A Pre-Modern Middle-Eastern Population Brought to Light: Digitization of the 1848 and 1868 Egyptian Individual-Level Census Records

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Abstract

Our knowledge about pre-modern Middle Eastern societies has been limited by the lack of data. The 1848 and 1868 Egyptian individual-level census records provide two detailed snapshots of the Egyptian population in its early attempts to make the transition into a modernized society. Carried out during the reigns of Muhammad Ali (1805-1848) and Ismail (1863-1879) respectively, these censuses are perhaps the earliest in the Middle East to include information on all segments of society including females, children, and slaves, and on a wide range of demographic and socioeconomic variables. This paper describes the digitization project of a representative sample of the 1848 and 1868 censuses, and introduces an application of the data in the field of Egyptian economic history.

Keywords: historical census; Egypt modern economic history; historical demography; Muhammad Ali; Middle Eastern economic history.

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I. Introduction

"*It is therefore necessary for Us to enumerate exactly the people of Our country so that it may be a cause of its progress in civilization*," Muhammad Ali Pasha (1845) (Cuno and Reimer 1997, 213, italics mine)

"*The conducting of the census is a matter of benefit for the homeland, and whoever understands its merit will strive body and soul for the sake of its execution*," Census Order (1847) (Cuno and Reimer 1997, 215, italics mine)

In 1816, Muhammad Ali Pasha, who was officially the viceroy of Egypt under the Ottoman Empire but who achieved a high degree of autonomous rule of the country, initiated an ambitious manufacturing program in what constituted one of the earliest manufacturing experiments outside Western Europe and United States. This early program, which failed in the end to transform Egypt into an industrial nation, was so intriguing to historians that it remained one of the most central topics in the social and economic history of 19th century Egypt and the Middle East at large. A central aspect of this program is its social impact on the labor force: To what extent did it lead to the disappearance of the traditional guilds and the emergence of wage earners? Did it provide routes for upward occupational mobility for its workers or did it rather lead to the deterioration of their social status? Nevertheless, despite the vast historical literature on this topic (M. Fahmy 1954; Baer 1964; Marsot 1984; Owen 2002; K. Fahmy 2009), little is known with respect to the real size of workers in these early Egyptian factories, let alone their occupational, ethnic, age, or religious distributions. Such detailed picture, which is indispensable to evaluate the social impact of the manufacturing experiment on the population, was unattainable either because the data do not exist at all, or even if they do exist they are too sporadic to form a complete picture of the topic. Indeed, Muhammad Ali's experiment is but one example of the topics in Egyptian and Middle Eastern history that are not adequately understood because of the lack of data. Other equally important examples include household structure, guilds, slavery, religious endowments, and schooling.

In this context, the Egyptian individual-level census records from 1848 and 1868 offer two extraordinary data sources on the Egyptian population in this period. By the wide range of information contained in these census records, one is able to form a detailed picture of the social impact of Muhammad Ali's manufacturing experiment, as well as of numerous other central topics in Egyptian and Middle Eastern social and economic history. The two censuses were carried out during the reigns of Muhammad Ali (1805-48) and Ismail (1863-79) respectively, and are preserved, in 6,592 handwritten registers, at the National Archives of Egypt (henceforth, NAE). They include information on a wide range of variables including geographic location, name, ownership of dwelling, type of dwelling, relationship to household head, age, gender, religion, ethnicity, nationality, place of origin, and occupation, among other variables. The data are recorded systematically for every individual in the household including females, children, and slaves.

In an international perspective the 1848 and 1868 Egyptian census records are perhaps the oldest modern censuses in the Middle East and among the earliest from any non-Western country. Several salient features make these two censuses "modern" and distinguish them from earlier Ottoman enumerations (in 15th and 16th centuries) or other censuses during the period: First, while the target population of the Ottoman enumerations was the taxpaying population or the population eligible for military conscription (adult males), the Egyptian census records enumerated all segments of the population including females, children, and slaves. Second, in the same spirit of contemporary Western censuses, the Egyptian census records kept standardized individual- level lists and not a mere "count" of heads (unlike the earlier Ottoman enumerations). Third, the two Egyptian censuses recorded socio-economic information (such as school enrollment and occupation for males) besides demographic ones (such as location, gender, age, and place of origin). This shows an interest on part of the Egyptian government in the "human capital" of the population.

The existence of these individual- level census records is significant for researchers in various fields. First, the census records open the door for Cliometricians to employ quantitative methods in studying

Egyptian and Middle Eastern economic and social history at the micro- or individual- level. So far, the study of history of this region has been mostly based on qualitative methods, mainly due to the aforementioned lack of data problem. While qualitative research is indispensable in understanding various historical phenomena in the Middle East, the introduction of quantitative methods can definitely enrich the historical research and can allow tackling a number of research questions that cannot otherwise be addressed. Moreover, the idea of creating representative digitized samples of historical records can perhaps be applied to other historical sources in the Middle East (such as tax registers) to make these as well usable in statistical analysis.

Second, little is known of the demographic and socio- economic characteristics of pre- modern populations in the Middle East and the Islamic world. Such knowledge is hindered by the lack of unbiased sources of information that can provide *representative* snapshots of the population. The available sources (such as tax, cadastral, and court registers) are usually confined to specific segments of the population (perhaps the wealthier strata), and are hence of limited use for the historical demographer interested in the overall characteristics of the population. By the inclusion of all segments of the population, the census records can allow the study of the basic demographics of this pre-modern Middle Eastern population: fertility, mortality, marriage, and immigration, as well as socio-economic conditions.

Finally, a significant feature of the census records is that they come from the pre-colonial period unlike comparable historical censuses from other developing countries that were conducted under colonial administration (e.g. British India 1872). They hence provide an early snapshot of a pre-modern and pre-colonial population in its early attempts towards modernization. When combined with later post-colonial censuses, this source allows examining the impact of colonization on the colonized population.

I undertook the digitization project of two representative 1- percent samples of the 1848 and 1868 census records, with the help of data entry assistants at the NAE. The project, which I undertook over the period 2009- 10, resulted in the creation of two datasets from 1848 and 1868 each with about 80,000 individual observations. The two datasets are currently being integrated into the historical censuses of the North Atlantic Population Project (NAPP) at Minnesota Population Center (MPC) and will be disseminated on the web, with free access to all, as soon as the integration is done. Upon their public dissemination, the two datasets will hopefully boost quantitative research on the history of the Middle East.

The rest of this paper is organized as follows. Section II describes the census registers: the historical context in which the Egyptian 19th century censuses were undertaken, the format of the census registers, and the enumeration methodology. Section III describes the sampling strategy and the details of the digitization project. Section IV discusses how the constructed samples can shed a strong light on Muhammad Ali's manufacturing experiment, as an example for the research questions that one can tackle using this new data source. Finally, section V concludes.

II. The Census Registers: Historical Context, Format of the Registers, and Enumeration Methodology

A. Historical Context

In 1845, Muhammad Ali Pasha ordered the undertaking of a nationwide census enumerating every individual in the country (including females, children, and slaves) (Appendix A.1). The census operations started in the rural provinces as early as in 1846 but were then extended to the urban ones in 1847 (Appendix A.2) and were further repeated in 1848 in most of the rural units already enumerated in the period 1846- 47. Although a number of enumerations took place in the 1850s and the early 1860s, these remained limited to scattered villages and did not constitute a national census. Egypt had to wait for almost twenty years to have its second wide- scale census in 1865-69 during the reign of Khedive Ismail (1863-79) (Appendix A.3). That second census is incomplete in the sense that it did not cover the entire country. The result of these two census operations was the creation of standardized lists of individual-

level census records kept in 6,592 hand-written registers (the vast majority of which belong to the years 1848 and 1868) that were since then preserved at the NAE.

Before the discovery of the 1848 and 1868 censuses in Egypt, the series of Egyptian modern censuses was believed to have started in 1882 (a few months before the British occupation). The 1882 census was widely known because it resulted in a published census report (in French) at the village/urban quarter-level although the microdata did not survive[1]. The second published census was conducted in 1897, and was then followed by almost regular decennial censuses (1907, 1917, 1927, 1937, 1947, 1960, 1966, 1976, 1986, 1996, and 2006). However, the microdata for the censuses over the period (1882-1976) were destroyed either by choice or by chance. This resulted in the anomalous situation that the only available census microdata in Egypt are either the very early ones from 1848 and 1868 or the most recent ones (1986, 1996, and 2006).

Within the Middle East, the 1848 and 1868 censuses are perhaps the oldest modern censuses. On the one hand, the earlier Ottoman tax registers (*Tahrir Defterleri*) in the 15th and 16th centuries contained an enumeration of only the adult male population with very basic information provided since the main concern of the government was the tax-paying population (Barkan 1957; Cosgel 2004). On the other hand, while, according to Cuno and Reimer (1997), the Egyptian censuses were the counterparts of the censuses undertaken in other parts of the Ottoman Empire from the 1830s onwards, it is essential to compare the Egyptian censuses to these contemporary Ottoman censuses in order to understand the relative significance of the former. One major similarity between the Egyptian and Ottoman censuses was the issuance of "enumeration tickets" upon enumerating an individual, which can be regarded as some preliminary form of a national ID. Nevertheless, two features of the Egyptian censuses make them distinct from the Ottoman ones: first, they contained an enumeration of females and children, and second, they contained detailed information on occupation of males and school enrollment of male children, which shows an interest in the human resources. The contemporary Ottoman censuses lacked these features. According to Karpat (1978), the first Ottoman governmental census took place in certain parts of the empire in 1831-38, but was an enumeration of households rather than individuals. The second census took place in 1844 and was an enumeration of the adult male population. Finally, the third census (1866-73) that was limited to the Danube province was also an enumeration of adult males. In fact, the first census in the Ottoman Empire that contained an enumeration of females took place in 1881/82- 1893 (Karpat 1978).

These comparisons naturally lead to the questions: Why did the Egyptian government conduct these censuses? What were the motives behind them? Was the Egyptian government attempting to imitate the experiences of European countries? Answering such questions is in no way definite; nevertheless, it may be useful to speculate on the answers. Indeed, one important motivation for conducting the 1848 and 1868 censuses was "controlling" the individuals. Census lists provided the basis for tax collection, military conscription, and corvée work just like the earlier and contemporary Ottoman enumerations, and they also allowed the government to effectively control internal migration between villages (which was not normally allowed). Nevertheless, enumerating females and children and including socio-economic variables such as school enrollment cannot be explained by purposes of "controlling" the population, and might have been motivated by concerns about fertility and the potential size of the labor force. Here, one may speculate, following Alleaume and Fargues (1998), that the Egyptian students who were sent on educational missions to Europe may have played a role in introducing the techniques of the European censuses into Egypt. One can also speculate that the European technicians (mostly French and Italian) whom Muhammad Ali and his successors employed in order to provide advice to the administration may have also played a role. At any rate, the census orders suggest a *conscious* attempt to imitate the

[1] There are a number of census registers at the NAE that date back to 1879-82. These registers include individual-level census records as well as preliminary tabulations and might represent part of the largely destroyed microdata of the 1882 census.

experiences of the more advanced nations. In this context, it seems that the developments of modern censuses in France were going on in parallel to, rather than ahead of, the corresponding developments in Egypt[2].

B. Format of the Census Registers

The census registers are organized by province, with each province having a number of registers enumerating its population. In urban provinces (Cairo, Alexandria, and Rosetta), the registers are further classified by district (which are in turn divided into urban quarters or *shiyakhas*). Rosetta is treated as one single district and is hence directly classified by urban quarter. In rural provinces, the registers are classified into provincial towns, villages, hamlets, and Arab tribes. Besides the aforementioned urban and rural provinces, there are two single-city provinces that have one register each: Al-Arish (in Sinai peninsula) and Al-Qusayr (at Red Sea coast).

The format of the recording in urban provinces is on a dwelling-by-dwelling basis with the heading of each page usually stating the urban quarter and the street name. For each dwelling, the dwelling type (e.g. ruined hut, tenement house) is recorded, followed by the legal status of the dwelling (e.g. private ownership, religious endowment), the name of the property right holder, and the dwelling number in the street[3]. The households residing in the dwelling are then recorded one by one. Each household starts with the word "residence of" followed by the name of the household head, and the breaks between the households are usually clearly marked. The household members are then recorded: males followed by females, and within each gender free individuals are followed by servants (who are also free) and then followed by slaves.

In rural provinces, the census records of the provincial towns, villages, and hamlets are classified into: (i) locals, (ii) strangers, who are further divided into legal immigrants and illegal immigrants[4], and (iii) deserters, or those who escaped illegally from the geographical unit. The locals are recorded according to which section of the geographical unit (*Hissa*) they are residing in. The household of the *Hissa*'s headman (*sheikh*) is always recorded first followed by the other households. Strangers and deserters, on the other hand, are classified geographically according to their place of origin (for strangers), or place of destination (for deserters). In large provincial towns, the census records are classified by quarters and street names (if available), and are hence more similar to the recording in the urban provinces. Finally, Arab tribes[5] registers classify the members of the tribe by the specific tribal group (*gama'a*) they belong to and/or by their location[6]. No information is recorded on the dwelling's legal status in rural provinces, perhaps because property rights on land in rural areas were not yet recognized by the state.

For every individual record a systematic list of information is usually recorded that includes the following variables:

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[2] According to Cuno and Reimer (1997), "the 1831 census of France was the first in which lists of names were compiled, and that of 1836 the first in which the actual (as opposed to legal) residence was recorded. In the 1851 census, data on age, nationality, occupation, religion and infirmities were collected for the first time". I add that the independent Italian states, on the other hand, had individual- level census records from late 18th century (*Encyclopedia Britannica*) that might have affected census taking in Egypt.

[3] I found a governmental order that dates back to 1847 with respect to naming Cairo's streets and numbering its dwellings that is published in Sami (1928), 2: 547-552. The order might have been related to the ongoing census operations.

[4] At that time, immigration from one village to another required a governmental permission. People were "illegally" migrating from one village to another in order to avoid paying the excessive taxes, the military conscription, and corvée in public works (K. Fahmy 1998).

[5] For Arab tribes, the recording starts with the household of the headman of the tribe followed by the other households in the tribe. The registers usually state the tribe's name and its location.

[6] See Appendix B for two scanned pages of the registers.

1. *Name*: Egyptian naming system uses the first name of the individual followed by the name of the father, the paternal grandfather, and so on. The names in the records are usually recorded up to the father's name. Some individuals have their names recorded up to the grandfather's name. Females' first names in urban provinces are usually *not* recorded unless the female is the household head.

2. *Relationship to household head*: This is recorded in detail for most individuals. Some confusion might occur in large rural households where the relationship recorded for an individual might be relating the individual to the household head or to the preceding household member.

3. *Age*: is recorded in full years (as of the next birthday) for every enumerated individual. Age is categorical (with only two options: child and adult) for females in urban provinces. Age for infants is sometimes recorded in months or even days.

4. *Occupation*: This is recorded mainly for males. The occupational titles are pretty detailed and follow the highly specialized guild system that was prevalent at the time. I found about 3,700 distinct occupational titles in each census[7]. For male children, school enrollment is recorded as an occupation. Unemployed and retired personnel are recorded as such. Often the economic activity or sector of employment is recorded. The name of the work establishment is usually recorded if the person is employed in governmental enterprises. Occupation in rural localities is often missing indicating the default occupation: farmer. Similarly, for Arab tribes, occupation is often missing indicating perhaps that they are shepherds.

5. *Nationality*: This includes two categories: inside or outside the government's control. The concept of Egyptian nationality seems to have been quite developed in the censuses as nationals of other regions of the Ottoman empire are recorded as "Outside the government's control", meaning that they are foreigners.

6. *Ethnicity*: This is usually missing for those inside government's control who are ethnically Egyptians. Sometimes categories such as "Son of an Arab" or "Son of the Country" are used to describe these individuals. For the individuals outside the government's control, and for slaves (who are mostly inside the governments' control), the ethnicity is usually recorded.

7. *Religion*: This includes the following categories: Muslim, Christian, and Jew. Often the denomination within Christianity and Judaism is recorded. Also, the denomination can often be inferred upon combining religion with ethnicity (e.g. *Maronite* Christian and *Wahhabi* Muslim).

8. *Place of origin*: This is *not* exactly place of birth. In 1848 census, children inherit the place of origin of their father. The wife does *not* take the place of origin of her husband, and it seems that she takes the place of origin of her father instead[8].

9. *Infirmities*: An infirmity is indicated if the individual has any.

10. *Marital Status*: is also often recorded for females living with no adult males present in the household.

Despite these modern features of the Egyptian census records, an element of trial-and-error is also evident. The standardized lists are often not so standard, with some information omitted or mentioned irregularly. Information on religion and nationality are often omitted so long as the "default" category is assumed (e.g. "Muslim" and "Inside government's control"). Confusion on part of the census takers over some fields can be inferred. For instance, age, which is a categorical variable (child or adult) for females in Cairo and Alexandria according to census instructions (Appendix A.2), is sometimes recorded in full years for females in these cities. In both censuses, there was often some confusion on whether there

[7] The occupational titles "scribe" and "scribe at the customs department" are counted as distinct.

[8] In the 1868 census, many children are recorded as from Cairo while their fathers are from another province indicating that the concept of this variable was getting closer to the "place of birth".

should be an age restriction when recording the occupation for males or not[9]. Spelling mistakes are numerous, and each scribe seems to have, to some extent, his *own* way of recording information, some being keener on recording details than others. The records also reflect the preliminary stage of the statistical operations at the time. Apart from preliminary tabulations on the age and occupational distributions at the street- or village section (*Hissa*)- level, the census operations in both years did not result in national statistical tabulations in published census reports perhaps due to the unsophisticated techniques the census takers were using.

C. Enumeration Methodology

Enumeration in the censuses seems to have largely followed the "de facto" principle, as is clear from the census order in Appendix A.2. This means enumerating individuals according to their actual, rather than permanent, place of residence: A person who is not present in his permanent place of residence at the time of enumeration is recorded in that place as "not enumerated", and is enumerated instead in his actual location[10]. Servants and slaves are recorded as part of the household they are residing with. An exception to this principle comes in not enumerating the individuals who are "protected" by foreign consulates. These individuals, although they should have been enumerated according to the de facto principle, and who are mostly (but not always) foreigners in the modern sense of the word, are recorded at the household head level only with the note that they are to be enumerated by their foreign consulate. Another important exception to this principle is military personnel (officers and soldiers) and students in public schools (which were military boarding schools in nature) who were recorded with the note that they are to be enumerated in the census of the army. The members of their households, however, were recorded and enumerated. Finally, Cairo's notables in the census of 1848 (but fortunately not in 1868) were not enumerated in their actual place of residence and were instead recorded separately in a special register[11]. The information on these notables in 1848 was scarce and only mentioned the household head's name and the number of males and females residing in his/her household. Notables seem to have been a broadly defined group constituting about 6% of 1848 Cairo's population (Cuno and Reimer 1997).

The 1848 census operations were explicitly mentioned in the census orders of 1845 and 1847 (Appendix A.1 and A.2). Noticeably, there was no "census form" and the census operations were conducted by the headmen of urban quarters and villages' sections, under the supervision of an officer from the army. There were threats by harsh punishments for the concealment of individuals. Each enumerated individual was issued a "ticket" indicating that he/she has been enumerated. For the 1868 census, the only order that I found so far is very brief and refers to some decree issued by the parliament (Appendix A.3). However, the 1868 census operations seem to have been very similar to those of 1848 as far as one can infer from the format of the census registers.

III. Digitization Project and Sampling Strategy

The digitization project of the census records consisted of the creation of a 1% sample of each of the 1848 and 1868 census records (5% in the two major cities, Cairo and Alexandria). I undertook this project over

[9] The occupation for males who are less than 6 years old is sometimes left blank. In other cases, the word "child" or "infant" is recorded in place of the occupation.

[10] The "not enumerated" note is either mentioned explicitly in words or by assigning a "zero" beside the name of the non-enumerated individual meaning that he/she is not added to the enumeration count of the page. A person who is not enumerated usually has only his/her name recorded (and occupational title for the military personnel). Age and other information are normally not mentioned for non-enumerated individuals.

[11] According to the census order (1847) (Appendix A.2), each quarter's headman had to send to the Prefect a list of the notables in his urban quarter. The Prefect was to request counts of males and females in the household from the household head, which were to be recorded in the notables' register. This way, the census takers and the quarters' headmen in charge of the census operations could not intervene in the enumeration of the notables or access their houses. Similarly, the *Khedivial Diwan* was responsible for collecting the information on foreigners from the consulates.

the period 2009-10 with the help of data entry assistants at the NAE. The result was the creation of two representative samples (about 80,000 individuals each) from the years 1848 and 1868[12], which are currently being integrated into the NAPP datasets and will be publicly disseminated once the integration is complete.

In what follows, I will first discuss the target population and the sampling frame. Second, I will discuss the sampling mechanism in detail. Third, I will compare the sampling strategy to the U.S. 1850 census sample constructed by IPUMS, and to the unreleased and uncompleted sample of the 1848 Egyptian census described in Alleaume and Fargues (1998).

A. Target Population and Sampling Frame

I define the target population for each of the two samples as the population that was residing in Egypt at some point (the census night) in 1848 or 1868. The sampling frame, however, can be different and I define it as all the available census records in the *surviving* registers from both years. The discrepancy between the two concepts is due to two problems: First, the missing registers (non-coverage problem), and second, the multiple enumerations of some geographical units over the periods (1846-48) and (1866-68) (duplicates problem). In this subsection, I will address each of these two problems in turn. I want to emphasize, however, that the solutions to these two problems discussed in this subsection are the "pre-sampling" solutions that have to do with re-defining the target population and/or the sampling frame. Post-sampling solutions are discussed in section III.B.

1. Missing Registers[13]: Some census registers are missing. They might have been destroyed or are undiscovered yet. In order to evaluate the completeness of the surviving registers of the 1848 and 1868 censuses and the extent to which the surviving census records represent the population of Egypt in these two years, I use the first published census of 1882 as the reference point. The 1882 census has a complete list of the geographical units in Egypt[14] to which one can compare the available list from 1848 and 1868. Table (1) shows this comparison at the province-, district-, and village- levels[15]. At the province- level all the 1882 provinces are represented with at least one register in 1848 except Port Said and Canal province. The latter province came to existence only with the construction of the Suez Canal in the 1860s (with the exception of Suez district that was existent in 1848). Within the "surviving" provinces, Al-Gharbiya and Isna have the most serious missing registers problem at the village-level (coverage rate is 7% and 14% respectively). In 1868, however, the problem seems to be more severe, since 9 out of 22 provinces are entirely missing, and 3 provinces (Al-Minya, Girga, and Al-Sharqiya) have extremely low coverage rates. Alexandria has a relatively low coverage rate in 1868 because its administrative division (districts) in 1868 is different from that in 1848. At this point I cannot confirm whether the 1868 census was a nationwide census whose registers did not survive or rather a partial one that was not completed for some unknown reason.

Although the aforementioned comparison gives an idea of the degree of coverage up to the village- level within each province, it does not tell how complete the *individual* records are within each province. After

[12] The funding for this project came from University of Southern California, Economic History Association, and Minnesota Population Center (at University of Minnesota).

[13] The problem of missing pages within a surviving register is also possible. However, it is generally very limited in both censuses. In such cases, I assumed that the missing pages are random and I oversampled from the surviving pages.

[14] In 1882 census onwards, Egypt is divided into provinces. Each province is divided into districts. Urban districts are further divided into urban quarters, while rural districts are divided into villages (or hamlets) and towns. The 1848 and 1868 censuses follow the same division, but they treat Arab tribes as separate entities within the rural provinces.

[15] In urban provinces (Cairo, Alexandria, Rosetta, Al-Arish, Al-Qusayr, and Damietta), the comparison is limited to the district- level because the lower administrative division (urban quarters) in the 1882 census is totally different from that in the 1848/68 censuses.

all, there might have been missing individual census records within each village due to under-enumeration. To have an approximate idea on the extent of completeness of the individual-level records in each province, I again use the 1882 census as the reference point under the assumption that under-enumeration was less of a problem in that year. In particular, in order to find an estimate of the true population size of each province, I calculate the population of each province in 1848 and 1868 based on its share of the total population in 1882 census (I will discuss the validity of the assumptions underlying this calculation in section III.B). I then compare this "estimated" population size to the size of the population that has been *actually* enumerated in the census registers; the latter I obtained by summing up the population counts from all the geographical units in a given province[16]. In order to do this comparison, a priori information on the size of the entire population in Egypt in both years is required. For 1848, I used the widely accepted figure of 4,476,439 (Alleaume and Fargues 1998). For 1868, I assumed a constant annual growth rate over the period (1848-1882) in order to calculate the population in 1868 (knowing the population in 1848 and 1882). Table (2) shows this comparison for the two censuses. Overall, the results are similar to the coverage rates in table (1), although the enumeration counts in a number of provinces actually exceed the estimated populations especially in 1848. Nevertheless, these provinces have relatively high coverage rates in table (1).

[Insert tables (1) and (2)]

The problem of missing registers results in discrepancy between the target population and the sampling frame. I chose to treat this problem in the pre-sampling phase as follows: If an entire province listed in the 1882 census is missing in the 1848 or 1868 census (or has only a very few number of its units represented in the registers[17]), I re-defined the target population to exclude this province. If, on the other hand, a province listed in the 1882 census has a significant number of surviving registers in the 1848 or 1868 census, I included its registers in the sampling frame, and oversampled from them. Whether the sampling frame *represents* the target population in this province depends on the validity of the assumption that the missing registers are randomly distributed in that given province. In the post-sampling phase, I address this point by adjusting the sampling weight (Subsection III.B).

2. Multiple Enumerations: The enumerations for the 1848 census started as early as in 1846, but were repeated in most of the geographical units in 1847 and 1848 perhaps in order to raise the accuracy of enumeration and to mitigate under-reporting of individuals. Similarly for the 1868 census, there were early enumerations in 1865 and 1867, and enumeration operations seem to have been extended to 1869 in some provinces. In order to keep the consistency between the target population and the sampling frame, and to avoid double counting of individuals, only the register(s) from the latest year of each geographical unit was included in the sampling frame. For instance, if a village was enumerated in 1846, 1847, and 1848, I included only the register(s) from 1848 in the sampling frame. This assumes that (i) the register(s) from the earlier year(s) enumerate exactly the same population of the unit, and (ii) that the register(s) from the latest year enumerate different segments of the population and that they should be added up. Unfortunately, in specific provinces in the 1848 census, and due to logistical problems, I discovered the existence of duplicate registers for the same unit *after* sampling started, and hence very few units had higher chance of selection. To correct for these duplicates, I adjusted their sampling weights in the post-sampling phase (Section III.B). Table (3) shows the number of units with multiple enumerations (in

[16] Logistical problems at the NAE did not allow me to collect the enumeration counts for the 1868 census. I instead estimated the actually- enumerated population in each province in 1868 using the total number of pages for each province (adjusted for blank pages and tabulations), and the average number of individuals per page in the sample taken from that province.

[17] I namely excluded Al-Minya and Girga in 1868. In 1848, Damietta (by 1882 boundaries) has only one surviving register that is actually classified in that year under another neighboring province, Al-Daqahliya, and I thus sampled it as part of the latter province. So Damietta was not sampled as an independent province. On the other hand, I decided to sample Al-Sharqiya in 1868 although its coverage rate is pretty low (1% at the village-level and 6% at the individual-level) because it has 20 census registers, which is (arguably) a relatively large number.

different years) in each province for each census. As is evident from the table, the problem is prevalent in very few provinces.

[Insert Table (3)]

B. Sampling Mechanism

(1) *Explicit Stratification by Province*:

I started sampling in each census by explicitly stratifying the country into the provinces that are included in the sampling frame. In order to obtain an estimate of the population size of each stratum, I used the relative share of each province in 1882 census and the a priori information on the total population size of the country in 1848 and 1868. This calculation is based on two assumptions: (i) that the administrative boundaries between provinces did not change over the period, and (ii) that the distribution of the population in 1848 and 1868 across provinces is the same as the distribution in 1882. As for the first assumption, it suffices to notice that only 2.5% of the geographical units of 1848 (less than 1% in 1868) belonged to a different neighboring province in 1882. The second assumption may be justified for the distribution *across* the rural provinces, but might be questionable for the urban-rural distribution with presumably an increasing share of the urban provinces over time due to urbanization and foreigners' migration to Cairo and Alexandria in the second half of the 19th century as well as the growth of the Suez Canal cities. However, table (2) showed that the actual enumeration counts in the urban provinces are not much different from the estimated sizes of strata.

Setting the sampling rate at 5% in Cairo and Alexandria and at 1% in all the other provinces, I calculated the targeted sample size in each stratum (province). Two notes are in order: First, I chose to explicitly stratify the sample by province. By explicit stratification I mean that I calculated the targeted sample size in each province, and I sampled independently from within each province to achieve that sample size. The other option that I did not choose, namely implicit stratification, was to apply the fixed sampling rate of 5% on Cairo and Alexandria as one stratum, and 1% on all the other provinces as another stratum, without the need for setting a *targeted* sample size in each province[18]. In other words, under implicit stratification I would have taken one page every 20 pages in Cairo and Alexandria and one page every 100 pages in all the other provinces. My choice of explicit stratification by province is actually motivated by the desire to make the geographical distribution of the sample approximately reflect the true geographical distribution of the target population at the province- level. In particular, given the missing registers problem, implicit stratification would have resulted in a geographical distribution of the sample that reflects that of the surviving registers, which is not of significance *per se*.

Second, I calculated the stratum size using the 1882 census shares because I could not find reliable *a priori* information on the 1848 or 1868 total population in each province. The closest approximation is to use the sum of the enumeration counts from all the available geographical units in each province. This, however, will result in the true stratum size only if there is no missing registers problem or no under- (or over-) enumeration. Since this is not always the case, it was perhaps safer to use the 1882 shares in order to calculate the sizes of the strata. Table (4) shows the geographical distribution of the two samples along with the targeted and actual sampling rates.

[Insert Table (4)]

(2) *Sampling Rules*:

I applied systematic sampling by page within each stratum. Given the targeted sample size, knowing the total number of pages in the registers of each province, and by assuming an average number of individual records per page, I calculated the total number of pages required to collect in each stratum and hence the

[18] This is not to be confused with explicit stratification between Cairo and Alexandria on the one hand, and the rural provinces on the other hand, which was essential under both scenarios discussed in the text since I applied different sampling rates between these two groups.

interval of the systematic sample. I selected a page randomly in the beginning of each stratum, and then I took the successive pages according to the calculated interval. Hence, the page is the sampling unit. If a page is to be taken in the sample, I recorded all the households that *start* in the page along with information on the dwelling they are residing in (including the total number of households and individuals in the dwelling)[19]. I also recorded the information on the register code and page number to facilitate referring to the original register if need arises in the future. In applying this rule, if a household starts in a previous page and continues on the sample page it is not included in the sample. Similarly, if a household starts on the sample page and continues in the following page I entered it in its entirety. This ensures that all households have an equal chance of appearing in the sample regardless of their size. A page is accepted in the sample if at least 75% of it has individual-level records. If a page is rejected, the closest preceding or succeeding page, which satisfies the 75% rule, is taken on an alternating basis. Each time a page is rejected, I counted the interval from the original sampling page. This systematic sampling mechanism was less costly than a pure random sample and was much easier to apply by data entry assistants. It also ensures the geographic spread of the sample within each stratum (implicit sub-stratification).

A few notes on the sampling rules are in order. First, group quarters are dwellings where individuals live together with no household relationships between them (e.g. churches, monasteries, and jail). The individuals in these group quarters are recorded in the registers as one single household. If the sample page has a group quarter *starting* in the page, I entered the group quarter as a single household in its entirety. Otherwise, the page is rejected (since it won't satisfy the 75% rule) and a preceding or a successive page is taken[20]. Second, fragments, which are the individuals enumerated separately from their place of residence or their households for some reason, are taken into the sample if they happen to be on the sample page. I entered the fragments as separate households in the same way as they are recorded in the registers. Fragments in 1848 Cairo are usually confined to the end of the urban district where they include individuals who were away at the time of the census, and who came back and were thus enumerated afterwards. In 1868 Cairo, however, fragments are found within the pages of the regular enumeration. In other provinces from both years, fragments are usually mentioned at the end of the geographical unit.

Third, in some registers in Alexandria in the 1848 census, the households' breaks within the dwelling were not marked. In such dwellings, individuals were classified by nationality, place of origin, and gender, *regardless of* the household they belong to. Household relationships were sometimes mentioned (for males), but were mostly ignored for females. For such cases, and since it is often impossible to fully identify the households inside the dwelling, I decided to enter the dwelling in its entirety. In particular, if a page is selected into the sample, all the *dwellings* that start on the page are taken into the sample. Nevertheless, since most of the male household members do have common nationality and place of origin (defined in section II.B), it was mostly possible to identify the male members of each household.

Most of the variables were coded either ex ante or during the data entry operations. The data enterer was able to add new codes to the variables as new categories are discovered in the registers. These coded variables are: type of dwelling, legal status of dwelling, relationship to household head, title (both of dwelling's property right holder and of individual; e.g. pasha), legal status of the individual, nationality (both of dwelling's property right holder and of individual), ethnicity (both of dwelling's property right holder and of individual), religion, place of origin (which I coded according to the 1882 census

[19] I defined the starting point of the household as the line including the information of the first member in the household.

[20] The IPUMS 1850 U.S. census sample applies individual- level sampling to individuals residing in the group quarters, instead of entering the group quarter in its entirety. The drawback of my approach is the resulting increase in the standard error because the observations in the group quarter are more likely to be correlated. Nevertheless, the very small number of group quarters that I found in the registers and the fact that they are limited to Cairo and Alexandria mitigate such concerns.

geographical coding), and the presence of infirmities. Numerical variables include number of households in the dwelling, and number of individuals in the dwelling. The variables that were entered as text are: register code, page number, street name, dwelling number, name of the dwelling's property right holder, age[21], occupational title (both of dwelling's property right holder and of individual), individual's name, and census taker's (or data enterer's) notes on both dwelling and individual. After the data entry was complete, I coded the occupational titles according to the Historical International Standard Classification of Occupations (HISCO), which is the same coding scheme used in NAPP samples, up to the most detailed five- digits classification. This will hence make the integration of the Egyptian occupational titles to the NAPP samples easier. Examples of the individual records in the digitized samples are shown in Appendix C.

(3) *Creating Post-sampling Weights*:

In the post-sampling phase, sampling weights are required when calculating population means, totals, and proportions in order to adjust for (i) different *actual* sampling rates across provinces (especially in Cairo and Alexandria as compared to the rest of the provinces), (ii) non-coverage of some geographical units within the province (missing registers), and (iii) duplicate registers for the same geographical unit (multiple enumerations) which resulted in higher chance of selection for some units. The final weight for each geographical unit is the product of the three adjusted weights. In what follows I will discuss the weight adjustment needed to correct for each of these three concerns.

1- Adjusting for Different Sampling Rates: Defining the probability of selection as the total number of individuals in the sample divided by the total number of individuals in the population, individuals in Cairo and Alexandria have a higher probability of selection than the individuals in the rest of the provinces, and sampling weights must adjust for that. Moreover, actual sampling operations may have resulted in different *actual* sampling rates across provinces. I use the estimated population figures based on the 1882 relative population shares (as the denominator for the probability of selection in each province). The sampling weight (W_A) is defined as the reciprocal of the probability of selection.

2- Adjusting for Non-Coverage: Missing registers within urban provinces is negligible. I thus focus here on non-coverage within the rural provinces. I estimate the probability of coverage of a geographical unit at the village- level in the rural provinces using a Probit model[22]. The dependent variable of interest is a dummy for having a surviving register in the relevant census. The regressors of interest are the characteristics of the geographical units that are known for both missing and surviving units. These are: location of the unit (I try three specifications with region, province, and district fixed effects), type of geographical unit (village, hamlet or Arab tribe, and provincial town), and population size (calculated using the 1882 shares or the enumeration counts for the unmatched 1848/1868 units). I estimated the regression for each year separately. The results of these regressions are shown in table (5), and the sampling weight (W_B) is defined as the reciprocal of the estimated probability of coverage.

[Insert Table (5)]

3- Adjusting for Duplicates: For the units that have multiple surviving registers in different years, only the register(s) from the latest enumeration was included in the sampling frame, and hence no weight adjustment is needed for these units. However, in very few cases, I discovered the existence of multiple enumerations only after sampling started, and hence such units had higher probability of selection. The sampling weight for these units has to be adjusted by multiplying the original sampling weight (W_A*W_B) by the reciprocal of the number of duplicate enumerations that were *included* in the sampling frame.

[21] Age is entered as text because it is categorical for females in Cairo and Alexandria. Also, for infants, the age is recorded in days or months, so I entered it as mentioned in the register.

[22] I am grateful to Ragui Assaad, University of Minnesota, for this advice.

C. Comparison to the IPUMS 1850 U.S. Census Sample and Alleaume and Fargues 1848 Egyptian Census Sample

My sampling strategy is similar to the methods used for the 1850 U.S. census sample constructed by IPUMS (Ruggles and Menard 1995; Davern et al. 2009). The systematic sampling mechanism was used for both samples. In the IPUMS sample, as in my sample, sampling is done every given interval of pages. However, there are two main differences: First, while my sampling unit is the page and the households within the page, the U.S. 1850 census sample is a sample of dwellings. In particular, while the U.S. sample selects a random line from the page and a dwelling is accepted if the line falls on the first individual in the dwelling; in the Egyptian sample, and due to the irregular content of pages and the non-numbered lines, the randomization is at the page- level. Once a page is selected, *all* the households in the page are taken into the sample. Hence, clustering in the Egyptian sample is at the *page*- level while in the U.S. sample is at the *dwelling*- level. Second, stratification in the U.S. sample is implicit, since the 1% fixed sampling rate is applied to all census records so as to choose 1 individual every 100 individuals. The missing registers problem led to the choice of explicit stratification in the Egyptian sample.

Alleaume and Fargues collected an unreleased and uncompleted sample of the 1848 Egyptian census, which is described in their 1998 article (henceforth, AF sample). The AF sample applies a two-stage stratified sampling strategy. Initially, the country is stratified into 29 strata (Cairo's 10 districts, Alexandria's 5 districts, Damietta, and the 13 rural provinces[23]). Although not explicitly mentioned, it seems that there are two additional strata: other urban governorates and the deserts. In addition, rural provinces were further sub-stratified into three substrata: main town, rural localities (villages and hamlets), and Arab tribes. In the first stage, a number of geographical units were selected within each stratum based on an a priori sampling rate f_1. If the stratum consists of exactly one unit (such as a district of Cairo) it is selected with sampling rate 100%. Also, Arab tribes are treated differently and each tribe is taken with probability 100%. In the second stage, a number of households are selected within the selected units with a sampling rate f_2. If a household is chosen, it is entered in its entirety. The mechanism of selecting the units in the first stage and of selecting the households in the second stage is not entirely clear in their 1998 paper.

My sampling strategy is different from the AF sample in the following aspects. First, in deciding the size of each stratum, the AF sample used the aggregate population figures available for each stratum in 1848. I instead used the 1882 population shares to decide the population figure for each province. The use of the 1882 population shares is justified given the missing registers problem in some provinces that does not permit knowing the *true* stratum size for these strata from summing up the enumeration counts. Second, by using systematic sampling by page within each stratum (province), I applied implicit geographic sub-stratification where the probability of selection of any geographical unit into the sample is directly proportional to the number of pages of its register (in other words, its population). The AF sample, on the other hand, applies explicit stratification within each rural province, and oversamples from the central towns as compared to the rural localities. Third, the AF sample treats the non-coverage problem by choosing close substitutes to replace the missing geographical units. The AF sample also chooses close substitutes for the households if the non-coverage is within the geographical unit (e.g. missing pages). I instead use sampling weights to adjust for the non-coverage problem at the geographical unit- level within the province. If the non-coverage occurs within the geographical unit, I made the assumption that the missing records are random and oversampled from the surviving records in order to facilitate the sampling methodology.

[23] The 1882 provinces (other than Cairo, Alexandria, and Damietta) that do have registers in 1848 are 17 provinces: Rosetta, Al-Arish, Al-Qusayr, Al-Daqahliya, Al-Sharqiya, Al-Qalyubiya, Al-Gharbiya, Al-Menoufiya, Al-Buhayra, Al-Giza wa Atfih, Bani Souayf, Al-Fayuum, Al-Minya wa Bani Mazar, Asyut, Girga, Qena, and Isna. According to the 1847 census order, three provinces might be part of the so-called "other urban governorates" in the AF sample: Al-Arish, Al-Qusayr, and Rosetta. Also, Qena and Isna might have been treated as one province in the AF sample (they were one province at the time) (Ramzi 1994). This leaves us with exactly 13 provinces.

IV. Application: Exploring Muhammad Ali's and Ismail's Modernization Program

In this section, I first provide selected descriptive statistics from the 1848 and 1868 samples to give a general idea of the information contained in this data source. Second, I discuss how this data source can provide very useful insight as to evaluating the ambitious modernization programs carried out by Muhammad Ali Pasha and his grandson, Khedive Ismail, one of the most central questions in modern Egyptian history.

A. Descriptive Statistics

The highest frequencies of selected variables from the 1848 and 1868 samples are shown in Table (6). I show the statistics for Cairo and Alexandria separate from all the other provinces to account for the different sampling rates in these provinces, and to show the interesting contrast between urban and rural provinces. Regarding the dwelling type, in both 1848 and 1868 about 73% of the individuals in Cairo and Alexandria live in houses, unspecified, or unknown dwellings, versus 100% in the other provinces. What is more interesting, however, is the composition of the dwelling types in which the remaining 27% of Cairo and Alexandria population resided in. About 16% of the population lived in low-status dwellings. These mainly include ruined huts, courtyards, and single rooms. Moreover, about 7% lived in multiple-household dwellings such as tenement houses. Finally, 3% lived in production sites, i.e. they resided in the same place as they worked (e.g. coffee shops and bathhouses).

[Insert Table (6)]

Dwelling legal status is almost only found in Cairo and Alexandria. Private or public ownership is the most dominant legal status as about 64% in 1848 and 71% in 1868 resided in privately- or publicly-owned dwellings. This is followed by *Waqf* dwellings; i.e. dwellings owned by the pious or religious endowments of individuals or entities (whether Muslim, Christian, or Jewish).

As for the individual- level variables, gender distribution seems pretty balanced and does not immediately indicate a gender bias in the sample. Muslims form the majority in urban and rural provinces in both the 1848 and 1868 samples. Christians are the largest religious minority followed by Jews. With respect to nationality, about 7% of the individuals are outside government's control or foreigners in the urban provinces, as compared to 1% in the rural provinces. Also, the percentage of slaves is higher in urban provinces than in rural provinces, since the majority of the slave population in Egypt (and in the Middle East at large) was involved in urban domestic service. In 1868, however, there was a slight increase in the percentage of slaves in rural provinces, perhaps due to the positive cotton price shock that resulted from the American civil war (1861-65), and that led to a significant improvement in the living conditions of the Egyptian peasants and their financial ability to hold slaves. Finally, regarding ethnicity, the vast majority of the individuals are locals. Turks represent the second largest ethnic group in 1848, followed by blacks. The latter group, however, seems to take over the non-local ethnicities in 1868.

B. Application:

Historians have long debated various aspects of the intriguing manufacturing program carried out by Muhammad Ali Pasha, who is widely regarded as the founder of modern Egypt. Apart from the debate on the economic evaluation of the program with respect to efficiency in production, which requires gathering data on the costs of production and market prices, the census records can provide useful insight into the social impact of the manufacturing experiment on the labor force. This social face of the experiment is a central and an often- ignored aspect of the manufacturing experiment. As K. Fahmy (2009) points out, it is important when evaluating Muhammad Ali's development experiment to take into account "*the millions of Egyptian people whose lot, as a direct result of what Mehmed Ali actually did achieve, was that of hardship and suffering*" (italics mine). In this subsection, I will discuss the type of information that one can extract from the census records to shed light on this social side. I will focus on two questions: First, to what extent did the manufacturing experiment by Muhammad Ali lead to the disappearance of the traditional guild system? Second, did the factories established under this experiment provide routes

for upward mobility for the labor force? In discussing these two questions, however, I want to stress the point that I am not trying to *answer* these questions in this limited space. I am only giving examples to the sort of information that the census samples can provide with respect to these questions.

The first question has long been debated among historians. M. Fahmy (1954) argued that the manufacturing program led to the abolition of restrictions on labor that were present under the guild system, and thus to the complete liberation of the labor market. By contrast, Baer (1964) criticizes this argument and refers to the strong qualitative evidence that shows that the guild system survived until the early 20th century, and that Muhammad Ali's factories did *not* give the final blow to the medieval guilds, although it might have indeed hurt specific guilds. In support of Baer's thesis, Owen (2002) points out that even the textile workers who were hurt the most by the factories did indeed manage to survive. In the same direction, Marsot (1984) states that the guild system remained largely unaffected except in the occupations that were in direct competition with the factories, although she also notices that the factory system opened up possibilities for children to work and to be promoted "by training rather than by heredity" in contrast to the guild rules (Marsot 1984, 181-83). Nonetheless, a slightly different viewpoint is provided by Ghazaleh (1999), who criticizes Baer's thesis on the grounds that although the guilds did survive until early 20th century they were largely weakened by the manufacturing experiment and gradually came under state control. In response to Baer's claim that the artisanal guilds, which were the most affected guilds by the manufacturing experiment, did not constitute more than one third of the total number of guild members, Ghazaleh admits the difficulty of estimating the total number of guild members and their breakdown.

Fortunately, the Egyptian census samples can provide very useful insight into answering this question. First, by having the occupational title recorded for every male, along with the name of the work establishment if the person is employed by the governmental/public sector, one is able to estimate the size of labor force in the manufacturing and transportation projects (henceforth, modern sector) in 1848 under Muhammad Ali and twenty years later in 1868 under Ismail after most of Muhammad Ali's factories closed down. Second, equally important, one is able to estimate the size and breakdown of the traditional guilds outside the factories (henceforth, traditional sector). An important caveat here is that the census records include information on occupations rather than guild membership. Although the two variables are not the same, one may argue that the occupational title is a reasonable *proxy* for guild membership, given the fact that there was a high degree of specialization within the guild system, with "the extreme splitting of occupations into guilds of specialized branches" (Baer 1964, 25). At any rate, holding this caveat in mind, the census records allow us to estimate the extent to which the occupations/guilds actually disappeared due to the emergence of the modern projects, and also, to determine the specific occupations/guilds that were mostly hurt. Table (7) shows the descriptive statistics from both years on the size of the labor force (adult males) that was employed in the modern sector. From the table it is evident that the modern projects employed in 1848 about 11% of Cairo's adult male population (at least 15 years old), but the percentage went down to 3% in 1868. In Alexandria, the second largest city, the percentage of workers in the modern sector was about 2% in 1848 and went up slightly to 4% in 1868. The other provinces had very low share of the population working in the modern sector in both years but the share was higher in 1848. Overall, it seems that the modern projects in 1848 did not lead to the complete disappearance of the traditional occupations/guilds, and moreover, the percentage of workers employed in these projects fell sharply in 1868 as compared to 1848, with the corresponding increase in the size of the traditional occupations/guilds. I have to emphasize, however, that Ghazaleh's argument that the guilds were weakened by state control even if they survived cannot be answered using the census records.

Furthermore, one can extract more detailed information that can actually help determine which guilds were hurt most by modernization. Table (8) shows the breakdown (or occupational distribution) of workers in the modern and traditional sectors in both years into ten aggregate occupational categories (same as HISCO one- digit categories). This aggregate breakdown is for presentation purposes only, and the detailed occupational categories given by the detailed five- digit HISCO coding are available in the

digitized samples. From the table, one can see that 26% of the workers in the traditional sector are working in the category "construction workers, carpenters, building painters, transportation workers, and laborers". About 20% of the workers in the traditional sector are in the service occupations "cooks, servants, slaves, policemen, military personnel, and assistants". The occupational distribution in 1868 is quite similar. Going through the detailed occupational distribution in both years, one can decide the exact occupations/guilds that were affected most by modernization in both years.

The second question has to do with the routes for occupational mobility, that were provided by the modern sector in 1848 and 1868. While, most of the historians have admitted with varying degrees that the workers in the factories suffered from conscription into the factories and the bad working conditions they faced there (M. Fahmy 1954; Marsot 1984; Owen 2002), little is known about the occupational distribution of the workers in these factories, and how it compares to that in the traditional sector. This knowledge is crucial to evaluate the degree to which jobs in the modern sector compare (whether favorably or not) to those in the traditional guilds, and hence, whether they provided routes for upward or downward occupational mobility. To the best of my knowledge, only Ghazaleh (1999) provides a list of workers broken down by occupation, their working days, and their salaries in *Khurunfish* factory, the oldest factory in Egypt that was constructed in 1816. While the census samples do not have information on the salaries, it does provide detailed information on the occupation and the work establishment (factory) of each male worker in the modern sector. Table (8) shows the occupational distribution of workers in the modern sector in 1848 and 1868 in Cairo and Alexandria (the two cities with the vast majority of modern projects), and how it compares to that in the traditional sector. The vast majority of the adult male workers in the modern sector in 1848, about 69%, are in the occupational category "construction workers, carpenters, building painters, transportation workers, and laborers". About 9% are working as specialized artisans "wood treaters, gunpowder makers, textile workers, millers, and food processors". The white-collar workers (scribes, stores clerks, etc) constitute only 9% of the workers. In 1868, however, the distribution seemed to have shifted more towards white-collar workers (17%) and away from "construction workers, carpenters, building painters, transportation workers, and laborers" (57%). This may have been the case because of the nature of the modern transportation projects under Ismail in 1868 such as railways, telegraph, and steam navigation, which required more administrative/clerical jobs than Muhammad Ali's factories.

Moreover, when compared to the aggregated job distribution in the traditional sector, and by classifying the occupations into three major categories: white-collar workers, skilled artisans, and unskilled workers, in the second part of table (8), it seems that the percentage of unskilled workers in the modern sector in 1848 was actually higher than that in the traditional sector (58% versus 50%), while the percentage of white-collar workers was lower (14% versus 22%). In 1868, the situation is reversed with the percentage of white-collar workers being higher in the modern sector (38%) than that in the traditional sector (23%) and the percentage of unskilled workers being lower (38% versus 47%). This may suggest that the modern projects were actually a route for downward rather than upward mobility for Egyptians in 1848, but might have been a route for upward mobility in 1868.

[Insert Table (7) and Table (8)]

V. Conclusion

The 1848 and 1868 samples provide a rich source of information on the Egyptian population in mid- 19th century, which can benefit researchers in various disciplines. First, historical demographers can use the Egyptian census samples to examine patterns of fertility, mortality, marriage, and immigration in this population. Multigenerational households can also be studied using this source. Moreover, given the availability of contemporary historical census records from other countries in the NAPP database, international demographic comparisons will be feasible. Second, Cliometricians and historians of Egypt and the Middle East can benefit from these digitized samples in studying slavery, modernization, and *Waqfs*, among other topics. Quantitative statements about the magnitude of each of these phenomena will

be feasible. Third, genealogists can make use of these census records in studying history of families in Egypt. Fourth, the spatial data on location and addresses in the cities can benefit researchers in spatial sciences and urban history of Middle Eastern cities in reconstructing a detailed historical map of 19th century Cairo and Alexandria. Overall, the 1848 and 1868 census records open up entirely new possibilities for quantitative research in studying the social and economic history of Egypt and the Middle East.

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Appendix (A): Orders of Undertaking the 1848 and 1868 Censuses

1- Muhammad Ali's Order to Start the Census Operations in the Rural Provinces (Dhu Al-Qaida 13, 1261 H; November 13, 1845)

It is self-evident that among the causes of the progress and civilization of other nations is the precise enumeration of their people and the orderly administration of their interests. It is therefore necessary for Us to enumerate exactly the people of Our country so that it may be a cause of its progress in civilization, without causing the slightest difficulty to its people, and to arrive at this goal, it is incumbent upon all the provincial governors (mudirs); along with the supervisors (mamurs) of the jifliks and uhdas and their agents, and their headmen (umdas) and shaykhs; and all of the headmen and shaykhs of the villages of Egypt in their variety, to set out and precisely count and record the population in registers specifically designed for this purpose. And that the lists inscribed by means of the information supplied by the headmen and shaykhs of the villages shall be accurate. And if, upon examination, there appear discrepancies or the concealment of persons, regardless of whether they are male or female, or if fraudulent methods have been used in the count, every one against whom such things are proved shall be considered an enemy of his country and of the government and shall have drawn down upon himself the penalty. Similarly, any government or other official who causes the least slackness and neglects the execution of his duties in this matter shall be held responsible and their trial shall be conducted according to the administrative law (qanunan) with harsh punishments according to the degree of their offence; for they are the ones who are responsible for the exact conduct of the work in a proper way. The Government expresses its hope that these village headmen and shaykhs perform their duties in this regard in order that it may obtain what is desired and We pledge to compensate them for that specifically. And if they disappoint the government in this regard, We will be compelled in such instance to use means which We would prefer not to use in their regard.

Source: Cuno and Reimer (1997): translated from the order in Sami, Amin (1928), *Taqwim Al-Nil*, Vol. 2, pp. 535-536, Dar Al-Kutub, Cairo

2. Census Order to Extend the Census Operations to the Urban Provinces (Muharram 22, 1263 H; January 10, 1847)

Whereas the attainment of the general good from conducting a census of population necessitates the enumeration of the people of Cairo, Alexandria, Damietta, Rosetta, Qusayr, and Suez, the execution of this task shall commence at the beginning of Safar 1263 [19 January 1847] and be completed within four months. The counting of the people of Cairo and the aforementioned towns shall be by means of the shaykhs of the thumns and the haras, in consultation with the shaykhs and elders of the guilds. For each thumn, an officer from the regular army who is literate and competent in government operations (ashghal) shall be appointed to oversee the shaykhs conducting the census, to ensure that proper procedures are followed and to prevent delays. Likewise, two clerks shall be appointed to accompany each shaykh over a thumn. The aforementioned army officers shall act under the Prefect (dabit bek); the latter shall oversee census operations and shall exert himself to urge all census-takers to perform their duties, recording the count of persons in the official lists at the stipulated time. Inasmuch as the Prefect is charged with collecting the lists, an appropriate number of clerks shall be appointed to the Prefecture in order for the lists to be recorded and forwarded to the Khedivial Diwan (al-Diwan al-Khidiwi). If the Prefect notices problems in conducting the census, for which he cannot find a solution, the particulars shall be referred immediately to the Diwan for a decision. In order to assist the Prefect in the settlement of claims, there shall be appointed to the prefecture the Lieutenant Colonel (qa'im maqam) Khalil Afandi, Director of the Army's Office of Disbursements (nazir qalam al-khazina bi-l-jihadiyya). Inasmuch as the census shall obtain information concerning both adults and juveniles amongst the male and female populations such that it encompasses every living person, it is required that males shall be divided into two sections, boys

and men, and that females be divided also, into girls and women. In addition, information shall be obtained on female slaves and male slaves, and on Turks (abna al-turk), Arabs (abna al-arab), Maghribis, Hijazis, Syrians, Copts, Greeks, Armenians, and Jews; with an account of their trade (al-sinf) and their home town or village (al-balda); and similarly, the Europeans (taifat al-afranj) shall be recorded along with the names of the states to which they belong. In order that there be no problems in the conducting of the census, it is incumbent upon each of the shaykhs of the thumns to write a list with the names of the persons in his thumn who are from among the men of high state rank (al-dhawat), the great ulema, the prominent townsmen (wujuh al-balda), the great merchants- everyone to whom consideration is due- giving their titles, their houses (manazilihim), and the haras where they live; and to forward this list to the Prefect, who shall issue to them [i.e., the notables] special certificates (tadhakir), requesting from them lists with a count of the persons present in their houses including the aforementioned information [about sex, age-group, etc.]. Upon receipt thereof he shall confirm and record them in the register for the thumn and hara represented. Likewise, the aforementioned procedure shall be followed for the collection of the lists of Europeans, according to the consulates to which they belong, by the Khedivial Diwan itself. These lists shall be conveyed to the prefecture in order for the Europeans to be recorded in the thumns and haras where they reside. The compilation of lists for the people of lesser status shall be done by the shaykhs of the haras and thumns in consultation with the shaykhs of the guilds. These shaykhs shall not enter the homes (buyut) of the people, but are to request information for the census from the owners of the dwellings (ashab al-amakin) and enter these reports into the lists. If it is suspected that certain persons are not giving complete information, concealing persons who are with them (yukhfi ba'd induhu), it is imperative that the aforesaid shaykhs make inquiries with the neighbors. If it is determined thereby that there are more persons in the house (bayt) than reported, the shaykhs must strive to obtain complete information by going to the owner of the house (sahib al-bayt) and telling him that so-and-so is in your house (indak fulan) but has not been reported. Anyone who stubbornly refuses to report persons who are dwelling with him (man indahu) shall be informed that the government for its part has fixed a severe punishment for those who conceal the number of persons. The prefecture shall be informed of the situation so that it may take appropriate action with regard to the offender. Let the shaykhs of the thumns be urged to exercise diligence in this matter, knowing that for diligence and faithfulness in accurately recording the population they will be remunerated and promoted; if they are neglectful, their punishment has been set. The registration and enumeration of the inhabitants of tenement houses (al-rubu) shall take place in the manner discussed above. However, since many crude huts (al- ishash wa al- zarayib) are crowded together in certain areas, and most of the inhabitants are people of the villages [i.e. rural migrants], and it would not suffice to enumerate them by inquiring [in their places of residence], they shall be enumerated and registered at their place of work. Since some domestic servants are unmarried and living at their place of work while others have a residence in Cairo- and since duplication would result if one of the latter category were to be registered in both the house where he works and the hara where he lives- in order to prevent such duplication, these persons who own dwellings shall be merely noted and recorded as present in the lists for the houses where they serve, but registered in the lists for the haras where they live with their dependants, with the detailed report of males and females. The soldiers dwelling in huts in Cairo and other large towns shall be counted by the army itself, the lists being presented to the Ministry of War (Diwan al-Jihadiyya) and conveyed thence to the Khedivial Diwan. The conducting of the census is a matter of benefit for the homeland, and whoever understands its merit will strive body and soul for the sake of its execution. Therefore, before beginning the enumeration and the issuing of census certificates by the prefecture, it is necessary to summon his excellency the Shaykh al-Azhar, their excellencies the Muftis, Arusi Pasha and Sharqawi Pasha, the heads of the merchants' councils, and some of the headmen, to the Khedivial Diwan, to instruct them in the positive merit of the census. The census at Alexandria shall be conducted upon the same principles as that of Cairo, by the Khedivial Diwan and the Prefect of Alexandria; and similarly also for the counting of the people of the towns of Damietta, Rosetta, Qusayr, and Suez, by the governors of these towns, as has been determined.

Seals: Kathkhuda al-Khidiwi; Mudir Diwan al-Jihadiyya; Mudir Diwan al- Maliyya; Wakil Diwan al-Khidiwi; Ra'is Jamiyat al-Haqqaniyya; Mudir Diwan al-Madaris; Mudir al-Hisabat al-Misriyya.

Source: Cuno and Reimer (1997); Translated from the original order found at the NAE.

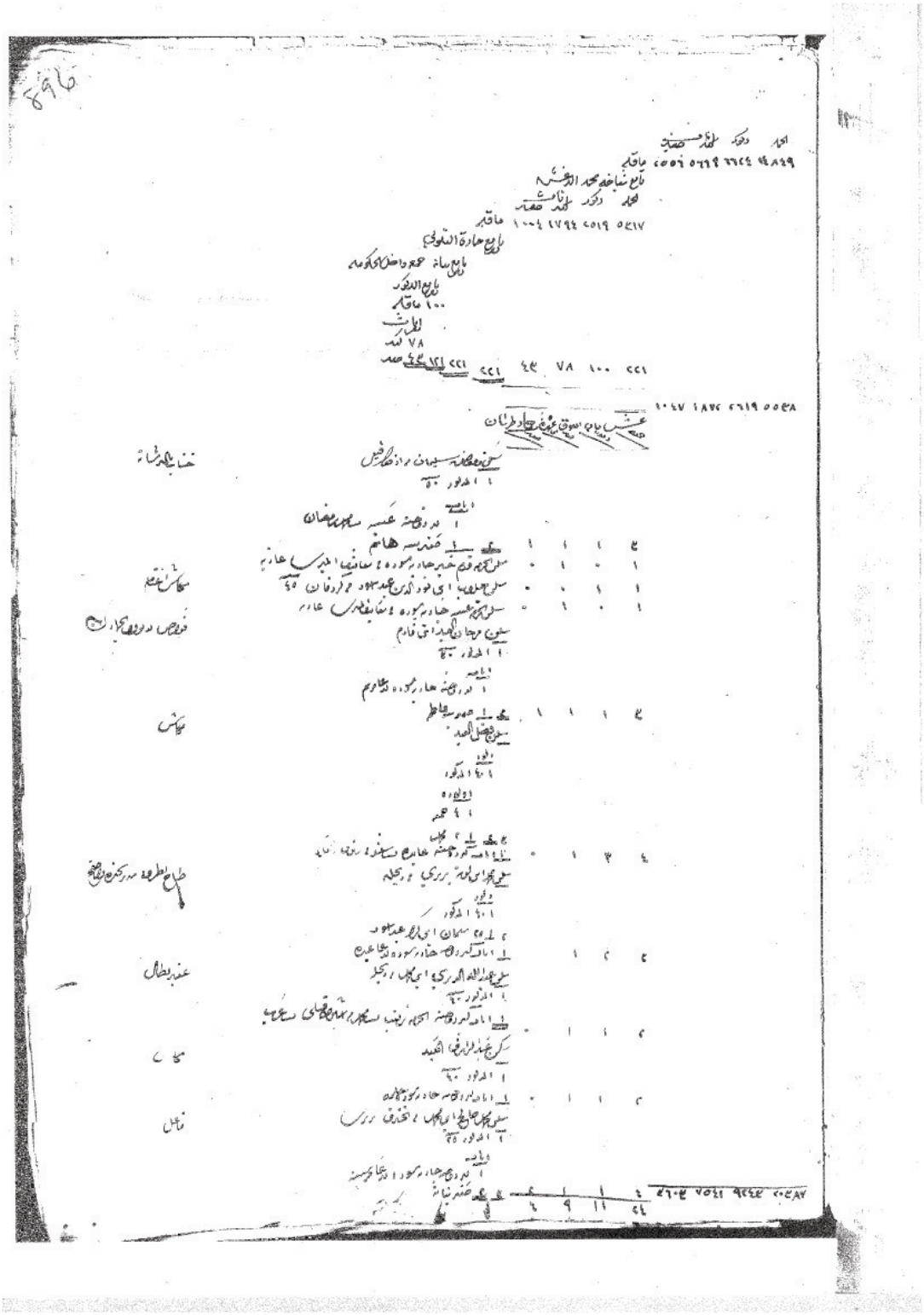
3- Ismail's Order to Ministry of Interior to Start the Census Operations (Safar 25, 1285 H; June 16, 1868)

This is a copy of the House of Representatives' decree issued on Safar 21, 1285 (H)[1], number 1, indicating the House's recommendation of conducting a census of the populations of hamlets and villages (Nuzul and Kufur). Since We approve starting this operation, according to the aforementioned House's decree in the way that is described in the copy, We issue this order to you to confirm starting the operation.

Source: Translated from the order in Sami, Amin (1928), *Taqwim Al-Nil*, Vol. 3(2), pp. 785, Dar Al-Kutub, Cairo

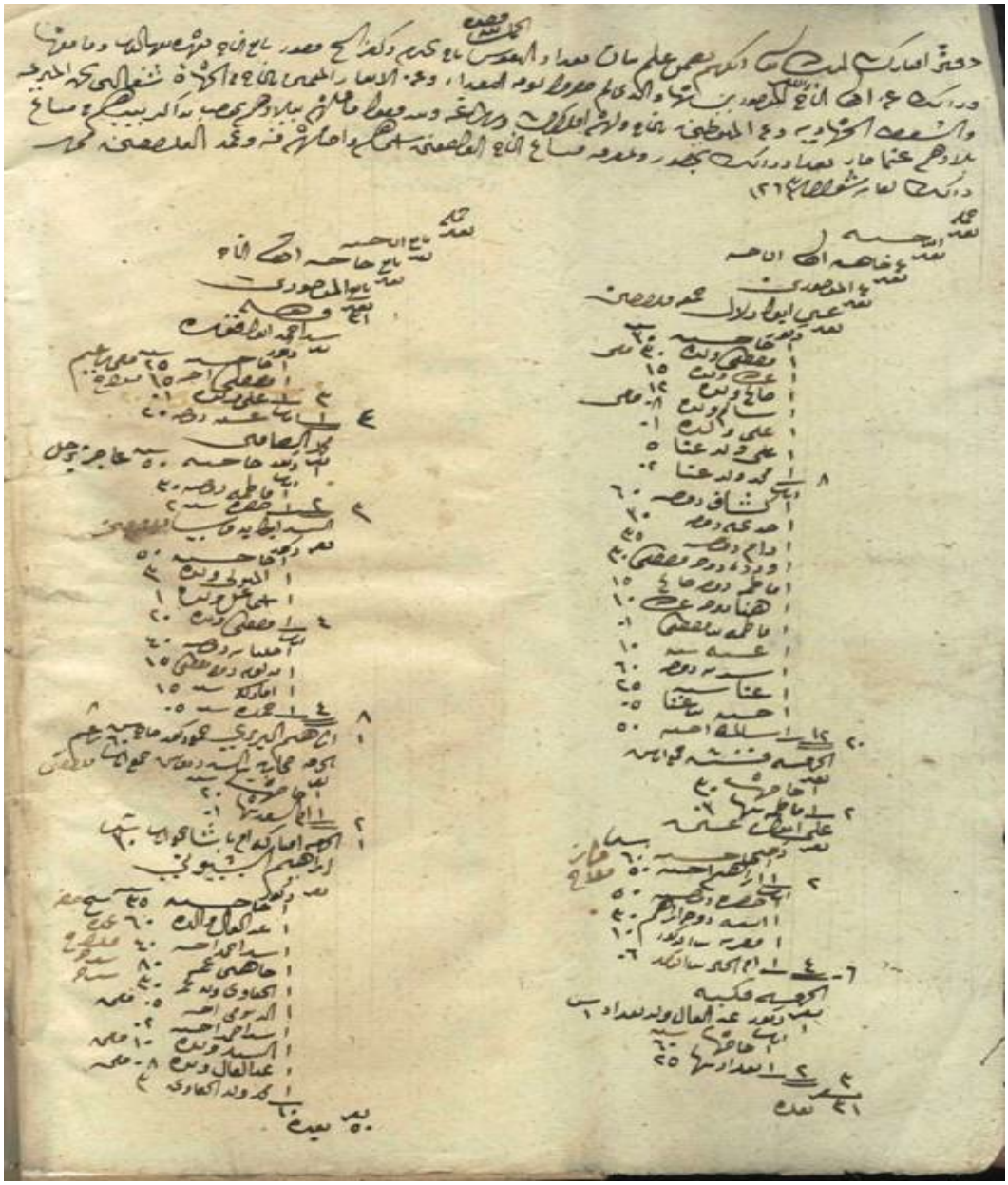
[1] June 11, 1868.

Appendix (B): Scanned Pages of the Census Registers
1- A Page from an Urban Province (Cairo)



Page 896 of Register of Abdin District, Cairo Province, 1848, Preserved at the NAE

2- A Page from a Rural Province (Al-Gharbiya)



First page of register of Village "Bigirim wa Kafr al-Sheikh Mansour", Al-Gharbiya Province, 1847, Preserved at the NAE

Appendix (C): Actual Examples of the Digitized Census Records

1. (Al-Mu'allem) Antonios Luqa: Male, Free, Able-bodied, HH Head, 40 years, Under the control of the government, Coptic Christian, From Abu-Tig (in Abu-Tig, Asyut), Scribe at the Customs Department in Bulaq.
Address: 15 Harat Al-Izba (From Darb Al-Geneina), Shyakhat (Quarter) Youssef Alam, (District of) Al-Azbakiya, (Province of) Cairo.
Type of Dwelling: House Waqf (Religious Endowment) of Copts.

2. Salman Abdel-Rehim: Male, Free, Able-Bodied, HH Head, 45 years, Under the control of the government, Muslim, From Tukh (in Qena, Qena), Farmer.
Address: House of Salman Abdel-Rehim, Hissat Naser Eleiwa, (Village of) Tukh, (District of) Qena, (Province of) Qena.

3. Mardukh Youssef: Male, Free, Able-Bodied, HH Head, 25 years, Under the control of the government, Jew, From Cairo, Goldsmith.
Address: 35 Harat Al-Yahud Al-Qarra'een (Karaite Jews), Shyakhat (Quarter) Khidr Ibrahim, (District of) Bab El-Shiriyya, (Province of) Cairo.
Type of Dwelling: House owned by the heirs of Ibrahim Khidr.

Table (1): Non-Coverage: Comparing Coverage at the District- and Village- Levels in the 1848/1868 Censuses and the 1882 Census

1882 Province	Number of Districts	% Covered 1848	% Covered 1868	Number of Villages	% Covered 1848	% Covered 1868	1848 Unmatched Units	1868 Unmatched Units
Cairo	12	91.67	83.33	NA	NA	NA	0	0
Alexandria	6	83.33	16.67	NA	NA	NA	0	9
Rosetta	2	100.00	100.00	NA	NA	NA	0	0
Al-Arish	1	100.00	100.00	NA	NA	NA	0	0
Al-Qusayr	1	100.00	0.00	NA	NA	NA	0	0
Damietta	3	33.33	0.00	NA	NA	NA	0	0
Port Said and Canal	1	0.00	0.00	NA	NA	NA	0	0
Al-Daqahliya	6	100.00	100.00	443	73.14	32.05	61	30
Al-Sharqiya	6	100.00	33.33	433	69.75	1.15	207	10
Al-Qalyubiya	3	100.00	0.00	163	79.75	0.00	37	0
Al-Gharbiya	10	80.00	0.00	547	6.58	0.00	21	0
Al-Minufiya	5	100.00	0.00	331	51.66	0.00	27	0
Al-Buhayra	6	100.00	0.00	304	47.04	0.00	43	0
Al-Giza	4	100.00	100.00	167	92.22	89.22	38	27
Bani Suwayf	3	100.00	100.00	168	81.55	29.17	66	15
Al-Fayyum	4	100.00	50.00	91	95.60	90.11	26	9
Al-Minya	4	100.00	25.00	267	86.52	0.37	119	0
Asyut	10	100.00	100.00	320	54.06	59.69	15	14
Girga	5	100.00	20.00	190	65.26	0.53	10	0
Qina	4	100.00	0.00	109	56.88	0.00	19	0
Isna	6	33.33	0.00	107	14.02	0.00		

Provinces, and number of districts and villages in columns 1, 2, and 5 are recorded according to 1882 census administrative division. The percentages of the 1882 districts (for the urban provinces) or villages (for rural provinces) for which there exists at least one surviving register in 1848/1868 censuses are recorded in columns 3, 4, 6, and 7. Columns 8 and 9 show the number of districts/villages that do have a surviving register in 1848/1868 but do not exist under the same name in 1882 census. These last two columns follow the administrative division of the 1848/68 censuses. The relatively high number of these unmatched units in some provinces is due to the relative concentration of Arab tribes and/or hamlets that were mostly integrated to the nearby villages by the 1882 census.

Table (2): Non-Coverage: Estimating Individual-Level Coverage Rate in Each Province in 1848

Province	1848			1868		
	Estimated Population	Actual Population	Coverage Rate (%)	Estimated Population	Actual Population	Coverage Rate (%)
Cairo	255,978	237,000	93	320,360	258,898	81
Alexandria	158,021	119,788	76	197,766	154,876	78
Rosetta	13,233	18,187	137	16,562	2,257	14
Al-Arish	2,005	2,311	115	2,509	1,820	73
Al-Qusayr	1,659	3,024	182	NA	NA	NA
Al-Daqahliya	397,720	333,615	84	497,752	144,489	29
Al-Sharqiya	259,766	295,533	114	325,100	20,384	6
Al-Qalyubiya	173,804	179,671	103	NA	NA	NA
Al-Gharbiya	627,764	55,403	9	NA	NA	NA
Al-Minufiya	439,745	139,280	32	NA	NA	NA
Al-Buhayra	270,526	142,890	53	NA	NA	NA
Al-Giza	187,672	215,873	115	234,874	257,038	109
Bani Suwayf	133,099	189,045	142	166,576	44,424	27
Al-Fayyum	145,444	172,801	119	182,025	121,448	67
Al-Minya	201,507	241,633	120	NA	NA	NA
Asyut	390,438	236,297	61	488,638	424,512	87
Girga	350,928	195,496	56	NA	NA	NA
Qina and Isna	413,234	213,490	52	NA	NA	NA

Province in this table is defined as follows: (1) For the geographical units of 1848/1868 census that were found in the 1882 census, the province is the one to which the unit belonged in that later census. (2) For the units that were not found in the 1882 census, the province is the one to which the unit belonged according to the 1848/1868 census administrative division, as reflected in the census registers' archival organization. Damietta is excluded because there is only one surviving census register of that province that actually belonged to another province, Al-Daqahliya, in 1848. Port Said and Canal province is excluded because it mostly did not exist in 1848/68, and the register of Suez, its oldest city, did not survive. Qina and Isna provinces are combined into one single province to match the administrative division in 1848/68. Estimated population of each province (which is an estimate of the true population size) is computed based on the province's share in 1882 population census under two assumptions: (1) There were no major administrative division changes that took place (for the units of 1848/68 that were not matched in 1882) between 1848/68 and 1882, and (2) There were no major immigration waves that took place between provinces between the two years. Actual population of each province is the total enumeration count that I obtained in 1848 by summing up the counts as recorded in the registers included in the sampling frame according to the province definition given above. In 1868, I obtained these numbers based on the total number of pages of the registers of each province and the average number of individuals per page. Coverage rate is the ratio of actual population to estimated population.

Table (3): Duplicates: Geographical Units that Were Enumerated in More than One Year in the Periods 1846-48 and 1865-68 by Province

Province	Duplicates in 1848	Duplicates in 1868
Cairo	0	0
Alexandria	0	0
Rosetta	0	0
Al-Arish	0	0
Al-Qusayr	0	NA
Al-Daqahliya	186	2
Al-Sharqiya	87	0
Al-Qalyubiya	0	NA
Al-Gharbiya	15	NA
Al-Minufiya	6	NA
Al-Buhayra	1	NA
Al-Giza	1	1
Bani Suwayf	1	9
Al-Fayyum	2	0
Al-Minya	10	NA
Asyut	0	21
Girga	0	NA
Qina and Isna	0	NA

Province in this table is defined as follows: (1) For the geographical units of 1848/1868 censuses that were found in the 1882 census, the province is the one to which the unit belonged in that later census. (2) For the units that were not found in the 1882 census, the province is the one to which the unit belonged according to the 1848/1868 census administrative division, as reflected in the census registers' archival organization. Damietta is excluded because there is only one surviving 1848 census register of that province (according to 1882 division) that actually belonged to another province, Al-Daqahliya, back in 1848. Port Said and Canal province is excluded because it mostly did not exist in 1848/1868, and the register of Suez, its oldest city, did not survive in either census. Qina and Isna provinces are combined into one single province to match the administrative division in 1848. A duplicate is defined as the geographical unit that has more than one register belonging to different years over the periods 1846-48 (for the 1848 census) and 1865-68 (for the 1868 census). Under this definition, a unit that has more than one register that all belong to the same year is *not* a duplicate.

Table (4): Sampling in 1848 and 1868: Geographical Distribution by Province, and Targeted and Actual Sampling Rates

1848/1868 Province	1848				1868			
	Target Population	Actual Sample Size	Target Sampling Rate	Actual Sampling Rate	Target Population	Actual Sample Size	Target Sampling Rate	Actual Sampling Rate
Cairo	255,978	20,635	0.05	0.08	320,360	33,285	0.05	0.10
Alexandria	158,021	16,061	0.05	0.10	197,766	23,617	0.05	0.12
Rosetta	13,233	448	0.01	0.03	16,562	513	0.01	0.03
Al-Arish	2,005	51	0.01	0.03	2,509	26	0.01	0.01
Al-Qusayr	1,659	175	0.01	0.11	NA	NA	NA	NA
Al-Daqahliya	397,720	6,374	0.01	0.02	497,752	5,039	0.01	0.01
Al-Sharqiya	259,766	3,012	0.01	0.01	325,100	3,257	0.01	0.01
Al-Qalyubiya	173,804	3,908	0.01	0.02	NA	NA	NA	NA
Al-Gharbiya	627,764	7,369	0.01	0.01	NA	NA	NA	NA
Al-Minufiya	439,745	5,661	0.01	0.01	NA	NA	NA	NA
Al-Buhayra	270,526	3,135	0.01	0.01	NA	NA	NA	NA
Al-Giza	187,672	3,509	0.01	0.02	234,874	2,590	0.01	0.01
Bani Suwayf	133,099	1,456	0.01	0.01	166,576	1,568	0.01	0.01
Al-Fayyum	145,444	1,489	0.01	0.01	182,025	2,403	0.01	0.01
Al-Minya	201,507	2,264	0.01	0.01	NA	NA	NA	NA
Asyut	390,438	4,309	0.01	0.01	488,638	6,117	0.01	0.01
Girga	350,928	3,540	0.01	0.01	NA	NA	NA	NA
Qina and Isna	413,234	4,212	0.01	0.01	NA	NA	NA	NA

Province is defined as that to which the geographical unit belonged in the 1848/1868 census registers. Target population is calculated based on the province's population share in the 1882 census (See Table 2) under two assumptions: (1) There were no major administrative division changes that took place across provinces between 1848 and 1882, and (2) There were no major immigration waves that took place between provinces between the two years. Both assumptions seem to be supported by evidence. Actual sample size is the number of individuals that were actually included in the sample in each province according to the province's definition given above. Target sampling rate is the *a priori* planned sampling rate. Actual sampling rate is the ratio of the actual sample size to the target population in each province.

Table (5): Probit Estimation for Probablity of Coverage in Rural Provinces in the 1848 and 1868 Censuses

	1848			1868		
	Dependent Variable: Indicator for having at least one surviving register					
log(population)	0.074*** (0.193)	0.240*** (0.023)	0.334*** (0.028)	0.037 (0.263)	0.131*** (0.040)	0.187*** (0.049)
Provinical Town	-0.332* (0.184)	-0.384* (0.216)	-0.346 (0.238)	-0.275 (0.207)	-0.136 (0.315)	-0.030 (0.395)
Hamlet or Arab Tribe	1.495*** (0.128)	1.762*** (0.158)	0.416* (0.239)	1.937*** (0.168)	1.492*** (0.184)	0.635* (0.337)
Delta	-0.446*** (0.042)			-1.069*** (0.053)		
Province Fixed Effects	No	Yes	No	No	Yes	No
District Fixed Effects	No	No	Yes	No	No	Yes
N	**4,243**	**4,243**	**3,433**	**3,728**	**2,275**	**1,236**
Pseudo R^2	0.065	0.293	0.293	0.169	0.464	0.342
Log Likelihood	-2,600.27	-1,965.15	-1,626.15	-1,516.23	-759.46	-561.50
LR Chi-Squared	361.99 (p=0.000)	1632.21 (p=0.000)	1346.52 (p=0.000)	617.85 (p=0.000)	1316.50 (p=0.000)	582.69 (p=0.000)

Standard errors are in parentheses. The observations are all the geographical units of the rural provinces in the 1848 (or 1868) census and the 1882 census. Dependent variable takes one if the geographical unit has at least one surviving register in 1848/1868 census. Regressors inlcude: (i) log(population) measured (a) using the 1882 census population shares for the units that existed in the 1882 census (whether covered in 1848/1868 or not), or (b) using the census registers actual enumeration counts for the units of 1848/1868 censuses that were not matched in the 1882 census. The enumeration counts of the 1868 unmatched units were estimated using the unit's page count and the sample average population per page in the province (See footnote 16). (ii) Type of the geographical unit with "village" being the base category. The other two types are provincial town and hamlet or Arab tribe. The type is measured using the recorded type in the 1848/1868 registers for the units that have a surviving register, or using the 1882 census types for the uncovered units (those that existed in 1882 but not in 1848/1868 census). (iii) Delta region, province, or district fixed effects. The regression is estimated for each year separately.

Table (6): Selected Descriptive Statistics from the 1848 and 1868 Samples

	1848		1868	
	Cairo and Alexandria	**Other Provinces**	**Cairo and Alexandria**	**Other Provinces**
Dwelling Type				
House/unspecified/unknown	73%	100%	73%	100%
Low-Status dwellings	16%	0%	17%	0%
Multiple-Household dwellings	7%	0%	6%	0%
Production sites	3%	0%	3%	0%
Dwelling Legal Status				
Unspecified	25%	99%	15%	100%
Ownership (public or private)	64%	1%	71%	0%
Waqf (religious endowment)	11%	0%	14%	0%
Gender				
Male	49%	50%	51%	50%
Religion				
Muslim	89%	92%	86%	91%
Christian	6%	6%	4%	7%
Jew	1%	0%	1%	0%
Unspecified	4%	2%	9%	2%
Nationality				
Outside government control	7%	1%	7%	1%
Legal Status				
Slave	2%	0%	3%	1%
Ethnicity				
Local	87%	97%	87%	97%
Turkish	3%	1%	2%	0%
Black	1%	0%	5%	2%
European	1%	0%	1%	0%
Levantine	1%	0%	1%	0%
Nubian	1%	0%	1%	0%
Sample Size	**36,509**	**43,519**	**56,902**	**21,513**

Table (7): Sectoral Distribution of Adult Male Workers in 1848 and 1868 Egypt

	1848			1868		
	Cairo	**Alexandria**	**Other Provinces**	**Cairo**	**Alexandria**	**Other Provinces**
% Adult males in the modern sector	10.91	2.2	1.64	2.78	3.61	0.32
N	**5,061**	**4,735**	**9,034**	**8,828**	**6,446**	**4,018**

Sample is restricted to males who are at least 15 years old with non-missing occupational title.

Table (8): Occupational Distribution of Workers in the Modern and Traditional Sectors in Cairo and Alexandria by Year

	1848		1868	
	Modern	**Traditional**	**Modern**	**Traditional**
Engineers, physicians, pharmacists, ships' masters	1%	1%	4%	1%
Judges, agents, teachers, religious workers, artists	0%	6%	0%	6%
Administrative and managerial workers	2%	0%	2%	0%
Scribes, financiers, stores clerks, customs clerks, post clerks	9%	5%	17%	5%
Merchants, street sellers, auctioneers, water porters, slaves traders	1%	14%	0%	15%
Cooks, servants, slaves, policemen, military, assistants	3%	20%	8%	18%
Farmers, animal husbandry workers, fishermen	0%	5%	0%	5%
Wood treaters, gunpowder makers, textile workers, millers, food processors	9%	17%	6%	17%
Shoe makers, blacksmiths, goldsmiths, silversmiths, potters, stone cutters	6%	6%	6%	7%
Construction workers, carpenters, building painters, transportation workers, laborers	69%	26%	57%	26%
N (Males at least 15 years old with non-missing occupational title)	**656**	**9,140**	**478**	**14,796**

	1848		1868	
	Modern	**Traditional**	**Modern**	**Traditional**
Unskilled Labor	58%	50%	38%	47%
Skilled Artisans	29%	28%	24%	30%
White-Collar Workers	14%	22%	38%	23%
N	**656**	**9,140**	**478**	**14,796**