. This is a pertinent example for the period in Mamluk Egypt's history when wages were at their lowest. Given this

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Sulūk 4: 27-9) which is *diwan/awqaf/iqtā'* and note that that is a lot (100,000 people via 129 kg) and then note that the second 500 ird/day is probably not meant to cover everyone. I think it is not. Look at Asadi's language here and note that 500/500 would literally mean the dependent sector in Cairo equaled the independent sector – I don't think so! The sectoral argument is great (!) and so I aim to keep it for the *fulūs* book! Maybe use the Tallis figure from Shoshan Allouche. It is very low (300) for Cairo but actually the logic is there and is interesting (!) Cairo was tiny in 1050.

<sup>44</sup> Sabra's discusses the issue (117) but did not try to factor in the bread ration.

<sup>45</sup> From his text, *Jawāhir al-'uqūd*, as analyzed by Donald Little, "Notes on Mamluk Madrasahs." *Mamluk Studies Review* 6 (2002): 9-20.

<sup>46</sup> Little, "Notes," 19-20.

<sup>47</sup> Little, "Notes," 13.

<sup>48</sup> See analysis in Hellenberg, "The Sultan Who Loved Sufis," *Mamluk Studies Review* IV (2000): 149-66, 152. Disūq is right across the Rashīd branch from the larger town of al-Raḥmāniyya. It was not in an obscure location, but neither was this even a provincial metropolis.

dismal wage average of the late 1400s, less than 6 dinars per year, the overall role of the bread ration seems obvious.<sup>49</sup>

Even when not specifically mandated by a waqfiyya document, the bread ration was an implicit part of the compact between regime and workers. This is reflected in the legal discretion given to the manager (nazir), who was responsible for allocating payments in kind, using sound judgment and discretion (ijtihād).<sup>50</sup>

### **Bread Ration - conclusion**

In conclusion, it seems highly unlikely that those at the epicenter of distribution simply sat and watched, not partaking of this ration when they needed it so badly for themselves and their families. And that the bread ration was truly ubiquitous is a fact also reflected by the context in which its interruption is noted: it is regarded as something worse than the extremities of famine, with gravity and dismay – it is akin to the eating of cats and dogs.<sup>51</sup> Bread rations, as indicated by the numbers al-'Asadī provides above, were important from a psychological as well as material perspective. Al-Maqrīzī's dismay and bitter resentment when recalling the curtailing of stipends in the early 1400s, something that reflects the general attitude towards these contracted arrangements with the regime.<sup>52</sup>

### **Alternative strategies: other foodstuffs and the survival gap**

When the bread ration itself was not sufficient, a family might resort to other sort of grain besides the standard wheat bread. Wheat was clearly the grain of preference and the favored pillar of subsistence. But of the most practical strategies for survival, the adoption of alternate foodstuffs was just as important as the bread ration. It is clear that many of Cairo's poor resorted to other foods such as broad beans – and sometimes barley – during the difficult times, especially during famines.<sup>53</sup>

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<sup>49</sup> Hellenberg, "The Sultan Who Loved Sufis," *Mamluk Studies Review* IV 2000: 152. The nāzīr in this case was paid only 3 dinars per months, 33.3 dinars per year.

urse of the 1347-1517 period.

<sup>50</sup> As noted by Sabra's study (على ما يروى الناظر). See Sabra, "Poverty," 88; see also Hamza, "Some Aspects,"

<sup>51</sup> Al-Sakhawi notes the interruption of the bread ration in the context of populations fleeing to other parts of the Mamluk Sultanate in search of food: al-Sakhāwī, *al-Wajīz*, 3: 1002.

<sup>52</sup> That is, as al-Maqrīzī bemoaned the fate of those whose wages had plummeted due to the shift from silver to copper. He in fact lumps one large group together: all those paid by the military regime, i.e. the "arbāb al-jawāmik" – perhaps one can use the term "dependent class." The term is given as he reviews the state of salaries and stipends in al-Sulūk 4: 27-9 (فصاروا يأخذون) على الاوقاف و المرتبات السلطانية. فصاروا يأخذون (و بهذا فسدت أحوال أرباب الجوامك من الفقهاء وأمثالهم الذين رزقهم على الاوقاف و المرتبات السلطانية. فصاروا يأخذون). See also David Ayalon, "The System of Payment in Mamluk Military Society (Concluded)." *Journal of the Economic and Social History of the Orient* (1958): 257-296.

<sup>53</sup> Sabra (*Poverty*, 113) notes that need drove the poor to have barley, millet, or other grains mixed into the bread.



Sorghum production and consumption is in this context highly relevant to the subject of survival in desperate circumstances. Sorghum (durra) was particularly important as the last line of defense (short of unripe green fūl, cats, dogs and other strange foods). It seems clear that the production and consumption of sorghum (durra) increased from almost nil in 1200 CE to becoming a flood of many by the late 1400s, and hence that its role in times of desperation was part of a new chapter in Egyptian material history. A rough timeline of production is indicated by the sources. When Ibn Mammātī (c. 1190 CE) compiled his agricultural schedules and cropping lists, he made no mention of it in his detailing of crops and their rent/taxation levels. Around the same time, in 1200 CE, the visitor to Egypt `Abd al-Laṭīf al-Baghdādī noted that it (along with millet) was limited to Upper Egypt.<sup>54</sup> Two centuries later, in 1402-1412, it appears in al-Qalqashandī's cropping lists; here it is distinctive from the rest of the crops as no taxation or rent is attached to its production, which can be explained by the role it was beginning to play as a peasant staple fare. In terms of durra's consumption, a couple of historical markers are evident. Its consumption during famines is first mentioned in the late 1300s.<sup>55</sup> By the 1420s, al-Maqrīzī was noting that durra was being eaten exclusive of all other foods during a famine in Upper Egypt. Ashtor's research has indicated that consumption of sorghum increased in the late Mamluk period (1382-1517 CE) and Levanoni also makes this point.<sup>56</sup>

Furthermore, irrigation system decay was the cause of not only famine but also increased production of durra. In fact the production of sorghum increased during the 1400s as a natural human response to the decay of the irrigation system problems. System decay, famine and durra went hand in hand. Indeed, hydraulic engineers from the late nineteenth century confirm this pattern: sorghum production increased proportionally with worsening flood conditions that equally caused famine; this observation equally applies to irrigation system decay that mirrored poor flood conditions.<sup>57</sup> Lewicka's research indicates that the population of fifteenth century

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<sup>54</sup> Al-Baghdādī (). See also Shoshan, "Grain Policy," and Hassan, "Extreme floods,"

<sup>55</sup> Lewicka 137, notes late 1300s references (for a famine in 755/1373-4) and other instances in the late 1300s. For the 1400s, she also notes 875/1470-71 for the instance where people ate bread made of millet and sorghum (Ibn Iyās, *Badā'i*, 3: 47). See also Amalia Levanoni, *A Turning Point in Mamluk History: The Third Reign of al-Nāṣir Muḥammad Ibn Qalāwūn* (Leiden: E.J. Brill, 1995), 172-3.

<sup>56</sup> Ashtor, *Levant Trade*, 437; idem, *Social and Economic History*, 319. Levanoni, *Turning Point*, 173.

<sup>57</sup> See Borsch, *Black Death*, 41-7. The logic and the symptoms of both decay and durra's spread speak to this. The symptoms of irrigation system decay very often resembled the symptoms of aberrant Nile floods, floods that were either too high or too low. This was patently the case in the 1400s, as is clear from eyewitness observations of flood conditions and irrigation system functioning combined. If dikes were partly ruined and did a poor job of containing Nile water in the irrigation basins as the flood receded in October-November, the flood for that year would appear as if it had been too low. At the same time, if ruined or partly ruined dikes failed to stop rising floodwater from swamping low-lying land, the flood for that year would appear as if it had been too high. In fact both of these symptoms could show up in the same flood year, when the flood was normal, but the result was not. The irrigation system in its demise could in this way assume the guise of an erratic climate. Engineer William Willcocks observed some very bad flood conditions in the late 1800's (e.g. the very low flood of 1877) and his observation that the

Egypt, including the urban population of Cairo, made recourse to sorghum when necessity drove them to it. It was not a popular solution to hard times, but it was better than starvation.<sup>58</sup> Sabra also describes how the populace took recourse to durra when necessary.

In terms of subsistence on low wages, durra production in the latter half of the 1400s may have been instrumental in allowing for survival during the worst of these years. Ibn Iyas noted the manner in which durra bread (*khubz al-durra*), once disdained and even unknown to urban dwellers, became a recourse for sustenance in the latter 1400s.<sup>59</sup> He notes its consumption, along with millet (*dukhn*), in one of the many inflationary periods of the fifteenth century. The production and consumption of sorghum was arguably the primary reason that Egypt was able to pull out of one of its worst famines; al-Sakhawi and Ibn Iyas both describe how the durra bread finally brought the out of control price of wheat down in the famine of 1486-7 CE, something that European wheat imports were not able to achieve.<sup>60</sup> Ibn Iyas passes along the words to an improvised dance intended to make light of the bad times.<sup>61</sup>

و أبيع خبز الذرة – ولم يظهر خبز الذرة فيما تقدّم من الغلوات المشهورة حتى صنفوا العوام ( رقصّة و هم يقولون: زوجى ذى المسخرة: يطعمنى خبز الذرة ... و أبيع الأردب القمح بأربعة (دنانير بعد ستة أشهر فية بوساطة كثرة جلب الذرة. و قد حصل للناس به غاية الرفق.

Durra was cheap, and was thus an alternate source of sustenance that beckoned during times of extreme need; anyone shortened on the bread ration and under the duress of a lowly annual wage of less than six gold dinars would certainly have taken recourse to durra if *fūl* (broad beans) or barley were too expensive, as durra was cheaper than both. In the conclusion below, these alternate foodstuffs will be quantified with subsistence calculations

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growing of durra rose in proportion to a flood's deviation from the mean applies equally well to the fifteenth century system in decay.

<sup>58</sup> Lewicka, *Food*, 136-7.

<sup>59</sup> Ibn Iyās, *al-Bida`i* 3:47

<sup>60</sup> Al-Sakhāwī, *Wajīz*, 3: 1002

<sup>61</sup> Ibn Iyās, *al-Bida`i* 3: 238

## Survival needs were supplemented by female and/or child labor

The last point supposes the failure of either the bread ration or alternate foodstuffs to close the subsistence gap. If the adult male head of the family was unable to bring home enough for everyone, it seems likely that other family members pitched in for the sake of survival. Though specific evidence is lacking here, it would be worth looking for the traces of an adaptation to these altered circumstances in the 1400s of Egypt's poverty, amid the plague years. Investigation into the material reality of such adjustments seems an inviting target for future research, which would include the psychological changes and pressures brought about by this disruption of cultural norms. This would indeed have been a real violation of traditional paternal posturing, something as significant in the Islamic world as in the Christian one.

But the help of family members might have made the difference in a substantial number of cases, and should not be discounted. There were a substantial number of women in the Egyptian labor force. Women's right to work was bound up in legal opinions with women's clearly defined rights to property – as supported by Islamic law.<sup>62</sup> Maya Shatzmiller, writing on women's labor in the medieval Islamic world, argues that female labor participation in the medieval Islamic world was considerable, diversified and wide ranging.<sup>63</sup> Particularly noteworthy in this regard is Shatzmiller's discussion of a fatwa (legal opinion) issued in Egypt in the medieval period that supported the rights of poor women (flax spinners) to their work and their livelihood.<sup>64</sup> This legal opinion allowed women flax spinners to moisten flax threads during the daylight hours fasting month of Ramaḍān, when Muslims were not supposed to eat or drink anything i.e. potentially not even chewing flax threads). If the fatwa noted they were poor, it was allowed – but only if they were poor. So the ruling excluded those who worked just for “domestic use.”<sup>65</sup> Shatzmiller's

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<sup>62</sup> Maya Shatzmiller, *Women and Wage Labor in the Medieval Islamic West: Legal Issues in an Economic Context*. See detail for the flax spinner (194-5) and the silk weaver (195-6) in particular.

<sup>63</sup> She notes of female labor participation (177) that, “their involvement and skills seem to have been more sophisticated and wide ranging than those of medieval European women. The trades and occupations which Muslim women exercised, the professional and unskilled tasks they performed and the commercial activities and deals in which they were involved reflect a high degree of participation, specialization and division of labor.” Women were to be found in the “industrial and service sectors, with the strongest showing in the textile industry.”

<sup>64</sup> Shatzmiller, 194; see also *Money and Divorce in Medieval Islamic Society* by Yossef Rapoport.

<sup>65</sup> She also notes (202) that women's work became legally associated with women's property rights, very much to their favor and that jurists supported the general notion of women's work – and even not sharing their wages with their husbands. Shatzmiller's arguments, taken in the context of the evidence here, also suggest a potentially interesting contrast between Europe and the Middle East. If Shatzmiller is indeed correct - that there were proportionally more women laborers in the Middle East than in Europe – and we also accept the generalization that female participation in the economy declined in much of 1400s Europe, we then should expect that the female participation in labor, at the poorest levels of society (e.g. at the lowest levels of foundation earnings in the mid-1400s) was proportionally greater in Cairo than it was in most European cities in the wake of the Black Death. As regards the issue of female labor participation in the wake of the Black Death, Shatzmiller does not hold this view

case here seems quite convincing and this evidence of legal support for women's labor in the medieval Islamic world seems particularly relevant to the issue at hand. Indeed it indicates that, in terms of the subsistence and survival of Cairo's lowest medieval wage earners, female labor may have been a factor that closed the gap between wages and the family's material needs, their bottom line.

So women's contribution may have been important – and could have made all the difference for these poorest of wage workers. Similarly, for survival wages there was the opportunity for child labor. It seems likely that when things became desperate enough, the share of child labor rose proportionally. Though we have no specific data for its prevalence from one period to another, research in the developing world and the study of preindustrial history both highlight the importance of child labor's contribution.<sup>66</sup>

### Conclusions and Quantifications

In conclusion one should view the balancing of budgets – and the meeting of survival needs – from precisely these three standpoints: bread rations, alternative primary foods, and the contribution of other family members. These were the key elements that allowed such miserly wages to prevail in the case of these fifteenth century endowments. The conclusion below studies two aspects of this question: the effect of bread rations on subsistence and the impact of alternate foodstuffs. As to the third factor, the labor of other family members, its quantitative contribution can only be guessed at and so no attempt is made to quantify this factor.

The results as shown below were calculated using a minimal 2 loaves of bread ration per day for each worker, priced at 1.42 times the going price of wheat.<sup>67</sup> Foodstuffs obtained beyond that amount were purchased with alternate grains (including fül, broad beans, with grains and also durra) priced at 57% of the price of wheat. The resulting trend of wages is then shown. For quantifying subsistence, and for caloric intake, the standard 450g loaf of bread was accounted as having a maximum caloric value of 1,200 kcal, and the minimum intake per capita (including children) was assumed to be 2000 kcal. These are supposed to represent the very bare minimums for survival.<sup>68</sup>

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and in fact makes the opposite conclusion, i.e. that female participation actually fell after the Black Death, as it did in Europe: Shatzmiller, 177.

<sup>66</sup> Sabra (*Poverty and Charity*, 117) discusses the possibilities of female and child labor, but makes no definitive conclusions..

<sup>67</sup> Popper, Systematic Notes, 104-6.

<sup>68</sup> See Livi Bacci; Cohen, 161.

Stuart Borsch, Research Fellow, Annemarie Schimmel Kolleg  
**SUBSISTING OR SUCCUMBING? FALLING WAGES IN THE ERA OF PLAGUE**

sources	Cohen 161	From	To	From	To	
	1 pound of bread in grams	kcal	kcal	kcal/gram	kcal/gram	average
	454	1070	1200	2.359	2.646	2.502
	450					2.482
	kcal per adult	kcal per capita	kcal/gram	grams required	# of 1 ratl loaves	per family of four
	2900	2000	2.482	805.661	1.790	7.161
sources	Cohen 161	Livi Bacci	NEPAL STUDY			

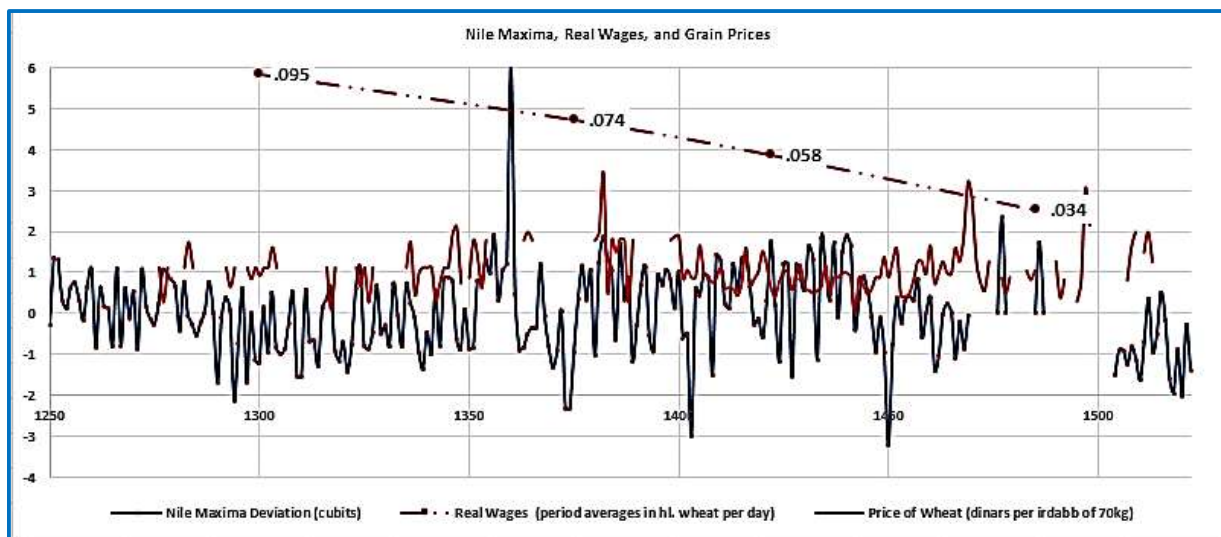
Table 1: Calculating Subsistence Consumption

1250-1346										
Income in dinars per annum	15.76	Purchased from Income	0.51	dinars per irdabb alt grain	30.90	irdabbs/year	2163.1	kg/year	0.078	liters/year
Bread Ration (2 ratl/day)	0	Free from waqf	2	ratls bread (= 1.42 * wheat)	6.66	irdabbs/year	466.5	kg/year	0.017	liters/year
									0.095	HI of grain/day
1347-1399										
Income in dinars per annum	19	Purchased from Income	0.84	dinars per irdabb alt grain	22.62	irdabbs/year	1583.3	kg/year	0.057	liters/year
Bread Ration (2 ratl/day)	0	Free from waqf	2	ratls bread (= 1.42 * wheat)	6.66	irdabbs/year	466.5	kg/year	0.017	liters/year
									0.074	HI of grain/day
1400-1450										
Income in dinars per annum	8.27	Purchased from Income	0.51	dinars per irdabb alt grain	16.22	irdabbs/year	1135.1	kg/year	0.041	liters/year
Bread Ration (2 ratl/day)	0	Free from waqf	2	ratls bread (= 1.42 * wheat)	6.66	irdabbs/year	466.5	kg/year	0.017	liters/year
									0.058	HI of grain/day
1451-1517										
Income in dinars per annum	5.41	Purchased from Income	0.81	dinars per irdabb alt grain	6.68	irdabbs/year	467.5	kg/year	0.017	liters/year
Bread Ration (2 ratl/day)	0	Free from waqf	2	ratls bread (= 1.42 * wheat)	6.66	irdabbs/year	466.5	kg/year	0.017	liters/year
									0.034	HI of grain/day

Table 2: Calculating Real Wages from Raw Wages, Prices, Bread Rations, and Alternate Grains

PERIOD AVERAGE INTERVALS	PRICE PERIOD AVERAGES	WAGE PERIOD AVERAGES	REAL WAGE PERIOD AVERAGES
Years CE	Gold Dinars per irdabb of Wheat (or alternate grains)(durra and broad beans)	Gold dinar per annum	hectoliters/day
1250-1346	0.90 (.51)	15.76	.095
1347-1399	1.48 (.84)	19.00	.074
1400-1450	0.89 (.51)	8.27	.058
1451-1517	1.43 (.81)	5.41	.034

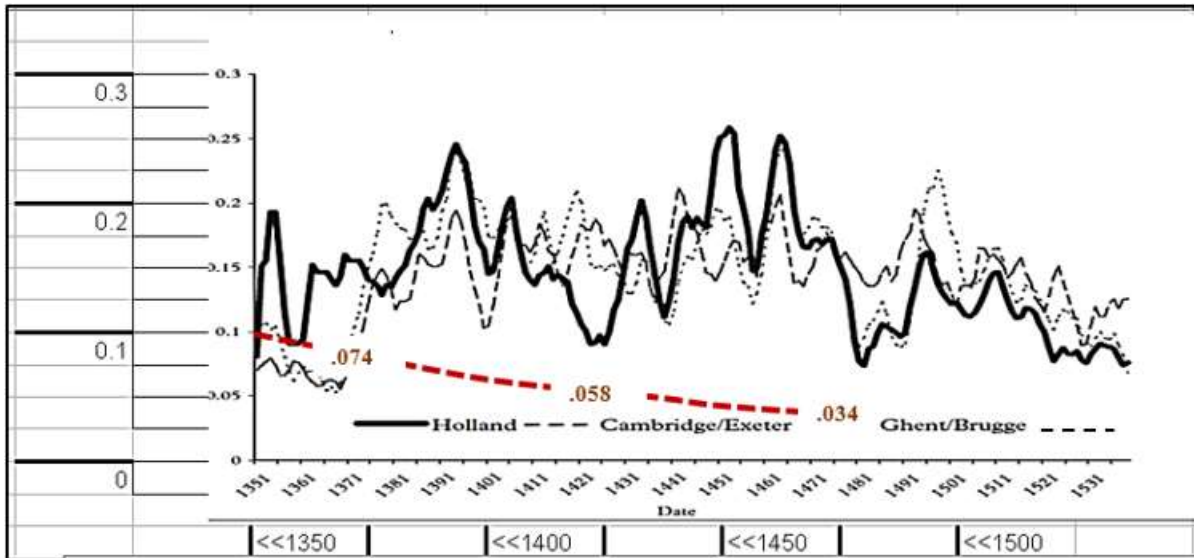
Table 3: Prices, Wages and Real Wages in Mamluk Egypt



Graph of Wages (top), Grain Prices, and Nile Flood Maxima Deviations from Mean

It needs to be pointed out that this calculation is one of many variations on possible accountings for subsistence on bread rations and alternate grains. Alteration of tactics no doubt became part of the game when conditions reached their very worst: bread ration, family labor, alternate foodstuffs. At any rate, a distinction should be made regarding the results for the average wages in gold and the results of calculations for the real wage. The gold figures are meant to be historically definitive, the real wage figures can be calculated in more than one manner.

Finally, however subsistence and the real wage are calculated, it is abundantly clear that wages in Egypt went down precipitously from the pre-plagues period (1250-1346) of Mamluk rule to the plagues period (1347-1517 CE). The evidence is definitive, though subsistence calculations can take numerous forms.



European and Middle Eastern Economic Outcomes  
(Real Wages in Hectoliters of Wheat per day)

Graph from Bas van Bavel, "The jump-start of the Holland economy during the late-medieval crisis, c. 1350–c. 15001." *The economic history review* 57.3 (2004): 515

## APPENDIX (A) Raw Wage Data

Worker Category	Worker Category	Year (CE)	Nominal Wage (Monthly)	Nominal Wage Units	Exchange Rate with Dinar	Monthly Wage in Dinars	Annual Wage in Dinars	Source
Muqri'	Reader	1284	20	dirham nuqra	20.00	1.00	12.00	Borsch from Nuwayri, <i>Al-Bihar al-Shar'iyah</i> in Appendix 3 of al-Maqrizi, <i>Kitaab al-Suqat</i> , 1000.
Mu'adhdhan	Muezzin	1284	30	dirham nuqra	20.00	1.50	18.00	Ibid.
Khādim	Servant	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Farrāsh	Janitor	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Bawwāb	Door Keeper	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Qayyim	Custodian	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Qayyim	Custodian	1299	20	dirham nuqra	20.00	1.00	12.00	Sabra 130 from (Dār al-Wathā'iq al-Qawmiyya ) D/W 3/17
Bawwāb	Door Keeper	1299	25	dirham nuqra	20.00	1.25	15.00	Ibid.
Sathī	Roof-sweeper	1299	25	dirham nuqra	20.00	1.25	15.00	Ibid.
Qawama	Cleaner	1303	29	dirham nuqra	20.00	29.00	17.40	Borsch, 2005, 106 from Nuwayri, <i>Al-Bihar al-Shar'iyah</i> (32: 45ff)
Qawama	Janitor	1303	***	dirham nuqra	20.00		15.00	Ibid., The original nominal wage figures have been lost.
Bawwāb	Door Keeper	1303	***	dirham nuqra	20.00		12.00	Ibid.
Bawwāb	Door Keeper	1303	***	dirham nuqra	20.00		18.00	Ibid.
Sawwāq	Fountain Keeper	1303	***	dirham nuqra	20.00		18.00	Ibid.
Qāri'	Reader	1303	25	dirham nuqra	20.00	20.00	12.00	Ibid.
Mu'adhdhan	Muezzin	1303	25	dirham nuqra	20.00	20.00	12.00	Ibid.
Khādim	Servant	1303	40	dirham nuqra	20.00	20.00	12.00	Ibid.
Farrāsh	Janitor	1308	15	dirham nuqra	20.00	0.75	9.00	Sabra 130 from Dār al-Wathā'iq al-Qawmiyya, D/W 4/23



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Worker Category	Worker Category	Year (CE)	Nominal Wage (Monthly)	Nominal Wage Units	Exchange Rate with Dinar	Monthly Wage in Dinars	Annual Wage in Dinars	Source
Muqri'	Reader	1284	20	dirham nuqra	20.00	1.00	12.00	Borsch from Nuwayri, <i>Al-Muqri'at al-'Arab</i> in Appendix 9 of <i>al-Muqri'at, Kitāb al-sulā</i> , 1000.
Mu'adhdhan	Muezzin	1284	30	dirham nuqra	20.00	1.50	18.00	Ibid.
Khādim	Servant	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Farrāsh	Janitor	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Bawwāb	Door Keeper	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Qayyim	Custodian	1284	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Qayyim	Custodian	1299	20	dirham nuqra	20.00	1.00	12.00	Sabra 130 from (Dār al-'Wathā'iq al-Qawmiyya ) D/W 3/17
Bawwāb	Door Keeper	1299	25	dirham nuqra	20.00	1.25	15.00	Ibid.
Sathī	Roof-sweeper	1299	25	dirham nuqra	20.00	1.25	15.00	Ibid.
Qawama	Cleaner	1303	29	dirham nuqra	20.00	29.00	17.40	Borsch, 2005, 106 from Nuwayri, <i>Al-Muqri'at al-'Arab</i> (32: 45ff)
Qawama	Janitor	1303	***	dirham nuqra	20.00		15.00	Ibid., The original nominal wage figures have been lost.
Bawwāb	Door Keeper	1303	***	dirham nuqra	20.00		12.00	Ibid.
Bawwāb	Door Keeper	1303	***	dirham nuqra	20.00		18.00	Ibid.
Sawwāq	Fountain Keeper	1303	***	dirham nuqra	20.00		18.00	Ibid.
Qāri'	Reader	1303	25	dirham nuqra	20.00	20.00	12.00	Ibid.
Mu'adhdhan	Muezzin	1303	25	dirham nuqra	20.00	20.00	12.00	Ibid.
Khādim	Servant	1303	40	dirham nuqra	20.00	20.00	12.00	Ibid.
Farrāsh	Janitor	1308	15	dirham nuqra	20.00	0.75	9.00	Sabra 130 from Dār al-'Wathā'iq al-Qawmiyya, D/W 4/23

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Mu'adhdhan	Muezzin	1349	15	dirham nuqra	20.00	0.75	9.00	Ibid.
Farrāsh	Janitor	1356	30	dirham nuqra	20.00	1.50	18.00	Sabra 130, from <i>Wizārat al-Awqāf</i> , 3195 Qadīm
Qayyim	Custodian	1356	30	dirham nuqra	20.00	1.50	18.00	Ibid.
Bawwāb	Door Keeper	1356	30	dirham nuqra	20.00	1.50	18.00	Ibid.
Khādim	Servant	1356	30	dirham nuqra	20.00	1.50	18.00	Ibid.
Khādim	Servant	1359	100	dirham nuqra	20.00	5.00	60.00	Sabra 130 from Ibn Ḥabīb, <i>Tadhkirat al-nabih</i> , Cairo, 1976-86, 406-7.
Khādim	Servant	1359	200	dirham nuqra	20.00	10.00	120.00	Ibid.
Farrāsh	Janitor	1359	40	dirham nuqra	20.00	2.00	24.00	Ibid.
Farrāsh	Janitor	1359	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Qayyim	Custodian	1359	40	dirham nuqra	20.00	2.00	24.00	Ibid.
Qayyim	Custodian	1359	50	dirham nuqra	20.00	2.50	30.00	Ibid.
Bawwāb	Door Keeper	1359	40	dirham nuqra	20.00	2.00	24.00	Ibid.
Sathī	Roof-sweeper	1359	40	dirham nuqra	20.00	2.00	24.00	Ibid.
Kannās	Sweeper	1359	40	dirham nuqra	20.00	2.00	24.00	Ibid.
Bawwāb	Door Keeper	1364	15	dirham nuqra	20.00	0.75	9.00	Borsch from <i>Wizārat al-Awqāf</i> , 132 Jaddīd
Qayyim	Custodian	1364	15	dirham nuqra	20.00	0.75	9.00	Ibid.
Sawwāq	Water Carrier	1364	15	dirham nuqra	20.00	0.75	9.00	Ibid.
Qāri'	Reader	1364	15	dirham nuqra	20.00	0.75	9.00	Ibid.
Mu'adhdhan	Muezzin	1364	15	dirham nuqra	20.00	0.75	9.00	Ibid.
Qā'im	Custodian	1408	52	dirham min al-fulūs	132.50	0.39	4.68	Sabra 130 from <i>Dār al-Wathā'iq al-Qawmiyya</i> (D'w 53/355)

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Farrāsh	Janitor	1408	62	dirham min al-fulūs	132.50	0.47	5.58	Ibid.
Qā'im	Custodian	1408	50	dirham min al-fulūs	132.50	0.38	4.53	Ibid.
Bawwāb/Farrāsh	Door Keeper/Janitor	1410	130	dirham min al-fulūs	190.00	0.68	8.21	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D/w 11/68)
Farrāsh/Qayyim		1412	100	dirham min al-fulūs	235.00	0.43	5.11	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D/w 11/70)
Bawwāb	Door Keeper	1412	100	dirham min al-fulūs	235.00	0.43	5.11	Ibid.
Mutawallī al-Mā'	Water Carrier	1414	200	dirham min al-fulūs	250.00	0.80	9.60	Borsch from Wiaṣrat al-Awqāf, 140 Jaddīd
Farrāsh	Janitor	1414	50	dirham min al-fulūs	250.00	0.20	2.40	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D/w 12/76)
Kannās	Sweeper	1416	20	dirham min al-fulūs	275.00	0.07	0.87	Ibid.
	muezzin	1420	15	niṣf fiḍḍa	30.00	0.50	6.00	Ashtor (Strauss), Prix et salaires, 78-9.
...	Lampighter	1420	20	niṣf fiḍḍa	30.00	0.67	8.00	Ibid.
...	Metal Worker	1420	30	niṣf fiḍḍa	30.00	1.00	12.00	Ibid.
...	Water Carrier	1420	60	niṣf fiḍḍa	30.00	2.00	24.00	Ibid.
...	Head Door Keeper	1420	60	niṣf fiḍḍa	30.00	2.00	24.00	Ibid.
...	Perfumer	1420	40	niṣf fiḍḍa	30.00	1.33	16.00	Ibid.
...	Servant (sufis)	1420	60	niṣf fiḍḍa	30.00	2.00	24.00	Ibid.
...	Fountain Keeper	1420	43	niṣf fiḍḍa	30.00	1.43	17.20	Ibid.
...	Fountain Keeper	1420	15	niṣf fiḍḍa	30.00	0.50	6.00	Ibid.
Farrāsh	Janitor	1420	30	niṣf fiḍḍa	30.00	1.00	12.00	Sabra 131, from Wiaṣrat al-Awqāf, Qadīm 328
Khādim al-Sajā'īd		1420	40	niṣf fiḍḍa	30.00	1.33	16.00	Ibid.
Kannās	Sweeper	1420	30	niṣf fiḍḍa	30.00	1.00	12.00	Ibid.

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Bawwāb	Door Keeper	1420	30	niṣf fidḡa	30.00	1.00	12.00	Ibid.
Bawwāb	Door Keeper	1420	45	niṣf fidḡa	30.00	1.50	18.00	Ibid.
Bawwāb/Farrāsh	Door-Keeper/Janitor	1421	50	dirham min al-fulūs	230.00	0.22	2.61	Ibid.
Farrāsh/Bawwāb	Janitor/Door-Keeper	1421	50	dirham min al-fulūs	230.00	0.22	2.61	Ibid.
Bawwāb	Door Keeper	1424	400	dirham min al-fulūs	250.00	1.60	19.20	Sabra 131 (from Ahmed Darrag, L'acte de waqf de Barsbay, Cairo, 1963, 4.)
Farrāsh	Janitor	1424	200	dirham min al-fulūs	250.00	0.80	9.60	Ibid.
Kannās	Sweeper	1424	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid., p. 5.
Qayyim/Bawwāb/Farrāsh		1425	60	dirham min al-fulūs	250.00	0.24	2.88	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D'w 13/78)
Qāri'	Readers	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Borsch from Wizārat al-Awqāf, 880 Qadīm
Maqāṭi	Timekeeper	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid.
Muzāmmalāt	Fountain Keeper (serviteur)	1425	500	dirham min al-fulūs	250.00	2.00	24.00	Ibid.
Khādim	Servant	1425	400	dirham min al-fulūs	250.00	1.60	19.20	Ibid.
Farrāsh	Janitor	1425	200	dirham min al-fulūs	250.00	0.80	9.60	Ibid.
Farrāsh	Janitor	1425	15	niṣf fidḡa	30.00	0.50	6.00	Ibid.
Bawwāb	Door Keeper	1425	400	dirham min al-fulūs	250.00	1.60	19.20	Ibid.
Sawwāq	Fountain Keeper	1425	400	dirham min al-fulūs	250.00	1.60	19.20	Ibid.
Kannās	Sweeper	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid.
Waqqād	Lamplighter	1425	200	dirham min al-fulūs	250.00	0.80	9.60	Ibid.
Mu'adhhan	Muezzin	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid.
Muzāmmalāt	Fountain Keeper (serviteur)	1425	500	dirham min al-fulūs	250.00	2.00	24.00	Ibid.

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Qayyim	Custodian	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid.
Bawwāb	Door Keeper (nortier)	1425	500	dirham min al-fulūs	250.00	2.00	24.00	Ibid.
Qāri'	Readers	1425	400	dirham min al-fulūs	250.00	1.60	19.20	Ibid.
Qāri'	Readers	1425	200	dirham min al-fulūs	250.00	0.80	9.60	Ibid.
Maqāti'	Timekeeper	1425	300	dirham min al-fulūs	250.00	1.20	14.40	Ibid.
Bawwāb	Door Keeper (nortier)	1425	500	dirham min al-fulūs	250.00	2.00	24.00	Ibid.
Khādim	Servant	1425	200	dirham min al-fulūs	250.00	0.80	9.60	Ibid.
Farrāsh	Janitor	1425	15	niṣf fidḡa	30.00	0.50	6.00	Ibid.
Mu'adhghan	Muezzin	1425	15	niṣf fidḡa	30.00	0.50	6.00	Ibid.
Muzāmmalātī	Fountain Keeper (serviteur)	1425	35	niṣf fidḡa	30.00	1.17	14.00	Ibid.
Sawwāq	Water Carrier (ouvrier)	1425	30	niṣf fidḡa	30.00	1.00	12.00	Ibid.
Bawwāb	Door Keeper	1430	300	dirham min al-fulūs	278.30	1.08	10.65	Sabra 131 from Wizārat al-Awqāf, 188 Jad'id
Farrāsh	Janitor	1430	200	dirham min al-fulūs	278.30	0.72	7.10	Ibid.
Bawwāb/Farrāsh/Qayyim		1430	450	dirham min al-fulūs	278.30	1.62	15.98	Sabra 131, from Wizārat al-Awqāf, 1021 Qad'im
Bawwāb/Farrāsh		1430	400	dirham min al-fulūs	278.30	1.44	14.20	Sabra 131 from Dār al-Wahā'iq al-Qawmiyya (D'w 13/84)
Farrāsh	Janitor	1430	15	Ashrafi-Mu'ayyadi dirham	30.00	0.50	4.94	Sabra 131 (from Ahmed Darrag, L'acte de waqf de Barsbay, Cairo, 1963, 31.)
Bawwāb	Door Keeper	1430	15	Ashrafi-Mu'ayyadi dirham	30.00	0.50	4.94	Ibid.
Farrāsh	Servant (valet de chambre)	1431	100	dirham min al-fulūs	285.00	0.50	4.94	Eliyahu Ashtor (Strauss), Prix et salaires, p. 81.
Sawwāq	Water Carrier (ouvrier)	1431	100	dirham min al-fulūs	285.00	0.50	4.94	Ibid.
Bawwāb	Door Keeper	1431	200	dirham min al-fulūs	285.00	0.50	4.94	Ibid.

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Muzāmmalāū	Fountain Keeper (serviteur)	1431	150	dirham min al-fulūs	285.00	0.50	4.94	Ibid.
Bawwāb	Doorkeeper and Servant	1431	100	dirham min al-fulūs	285.00	0.50	4.94	Ibid.
Bawwāb	Door Keeper	1433	200	dirham min al-fulūs	285.00	0.70	6.93	Sabra 131, from Wizārat al-Awqāf, 1021 Qadīm
Farrāsh	Janitor	1434	15	Ashrafi-Mu'ayyadi dirham	30.00	0.50	4.94	Sabra 131 (from Darraq, L'acte, 31.)
Bawwāb	Door Keeper	1434	***	dirham min al-fulūs	285.00	0.50	4.94	Ibid., 49.
Farrāsh	Janitor	1434	***	dirham min al-fulūs	285.00	0.50	4.94	Ibid., 54.
Bawwāb	Door Keeper	1439	300	dirham min al-fulūs	285.00	1.05	10.40	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D'W/ 15/95)
Bawwāb	Door Keeper	1441	600	dirham min al-fulūs	285.00	2.11	20.80	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D'W/ 54/371)
Farrāsh	Janitor	1441	300	dirham min al-fulūs	285.00	1.05	10.40	Ibid.
Farrāsh	Janitor	1442	250	dirham min al-fulūs	285.00	0.88	8.67	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D'W/ 16/101)
Qayyim	Custodian	1442	150	dirham min al-fulūs	285.00	0.53	5.20	Ibid.
Qāri'	Reader	1444	100	dirham min al-fulūs	285.00	0.35	3.47	Borsch, Black Death in Egypt and England (2005) 106 (from 749 Jad'īd Wizārat al-Awqāf )
Bawwāb	Door Keeper	1446	300	dirham min al-fulūs	287.50	1.04	10.31	Sabra 131 from Dār al-Wathā'iq al-Qawmiyya (D'W/ 16/105)
Farrāsh	Janitor	1446	100	dirham min al-fulūs	287.50	0.35	3.44	Ibid.
Farrāsh/Kannās	Janitor/Sweeper	1446	150	dirham min al-fulūs	287.50	0.52	5.16	Ibid.
Qayyim	Custodian	1447	20	dirham nuqra	20.00	1.00	9.88	Sabra 131 from Wizārat al-Awqāf, 1143 Qadīm
Farrāsh	Janitor	1447	40	dirham nuqra	20.00	2.00	19.76	Ibid.
Bawwāb	Door Keeper	1447	60	dirham nuqra	20.00	3.00	29.65	Ibid.
Bawwāb	Door Keeper	1448	100	dirham min al-fulūs	287.50	0.35	3.44	Sabra 132 from Dār al-Wathā'iq al-Qawmiyya (D'W/ 17/106)
Bawwāb/Farrāsh	Door Keeper/Janitor	1448	200	dirham min al-fulūs	287.50	0.70	6.87	Ibid.

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Qayyim	Custodian	1458	50	dirham min al-fulūs	353.33	0.14	1.40	Sabrs 132 from Dār al-Wathā'iq al-Qawmiyya (D/W 18/117)
Qayyim	Custodian	1460	100	dirham min al-fulūs	360.00	0.28	2.75	Sabrs 132 from Dār al-Wathā'iq al-Qawmiyya (D/W 20/121)
Qāri'	Reader	1461	50	dirham min al-fulūs	360.00	0.14	1.37	Borsch, Black Death in Egypt and England (2005) 106. From 759 Jad'id Wizarat al-Awqāf.
Qayyim	Custodian	1461	...	dirham min al-fulūs	360.00		1.18	Ibid.
Turabī	Tomb Guard	1462	60	dirham min al-fulūs	360.00	0.17	1.65	Sabrs 132 from Dār al-Wathā'iq al-Qawmiyya (D/W 21/133)
Bawwāb	Door Keeper	1463	10	dirham min al-fulūs	360.00	0.03	0.27	Ibid.
Farrāsh	Janitor	1464	...	dirham min al-fulūs	360.00		3.12	Borsch, Black Death in Egypt and England (2005) 106.
Bawwāb	Door Keeper	1464	...	dirham min al-fulūs	360.00		3.12	Ibid.
Qāri'	Reader	1464	...	dirham min al-fulūs	360.00		1.56	Ibid.
Qāri'	Reader	1464	...	dirham min al-fulūs	360.00		0.78	Ibid.
Khādim Dār al-Ṣāqā	Water Worker	1464	200	dirham min al-fulūs	360.00	0.56	5.49	Borsch, from 759 Qad'im Wizarat al-Awqāf
Ṭabbākh	Cook	1464	50	dirham min al-fulūs	360.00	0.14	1.37	Ibid.
Khabbāz	Baker	1464	50	dirham min al-fulūs	360.00	0.14	1.37	Ibid.
Sawwāq	Water Carrier (fourrier)	1464	100	dirham min al-fulūs	360.00	0.28	2.75	Ibid.
Mu'adhdhan	Muezzin	1464	50	dirham min al-fulūs	360.00	0.14	1.37	Ibid.
Farrāsh		1466	500	dirham min al-fulūs	360.00	1.39	13.73	Hani Hama, "Some Aspects," Mamluk Studies Review XII (2008) 159-72 From Dar al-Wathā'iq al-Qawmiyya (D/W 23/147).
Muzāmmalātī		1466	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Qāri'		1466	150	dirham min al-fulūs	360.00	0.42	4.12	Ibid.
Bawwāb	Door Keeper	1466	400	dirham min al-fulūs	360.00	1.11	10.98	Ibid.
Khādim al-Rab'a		1466	300	dirham min al-fulūs	360.00	0.83	8.24	Eliyahu Ashtor (Strauss), Prix et salaires. 81.

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Murraqī	Servant (mosque): serviteur	1466	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Waqqād	Lamplighter	1466	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Bawwāb	Door Keeper	1466	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Farrāsh	Servant (valet de chambre)	1466	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Qayyim	Custodian	1468	50	dirham min al-fulūs	360.00	0.14	1.37	Sabra 132 from 1018 Qadīm Wizarat al-Awqāf
Qayyim	Custodian	1474	...	dirham min al-fulūs	360.00		7.06	Borsch, Black Death in Egypt and England (2005) 106.
Bawwāb	Door Keeper	1474	...	dirham min al-fulūs	360.00		8.47	Ibid.
Muzāmmalātī	Water Carrier	1474	...	dirham min al-fulūs	360.00		12.00	Ibid.
Qāriʿ	Reader	1474	...	dirham min al-fulūs	360.00		7.77	Ibid.
Farrāsh	Janitor	1474	250	dirham min al-fulūs	360.00	0.69	6.86	Popper, William, 1957. <i>Egypt and Syria</i> . Berkeley: University of California Press, 2: 120-1.
Kannās	Sweeper	1474	250	dirham min al-fulūs	360.00	0.69	6.86	Ibid.
Bawwāb	Door Keeper	1474	200	dirham min al-fulūs	360.00	0.56	5.49	Ibid.
Bawwāb	Door Keeper	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Muʿadhdhan	Muezzin	1474	200	dirham min al-fulūs	360.00	0.56	5.49	Ibid.
Muzāmmalātī	Fountain Keeper (serviteur)	1474	1200	dirham min al-fulūs	360.00	3.33	32.94	Ibid.
Muzāmmalātī	Fountain Keeper (serviteur)	1474	600	dirham min al-fulūs	360.00	1.67	16.47	Ibid.
Muzāmmalātī	Fountain Keeper (serviteur)	1474	500	dirham min al-fulūs	360.00	1.39	13.73	Ibid.
Muzāmmalātī	Fountain Keeper (serviteur)	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Bawwāb	Door Keeper	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Sawwāq	Fountain Keeper	1474	600	dirham min al-fulūs	360.00	1.67	16.47	Ibid.



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Suqqāʾ	Water Carrier	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Farrāsh	Janitor	1474	250	dirham min al-fulūs	360.00	0.69	6.86	Ibid.
Kannās	Sweeper	1474	250	dirham min al-fulūs	360.00	0.69	6.86	Ibid.
waqqād	Lamplighter	1474	250	dirham min al-fulūs	360.00	0.69	6.86	Ibid.
Mufarriq	Qurʾān Distributor	1474	150	dirham min al-fulūs	360.00	0.42	4.12	Ibid.
Mubakkkhir	Perfumer	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Sabbāk	Metal Worker	1474	150	dirham min al-fulūs	360.00	0.42	4.12	Ibid.
Murakkkhim	Stone Mason	1474	200	dirham min al-fulūs	360.00	0.56	5.49	Ibid.
Khādim al-Rabʿa	Qurʾān Keeper	1474	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Qayyim	Custodian	1475	150	dirham min al-fulūs	360.00	0.42	4.12	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 27/177)
Turabī/Bawwāb/Farrāsh	Tomb Guard, Door	1477	150	dirham min al-fulūs	360.00	0.42	4.12	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 28/184)
Turabī	Tomb Guard	1482		Dinar Ashrafī		0.08	0.82	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 29/192)
Turabī	Tomb Guard	1482	60	dirham min al-fulūs	360.00	0.17	1.65	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 29/191)
Turabī	Tomb Guard	1482	100	dirham min al-fulūs	360.00	0.28	2.75	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 29/193)
Bawwāb	Door Keeper	1485	300	dirham min al-fulūs	360.00	0.83	8.24	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 31/198)
Farrāsh	Janitor	1485	150	dirham min al-fulūs	360.00	0.42	4.12	Ibid.
Farrāsh al-Miḍāʾa	Janitor	1485	200	dirham min al-fulūs	360.00	0.56	5.49	Ibid.
Qayyim	Custodian	1490	50	dirham min al-fulūs	360.00	0.14	1.37	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 33/207)
Bawwāb	Door Keeper	1494	500	dirham min al-fulūs	360.00	1.39	13.73	Sabra 132 from Dār al-Watḥāʾiq al-Qawmiyya (Dʿw 28/183)
Bawwāb	Door Keeper	1494	600	dirham min al-fulūs	360.00	1.67	16.47	Ibid.

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Farrāsh	Janitor	1497	150	dirham min al-fulūs	360.00	0.42	4.12	Sabra 132 from Dār al-Wathā'iq al-Qawmiyya (D/w 35/221)
Bawwāb	Door Keeper	1497	300	dirham min al-fulūs	360.00	0.83	8.24	Ibid.
Bawwāb/Farrāsh	Janitor/Door-Keeper	1497	13	dirham fidda	30.00	0.42	4.12	Ibid.
Turabī	Tomb Guard	1498	15	dirham min al-fulūs	360.00	0.04	0.41	Sabra 132 from Dār al-Wathā'iq al-Qawmiyya (36/224)
Qayyim	Custodian	1502	400	dirham min al-fulūs	400.00	1.00	9.88	Sabra 132 from Dār al-Wathā'iq al-Qawmiyya (43/277)
Bawwāb	Door Keeper	1502	200	dirham min al-fulūs	400.00	0.50	4.94	Ibid.
Bawwāb	Door Keeper	1503	25	niṣf fidda	30.00	0.83	8.24	Sabra 132 from 1019 Qadīm Wizarat al-Awqāf
Farrāsh	Sweeper	1503	25	niṣf fidda	30.00	0.83	8.24	Ibid.
Kannās al-Miḍā'a		1503	16	niṣf fidda	30.00	0.53	5.27	Ibid.
Farrāsh	Janitor	1504	500	dirham min al-fulūs	400.00	1.25	12.35	Sabra 132 from 882 Qadīm Wizarat al-Awqāf
Bawwāb	Door Keeper	1504	500	dirham min al-fulūs	400.00	1.25	12.35	Ibid.
Bawwāb	Door Keeper	1505	612	dirham min al-fulūs	400.00	1.53	15.12	Ibid.
Farrāsh	Janitor	1505	400	dirham min al-fulūs	400.00	1.00	9.88	Ibid.
Farrāsh	Janitor	1505	400	dirham min al-fulūs	400.00	1.00	9.88	Ibid.
Farrāsh	Janitor	1505	300	dirham min al-fulūs	400.00	0.75	7.41	Ibid., 133.
Bawwāb	Door Keeper	1505	600	dirham min al-fulūs	400.00	1.50	14.82	Ibid., 133.
Qayyim	Custodian	1507	24	dirham nuqra	20.00	1.20	11.86	Ibid., 133.
Kannās	Sweeper	1507	300	dirham min al-fulūs	400.00	0.75	7.41	Ibid., 133.
Bawwāb	Door Keeper	1507	400	dirham min al-fulūs	400.00	1.00	9.88	Ibid., 133.
Khāfir	Guard	1507	200	dirham min al-fulūs	400.00	0.50	4.94	Ibid., 133.

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Bawwāb	Door Keeper	1510	300	dirham min al-fulūs	400.00	0.75	7.41	Sabra 133 from 1013 Qadīm Wizarat al-Awqāf
Qayyim	Custodian	1510	120	dirham min al-fulūs	400.00	0.30	2.96	Sabra 133 from 301 Qadīm Wizarat al-Awqāf
Turabī	Tomb Guard	1510	96	dirham min al-fulūs	400.00	0.24	2.37	Sabra 133 from Dār al-Wathā'iq al-Qawmiyya (42/270)
Sawwāq	Water Carrier (ouvrier)	1511	1000	dirham min al-fulūs	400.00	2.50	24.71	Eliyahu Ashtor (Strauss), Prix et salaires, "Revue d'études arabes et islamiques" (1943), p. 82-3.
*	Servant (valet de chambre)	1511	500	dirham min al-fulūs	400.00	1.25	12.35	Ibid.
*	Door Keeper	1511	500	dirham min al-fulūs	400.00	1.25	12.35	Ibid.
Waqqād	Lamplighter	1511	300	dirham min al-fulūs	400.00	0.75	7.41	Ibid.
Murraqī	Servant (mosque); serviteur	1511	150	dirham min al-fulūs	400.00	0.38	3.71	Ibid.
Mubakkhir	Incensor	1511	100	dirham min al-fulūs	400.00	0.25	2.47	Ibid.
Qayyim	Custodian	1511	36	dirham min al-fulūs	400.00	0.09	0.89	Sabra 133 from Dār al-Wathā'iq al-Qawmiyya (42/271)
Farrāsh	Janitor	1511	200	dirham min al-fulūs	400.00	0.50	4.94	Sabra 133 from 301 Qadīm Wizarat al-Awqāf
Farrāsh	Janitor	1511	800	dirham min al-fulūs	400.00	2.00	19.76	Ibid.
Bawwāb	Door Keeper	1511	500	dirham min al-fulūs	400.00	1.25	12.35	Ibid.
Qayyim	Custodian	1513	2	niṣf fiḍḍa	30.00	0.07	0.66	Sabra 133 from Dār al-Wathā'iq al-Qawmiyya (43/279)
Muzāmmalātī	Fountain Keeper (serviteur)	1516	1000	dirham min al-fulūs	400.00	2.50	24.71	Eliyahu Ashtor (Strauss), Prix et salaires, "Revue d'études arabes et islamiques" (1943), p. 83.
Bawwāb	Door Keeper and	1516	612	dirham min al-fulūs	400.00	1.53	15.12	Ibid.
Mubakkhir	Incensor	1516	500	dirham min al-fulūs	400.00	1.25	12.35	Ibid.
Khādim al-Rab`a	Qur`ān Keeper	1516	400	dirham min al-fulūs	400.00	1.00	9.88	Ibid.
*	Valet de Chambre	1516	283	dirham min al-fulūs	400.00	0.71	6.99	Ibid.
*	Balayer des cours	1516	180	dirham min al-fulūs	400.00	0.45	4.45	Ibid.

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«	marbier	1516	193	dirham min al-fulūs	400.00	0.48	4.77	Ibid.
«	fondeur	1516	193	dirham min al-fulūs	400.00	0.48	4.77	Ibid.
«	serviteur dan le sabil	1516	1100	dirham min al-fulūs	400.00	2.75	27.18	Ibid.
Waqqād	Lamplichter	1516	600	dirham min al-fulūs	400.00	1.50	14.82	Ibid.
«	Door Keeper	1516	600	dirham min al-fulūs	400.00	1.50	14.82	Ibid.
«	Valet de Chambre	1516	425	dirham min al-fulūs	400.00	1.06	10.50	Ibid.
«	Ablutions Pool	1516	325	dirham min al-fulūs	400.00	0.81	8.03	Ibid.
«	Servant for Distribution	1516	300	dirham min al-fulūs	400.00	0.75	7.41	Ibid.
«	messenger	1516	300	dirham min al-fulūs	400.00	0.75	7.41	Ibid.
Bawwāb	Door Keeper	1516	400	dirham min al-fulūs	400.00	1.00	9.88	Sabra 133 from 802 Qadīm Wizarat al-Awqāf
Farrāsh	Janitor	1516	300	dirham min al-fulūs	400.00	0.75	7.41	Sabra 133 from 802 Qadīm Wizarat al-Awqāf
Bawwāb	Door Keeper	1516	600	dirham min al-fulūs	400.00	1.50	14.82	Sabra 133 from 802 Qadīm Wizarat al-Awqāf
Farrāsh	Janitor	1516	500	dirham min al-fulūs	400.00	1.25	12.35	Sabra 133 from 802 Qadīm Wizarat al-Awqāf

**APPENDIX (B) Price Data**

Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal		Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal
1264	100	4.5	20	5.00		1300	20	4.5	20	1.00
1264	85	4.5	20	4.25		1300	20	4.5	20	1.00
1264	150	4.5	20	7.50		1300	15	4.5	20	0.75
1264	45	4.5	20	2.25		1303	40	4.5	20	2.00
1277	5.5	4.5	20	0.28		1303	25	4.5	20	1.25
1283	35	4.5	20	1.75		1307	50	4.5	20	2.50
1293	13	4.5	20	0.65		1309	50	4.5	20	2.50
1294	60	4.5	20	3.00		1317	2	4.5	20	0.10
1295	90	4.5	20	4.50		1324	10	4.5	20	0.50
1295	100	4.5	20	5.00		1324	17	4.5	20	0.85
1295	120	4.5	20	6.00		1326	5.5	4.5	20	0.28
1295	20	4.5	20	1.00		1336	15	4.5	20	0.75
1295	120	4.5	20	6.00		1336	50	4.5	20	2.50
1295	150	4.5	20	7.50		1336	40	4.5	20	2.00
1295	120	4.5	20	6.00		1337	9	4.5	20	0.45
1295	25	4.5	20	1.25		1338	20	4.5	20	1.00
1295	120	4.5	20	6.00		1341	15	4.5	20	0.75
1296	155	4.5	20	7.75		1341	30	4.5	20	1.50
1296	75	4.5	20	3.75		1342	6	4.5	20	0.30
1296	180	4.5	20	9.00		1343	10	4.5	20	0.50
1296	167	4.5	20	8.35		1343	20	4.5	20	1.00
1296	170	4.5	20	8.50		1346	55	4.5	20	2.75
1296	35	4.5	20	1.75		1346	30	4.5	20	1.50
1296	25	4.5	20	1.25		1346	35	4.5	20	1.75
1296	35	4.5	20	1.75		1346	35	4.5	20	1.75
1296	35	4.5	20	1.75		1347	40	4.5	20	2.00
1297	45	4.5	20	2.25		1347	45	4.5	20	2.25
1299	17	4.5	20	0.85		1348	15	4.5	20	0.75
1299	0	4.5	20	0.00		1349	120.00	4.5	20	6.00
1300	17	4.5	20	0.85		1350	17.5	4.5	20	0.88
1300	14	4.5	20	0.70		1352	27.5	4.5	20	1.38
1300	14.5	4.5	20	0.73		1353	12.5	4.5	20	0.63
1300	20	4.5	20	1.00		1364	40	4.5	20	2.00
1300	27	4.5	20	1.35		1373	38	4.5	20	1.90
1300	20	4.5	20	1.00		1373	30	4.5	20	1.50

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Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal		Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal
1373	120	4.5	20	6.00		1395	110	4.5	26.5	4.15
1373	55	4.5	20	2.75		1396	175	4.5	26.5	6.60
1373	50	4.5	20	2.50		1396	175	4.5	26.5	6.60
1374	100	4.5	20	5.00		1396	170	4.5	26.5	6.42
1374	110	4.5	20	5.50		1396	130	4.5	26.5	4.91
1374	150	4.5	20	7.50		1396	50	4.5	26.5	1.89
1374	125	4.5	20	6.25		1396	120	4.5	26.5	4.53
1375	130	4.5	20	6.50		1396	55	4.5	26.5	2.08
1375	95	4.5	20	4.75		1396	28	4.5	26.5	1.06
1375	50	4.5	20	2.50		1396	30	4.5	26.5	1.13
1375	27	4.5	20	1.35		1396	25	4.5	26.5	0.94
1381	40	4.5	20	2.00		1399	25	4.5	33	0.76
1382	60	4.5	20	3.00		1399	40	4.5	32	1.25
1382	105	4.5	20	5.25		1399	40	4.5	25	1.60
1382	100	4.5	20	5.00		1399	60	4.5	20	3.00
1382	40	4.5	20	2.00		1399	70	4.5	23	3.04
1382	40	4.5	20	2.00		1399	50	4.5	30	1.67
1383	11.5	4.5	20	0.58		1400	75	4.5	30	2.50
1383	9	4.5	20	0.45		1400	50	4.5	38	1.32
1385	30	4.5	20	1.50		1401	50	4.5	59	0.85
1386	50	4.5	20	2.50		1402	60	4.5	59	1.03
1386	23.25	4.5	20	1.16		1402	65	4.5	59	1.11
1388	8	4.5	30	0.27		1403	70	6	67	1.04
1394	40	4.5	26.5	1.51		1403	70	6	67	1.04
1394	40	4.5	26.5	1.51		1403	95	6	67	1.42
1394	80	4.5	26.5	3.02		1403	110	6	67	1.64
1394	70	4.5	26.5	2.64		1403	130	6	67	1.94
1394	66	4.5	26.5	2.49		1403	210	6	67	3.13
1395	70	4.5	26.5	2.64		1403	265	6	67	3.96
1395	66	4.5	26.5	2.49		1404	310	6	103	3.00
1395	80	4.5	26.5	3.02		1404	400	6	103	3.87
1395	80	4.5	26.5	3.02		1404	300	6	103	2.90
1395	80	4.5	26.5	3.02		1404	245	6	103	2.37
1395	60	4.5	26.5	2.26		1404	250	6	103	2.42
1395	100	4.5	26.5	3.77		1404	230	6	103	2.23

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Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal		Year	Price, dirhams: silver/copper	dirhams per 450g copper coinage	dirhams per dinar	Price in Dinars Mithqal
1404	400	6	103	3.87		1418	240	6	280	0.86
1405	380	6	145	2.62		1419	255	6	280	0.91
1405	170	6	145	1.17		1419	300	6	280	1.07
1405	220	6	145	1.52		1419	250	6	280	0.89
1405	260	6	145	1.79		1419	300	6	280	1.07
1405	180	6	145	1.24		1419	350	6	280	1.25
1406	125	6	133	0.94		1420	400	6	230	1.74
1406	130	6	133	0.98		1420	300	6	230	1.30
1407	60	6	133	0.45		1421	280	6	230	1.22
1407	180	6	133	1.36		1421	250	6	230	1.09
1408	100	6	133	0.75		1422	150	6	240	0.63
1409	150	6	177	0.85		1423	75	6	240	0.31
1409	300	6	177	1.69		1423	60	6	240	0.25
1410	200	6	190	1.05		1423	80	6	240	0.33
1410	225	6	190	1.18		1423	140	6	240	0.58
1411	130	6	220	0.59		1423	135	6	240	0.56
1411	140	6	220	0.64		1424	200	6	250	0.80
1411	140	6	220	0.64		1424	180	6	250	0.72
1411	140	6	220	0.64		1424	220	6	250	0.88
1412	150	6	235	0.64		1424	200	6	250	0.80
1413	180	6	250	0.72		1425	200	6	250	0.80
1413	120	6	250	0.48		1425	300	12	250	1.20
1414	140	6	250	0.56		1425	250	12	250	1.00
1414	80	6	250	0.32		1426	300	12	250	1.20
1415	100	6	260	0.38		1426	330	12	250	1.32
1415	160	6	260	0.62		1426	150	12	250	0.60
1415	150	6	260	0.58		1427	95	12	250	0.38
1415	200	6	260	0.77		1427	110	12	250	0.44
1415	350	6	260	1.35		1427	200	12	250	0.80
1416	350	5.5	275	1.27		1427	170	12	250	0.68
1416	600	5.5	275	2.18		1427	140	12	250	0.56
1416	775	5.5	275	2.82		1428	140	12	250	0.56
1416	270	5.5	275	0.98		1428	160	12	250	0.64
1416	225	5.5	275	0.82		1428	260	12	250	1.04
1417	190	6	270	0.70		1428	300	12	250	1.20

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1428	375	12	250	1.50	1440	225	27	285	0.79
1429	475	18	260	1.83	1444	200	27	288	0.70
1429	280	18	260	1.08	1445	115	27	288	0.40
1429	240	18	260	0.92	1445	120		290	0.41
1429	250	18	260	0.96	1445	180		290	0.62
1429	300	18	260	1.15	1446	175	27	288	0.61
1430	250	18	278	0.90	1449	300	36	288	1.04
1430	200	18	278	0.72	1449	290	36	288	1.01
1430	150	18	278	0.54	1449	400	36	288	1.39
1430	120	18	278	0.43	1449	600	36	288	2.09
1430	130	18	278	0.47	1450	800	42	288	2.78
1431	130		225	0.58	1450	500	36	288	1.74
1432	130	18	265	0.49	1450	650	36	288	2.26
1432	130	18	265	0.49	1450	1000	36	288	3.48
1432	130		260	0.50	1450	1200	36	288	4.17
1432	130		260	0.50	1451	1500	36	288	5.22
1433	130	18	285	0.46	1451	900	36	288	3.13
1433	145	18	285	0.51	1451	900	36	288	3.13
1433	140	18	285	0.49	1451	900	36	288	3.13
1433	180	18	285	0.63	1451	1500		290	5.17
1433	170		285	0.60	1451	100		290	0.34
1433	200		285	0.70	1451	800		290	2.76
1434	170	18	285	0.60	1452	800	36	320	2.50
1434	200	18	285	0.70	1452	400	36	320	1.25
1435	250	27	285	0.88	1452	320	36	320	1.00
1435	360	27	285	1.26	1453	140	36	342	0.41
1435	400		280	1.43	1453	140		320	0.44
1436	120	27	285	0.42	1454	170		370	0.46
1436	140		280	0.50	1454	140		370	0.38
1439	190	27	285	0.67	1455	157.5	36	370	0.43
1439	300		280	1.07	1455	200		360	0.56
1439	360		280	1.29	1456	270	36	375	0.72
1439	250		280	0.89	1456	200	36	360	0.56
1440	300	27	285	1.05	1456	260	36	360	0.72
1440	330	27	285	1.16	1456	470	36	375	1.25



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1459	300	36	360	0.83	1470	800		350	2.29
1459	400		360	1.11	1472	200	24	360	0.56
1460	600	36	360	1.67	1472	350	24	360	0.97
1461	270		360	0.75	1473	200		350	0.57
1462	360	36	360	1.00	1478	175		350	0.50
1462	350	36	360	0.97	1484	200	36	360	0.56
1464	360	36	360	1.00	1484	400	36	360	1.11
1465	350	36	360	0.97	1486	1000	36	360	2.78
1466	420	36	360	1.17	1486	1100	36	360	3.06
1466	600	36	360	1.67	1487	2400	36	360	6.67
1466	540	36	360	1.50	1487	1600	36	360	4.44
1466	1000	36	360	2.78	1487	1200	36	360	3.33
1466	350	36	360	0.97	1491	150	36	360	0.42
1468	500	24	360	1.39	1491	130	36	360	0.36
1468	600	24	360	1.67	1495	130	36	360	0.36
1468	700	24	360	1.94	1495	80	36	360	0.22
1468	750	24	360	2.08	1497	1000	36	360	2.78
1468	900	24	360	2.50	1497	1200	36	360	3.33
1468	900	24	360	2.50	1508	500	36	400	1.25
1468	900	24	360	2.50	1508	800		400	2.00
1468	700		350	2.00	1509	800	36	400	2.00
1468	900		350	2.57	1511	400	36	400	1.00
1468	600		350	1.71	1511	800		400	2.00
1468	100		350	0.29	1512	800	36	400	2.00
1468	600		350	1.71					
1469	600	24	360	1.67					
1469	1000	24	360	2.78					
1469	1350	24	360	3.75					
1469	1200	24	360	3.33					
1469	1200		350	3.43					
1469	1200		350	3.43					
1469	1300		350	3.71					
1469	1300		350	3.71					
1470	1300	24	360	3.61					
1470	850	24	360	2.36					

### Appendix C: Nile Maxima and Extrema

Year	Cubits	Fingers	Hist Maximum (cubits)	Mean Maximum (cubits)	Hist. maximum deviation from the mean maximum	Absolute Value of Maximum Deviation (m)	Dev greater than (.7m) low	Dev greater than (.8m) high	Extreme Flood E	Price St. Dev.
1250	17	2	17.08	17.39	-0.14	0.14				
1251	18	18	18.75	17.39	0.63	0.63				
1252	18	17	18.71	17.39	0.61	0.61				
1253	17	17	17.71	17.39	0.15	0.15				
1254	17	12	17.50	17.39	0.05	0.05				
1255	18	0	18.00	17.39	0.28	0.28				
1256	18	3	18.13	17.39	0.34	0.34				
1257	17	17	17.71	17.39	0.15	0.15				
1258	17	5	17.21	17.39	-0.08	0.08				
1259	18	1	18.04	17.39	0.30	0.30				
1260	18	11	18.46	17.39	0.49	0.49				
1261	16	13	16.54	17.39	-0.39	0.39				
1262	18	0	18.00	17.39	0.28	0.28				
1263	17	13	17.54	17.39	0.07	0.07				
1264	17	12	17.50	17.39	0.05	0.05				0
1265	16	14	16.58	17.39	-0.37	0.37				
1266	18	12	18.50	17.39	0.51	0.51				
1267	16	14	16.58	17.39	-0.37	0.37				
1268	18	0	18.00	17.39	0.28	0.28				
1269	17	6	17.25	17.39	-0.07	0.07				
1270	17	22	17.92	17.39	0.24	0.24				
1271	16	12	16.50	17.39	-0.41	0.41				
1272	18	11	18.46	17.39	0.49	0.49				
1273	17	13	17.54	17.39	0.07	0.07				
1274	17	6	17.25	17.39	-0.07	0.07				
1275	17	3	17.13	17.39	-0.12	0.12				
1276	17	15	17.63	17.39	0.11	0.11				
1277	18	11	18.46	17.39	0.49	0.49				
1278	18	8	18.33	17.39	0.43	0.43				
1279	18	5	18.21	17.40	0.38	0.38				
1280	18	1	18.04	17.40	0.30	0.30				
1281	16	23	16.96	17.40	-0.20	0.20				
1282	18	4	18.17	17.40	0.36	0.36				
1283	17	8	17.33	17.40	-0.03	0.03				
1284	17	3	17.13	17.40	-0.13	0.13				
1285	16	20	16.83	17.40	-0.26	0.26				
1286	17	4	17.17	17.40	-0.11	0.11				
1287	17	10	17.42	17.40	0.01	0.01				
1288	18	4	18.17	17.40	0.35	0.35				
1289	17	10	17.42	17.40	0.01	0.01				
1290	15	17	15.71	17.40	-0.78	0.78	LOW			
1291	17	7	17.29	17.40	-0.05	0.05				

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1291	17	7	17.29	17.40	-0.05	0.05				
1292	17	19	17.79	17.41	0.18	0.18				
1293	17	12	17.50	17.42	0.04	0.04				
1294	15	7	15.29	17.42	-0.98	0.98	LOW		E	
1295	16	17	16.71	17.43	-0.33	0.33			E	
1296	18	1	18.04	17.44	0.28	0.28			E	
1297	15	18	15.75	17.45	-0.78	0.78	LOW		E	
1298	15	10	15.42	17.45	-0.94	0.94	LOW			
1299	16	8	16.33	17.46	-0.52	0.52				
1300	16	6	16.25	17.47	-0.56	0.56				
1301	17	15	17.63	17.48	0.07	0.07				
1302	16	13	16.54	17.49	-0.44	0.44				
1303	18	0	18.00	17.50	0.23	0.23				
1304	16	16	16.67	17.50	-0.39	0.39				
1305	16	12	16.50	17.51	-0.47	0.47				
1306	16	15	16.63	17.52	-0.41	0.41				
1307	17	7	17.29	17.53	-0.11	0.11			E	
1308	18	1	18.04	17.54	0.23	0.23				
1309	16	0	16.00	17.54	-0.71	0.71	LOW		E	
1310	16	0	16.00	17.55	-0.72	0.72	LOW			
1311	18	3	18.13	17.56	0.26	0.26				
1312	16	21	16.88	17.57	-0.32	0.32				
1313	16	22	16.92	17.58	-0.30	0.30				

1314	16	7	16.29	17.58	-0.60	0.60				
1315	17	17	17.71	17.59	0.05	0.05				
1316	17	22	17.92	17.60	0.15	0.15				
1317	18	6	18.25	17.61	0.30	0.30				
1318	16	17	16.71	17.62	-0.42	0.42				
1319	16	11	16.46	17.62	-0.54	0.54				
1320	16	22	16.92	17.63	-0.33	0.33				
1321	16	5	16.21	17.64	-0.66	0.66				
1322	16	21	16.88	17.65	-0.36	0.36				
1323	18	6	18.25	17.66	0.27	0.27				
1324	18	19	18.79	17.66	0.52	0.52				
1325	16	21	16.88	17.67	-0.37	0.37				
1326	16	19	16.79	17.68	-0.41	0.41				
1327	17	5	17.21	17.69	-0.22	0.22				
1328	18	9	18.38	17.70	0.31	0.31				
1329	17	5	17.21	17.70	-0.23	0.23				
1330	17	10	17.42	17.71	-0.14	0.14				
1331	16	22	16.92	17.72	-0.37	0.37				
1332	18	11	18.46	17.73	0.34	0.34				
1333	17	16	17.67	17.74	-0.03	0.03				
1334	16	22	16.92	17.74	-0.38	0.38				
1335	18	11	18.46	17.75	0.33	0.33				
1336	18	0	18.00	17.76	0.11	0.11				

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1337	17	16	17.67	17.77	-0.05	0.05			
1338	16	20	16.83	17.77	-0.44	0.44			
1339	16	10	16.42	17.78	-0.63	0.63			
1340	17	8	17.33	17.79	-0.21	0.21			
1341	16	17	16.71	17.80	-0.50	0.50			
1342	18	9	18.38	17.81	0.26	0.26			
1343	17	0	17.00	17.81	-0.38	0.38			
1344	18	16	18.67	17.82	0.39	0.39			
1345	18	17	18.71	17.83	0.41	0.41			
1346	18	15	18.63	17.84	0.36	0.36			
1347	17	5	17.21	17.85	-0.30	0.30			
1348	17	18	17.75	17.85	-0.05	0.05			
1349	16	23	16.96	17.86	-0.42	0.42		-	•
1350	17	0	17.00	17.87	-0.40	0.40			
1351	17	1	17.04	17.88	-0.39	0.39			
1352	18	16	18.67	17.89	0.36	0.36			
1353	18	16	18.67	17.89	0.36	0.36			
1354	19	5	19.21	17.90	0.60	0.60			
1355	18	21	18.88	17.91	0.45	0.45			
1356	19	20	19.83	17.91	0.89	0.89	HIGH	E	
1357	18	6	18.25	17.93	0.15	0.15			
1358	19	0	19.00	17.94	0.49	0.49			
1359	19	20	19.83	17.95	0.87	0.87	HIGH		
1360	24	0	24.00	17.96	2.79	2.79	HIGH	E	
1361	18	10	18.42	17.98	0.20	0.20			
1362	17	2	17.08	17.99	-0.42	0.42			
1363	17	4	17.17	18.00	-0.39	0.39			
1364	17	12	17.50	18.01	-0.24	0.24			
1365	17	16	17.67	18.03	-0.17	0.17			
1366	17	16	17.67	18.04	-0.17	0.17			
1367	19	6	19.25	18.05	0.55	0.55			
1368	18	0	18.00	18.06	-0.03	0.03			
1369	17	6	17.25	18.08	-0.38	0.38			
1370	16	18	16.75	18.09	-0.62	0.62			
1371	17	4	17.17	18.10	-0.43	0.43			
1372	18	4	18.17	18.12	0.02	0.02			
1373	15	19	15.79	18.13	-1.08	1.08	LOW	E	
1374	15	19	15.79	18.14	-1.09	1.09	LOW	E	
1375	17	5	17.21	18.15	-0.44	0.44		E	
1376	18	12	18.50	18.17	0.15	0.15			
1377	19	8	19.33	18.18	0.53	0.53			
1378	18	12	18.50	18.19	0.14	0.14			
1379	19	6	19.25	18.20	0.48	0.48			
1380	17	4	17.17	18.22	-0.48	0.48			
1381	19	12	19.49	18.23	0.58	0.58			

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1382	20	3	20.12	18.24	0.87	0.87		HIGH		
1383	19	14	19.58	18.25	0.61	0.61				
1384	19	8	19.33	18.27	0.49	0.49				
1385	17	15	17.62	18.28	-0.30	0.30				
1386	19	24	20.00	18.29	0.79	0.79				
1387	18	15	18.62	18.30	0.15	0.15				
1388	19	4	19.17	18.32	0.39	0.39				
1389	17	4	17.17	18.33	-0.54	0.54			E	
1390	18	1	18.05	18.34	-0.13	0.13				
1391	19	1	19.04	18.36	0.32	0.32				
1392	19	12	19.50	18.37	0.52	0.52				
1393	17	20	17.83	18.38	-0.25	0.25				
1394	17	11	17.46	18.39	-0.43	0.43			E	
1395	20	8	20.33	18.41	0.89	0.89		HIGH	E	
1396	19	2	19.08	18.42	0.31	0.31			E	
1397	19	12	19.50	18.43	0.49	0.49				
1398	19	7	19.28	18.44	0.38	0.38				
1399	18	14	18.58	18.46	0.06	0.06				
1400	19	12	19.50	18.47	0.48	0.48				
1401	17	21	17.87	18.48	-0.28	0.28				
1402	17	24	18.00	18.49	-0.23	0.23				
1403	15	12	15.50	18.51	-1.39	1.39		LOW	E	
1404	19	3	19.13	18.52	0.28	0.28			E	
1405	18	23	18.96	18.53	0.20	0.20				
1406	19	12	19.50	18.54	0.44	0.44				
1407	19	10	19.42	18.56	0.40	0.40				
1408	19	1	19.04	18.57	0.22	0.22				
1409	19	24	20.00	18.58	0.65	0.65			E	
1410	19	21	19.88	18.59	0.59	0.59				
1411	18	20	18.83	18.61	0.10	0.10				
1412	18	18	18.75	18.62	0.06	0.06				
1413	19	20	19.83	18.63	0.55	0.55				
1414	19	5	19.21	18.65	0.26	0.26				
1415	19	24	20.00	18.66	0.62	0.62				
1416	19	24	20.00	18.67	0.61	0.61				
1417	19	8	19.33	18.68	0.30	0.30				
1418	18	10	18.41	18.70	-0.19	0.13				
1419	18	14	18.58	18.71	-0.06	0.06				
1420	18	3	18.12	18.72	-0.28	0.28				
1421	19	1	19.04	18.73	0.14	0.14				
1422	20	12	20.50	18.75	0.81	0.81		HIGH		
1423	18	23	18.96	18.76	0.09	0.09				
1424	17	14	17.58	18.77	-0.55	0.55				
1425	19	24	20.00	18.78	0.56	0.56				
1426	19	24	20.00	18.80	0.55	0.55				
1427	17	6	17.25	18.81	-0.72	0.72		LOW		

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1428	19	24	20.00	18.82	0.54	0.54			
1429	19	16	19.67	18.83	0.38	0.38			
1430	19	10	19.42	18.85	0.26	0.26			
1431	20	12	20.50	18.86	0.76	0.76			
1432	20	5	20.21	18.87	0.62	0.62			
1433	17	18	17.75	18.89	-0.52	0.52			
1434	20	18	20.75	18.90	0.86	0.86	HIGH		
1435	19	24	20.00	18.91	0.50	0.50			
1436	19	6	19.25	18.92	0.15	0.15			
1437	20	15	20.65	18.94	0.79	0.79			
1438	18	20	18.83	18.95	-0.05	0.05			
1439	20	11	20.46	18.96	0.69	0.69			
1440	20	21	20.87	18.97	0.88	0.88	HIGH		
1441	20	15	20.62	18.99	0.76	0.76			
1442	18	14	18.58	19.00	-0.19	0.19			
1443	19	9	19.38	19.01	0.17	0.17			
1444	19	22	19.92	19.02	0.41	0.41			
1445	19	14	19.58	19.04	0.25	0.25			
1446	18	25	18.96	19.05	-0.04	0.04			
1447	18	3	18.12	19.06	-0.43	0.43			
1448	18	23	18.96	19.07	-0.05	0.05			
1449	18	5	18.12	19.09	-0.45	0.45			
1450	15	21	15.87	19.10	-1.49	1.49	LOW		E

1450	15	21	15.87	19.10	-1.49	1.49	LOW		E
1451	18	8	18.35	19.11	-0.35	0.35			E
1452	19	12	19.50	19.13	0.17	0.17			
1453	18	21	18.89	19.14	-0.12	0.12			
1454	19	11	19.46	19.16	0.14	0.14			
1455	19	14	19.58	19.17	0.19	0.19			
1456	19	12	19.50	19.19	0.14	0.14			
1457	20	1	20.03	19.21	0.38	0.38			
1458	18	15	18.62	19.22	-0.28	0.28			
1459						0.00			
1460	19	15	19.62	19.26	0.17	0.17			
1461	17	21	17.87	19.27	-0.65	0.65			
1462	18	6	18.25	19.29	-0.48	0.48			
1463	19	7	19.29	19.30	-0.01	0.01			
1464	19	13	19.54	19.32	0.10	0.10			
1465									
1466	18	6	18.25	19.35	-0.51	0.51			
1467	19	4	19.17	19.37	-0.09	0.09			
1468	18	12	18.50	19.39	-0.41	0.41			
1469	19	8	19.33	19.40	-0.03	0.03			
1470									
1471									
1472									

Stuart Borsch, Research Fellow, Annemarie Schimmel Kolleg  
 SUBSISTING OR SUCCUMBING? FALLING WAGES IN THE ERA OF PLAGUE

1473									
1474									
1475									
1476					0.00				
1477	21	21	21.88	19.53	1.08	1.08	HIGH	E	
1478					0.00				
1479									
1480									
1481									
1482									
1483									
1484									
1485					0.00				
1486	20	12	20.50	19.68	0.38	0.38			
1487					0.00	0.00			
1488						0.00			
1489						0.00			
1490						0.00			
1491						0.00			
1492						0.00			
1493						0.00			
1494						0.00			

1495						0.00			
1496						0.00			
1497						0.00			
1498						0.00			
1499						0.00			
1500						0.00			
1501						0.00			
1502						0.00			
1503					0.00	0.00			
1504	18	11	18.46	19.97	-0.70	0.70	LOW		
1505	19	2	19.08	19.99	-0.42	0.42			
1506	19	2	19.08	20.00	-0.42	0.42			
1507	18	18	18.75	20.02	-0.59	0.59			
1508	19	5	19.21	20.04	-0.38	0.38			
1509	18	22	18.91	20.05	-0.53	0.53			
1510	18	10	18.42	20.07	-0.76	0.76	LOW		
1511	19	9	19.38	20.08	-0.33	0.33			
1512	20	11	20.46	20.10	0.17	0.17			
1513	19	4	19.17	20.12	-0.44	0.44			
1514	19	15	19.62	20.13	-0.24	0.24			
1515	20	16	20.66	20.15	0.24	0.24			
1516	19	24	20.00	20.17	-0.08	0.08			
1517	18	14	18.58	20.18	-0.74	0.74	LOW		

1518	18	6	18.25	20.20	-0.90	0.90	LOW		
1519	19	8	19.33	20.21	-0.41	0.41			
1520	18	5	18.20	20.23	-0.94	0.94	LOW		
1521	19	23	19.96	20.25	-0.13	0.13			
1522	18	21	18.88	20.26	-0.64	0.64			