A great colonial divergence in biological standards of living?
The secular trend of stature among indigenous people and settlers in Algeria, 1880-1940

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1. Introduction: A Malthusian threat to indigenous Algerians and well-off settlers?

The demographic transition of the 1940s and 1950s, when the fertility of the Algerian population was beating world records[1], posed a conspicuous threat of a Malthusian crisis. This formed the leitmotif of the socio-economic and political analyses performed by the French authorities at the end of the colonial period (Chevalier 1947; Boyer and Breil 1958)[2]. Some French technocrats believed that, by overcoming this threat, France would maintain the trust of Algerians and so ensure a sustainable French presence in Algeria. Anthropometrically, following John Komlos (Komlos 1998; Haines 2000, 177), it is certain that there was no crisis as such, because this would have meant that the population grew taller during a period of demographic decline; now, while research is still underway to determine whether the population did gain height, demographers and historians have shown that no demographic decline occurred. But what were the consequences of the demographic explosion that accompanied the rise of Algerian nationalism in terms of net nutrition levels? In other words, how severe was the threat of a Malthusian crisis for the Algerian population between 1900 and 1962? Was the "beggaring of Algeria", as in Germaine Tillion's celebrated expression (*clochardisation de l'Algérie*, see Tillion 1957, 7 and 10), confirmed by the anthropometric index?

Population censuses still suffered from imperfections in the twentieth century, but even so they were much more reliable than in the nineteenth century (Chevalier 1947, 19; Kateb 2001, 103-108 and 232): the strong indigenous[3] population growth, and the concomitant decline in food supply per capita in Algeria was not in doubt (Stora 2004, 44)[4]. This declining per capita production was likely to reflect a decline in the per capita food ration for a population that was overwhelmingly rural and still largely engaged in self-sufficient farming (Kateb Melhani and Rebah 2018, 60)[5]. even if rural wage-earning surged very significantly in the twentieth century. Emigration to the metropole, which became massive after 1945, testified to this "beggaring" of the indigenous population[6]. But on the other hand, health and medical progress (Kateb 2001, 290-294) were likely to improve the net nutrition level of Algerians, as shown *a contrario* by the anthropometric malus of soldiers suffering from malaria, a disease then endemic in Algeria (Heyberger 2019a). Did

SIDeS, «Popolazione e Storia»,
2/2021, pp. 33-57. DOI: 10.4424/ps2021-6

the stunting effects (decrease in food intake per capita) outweigh the growth effects (improved epidemiological context) at the end of the colonial period, *i.e.* were Algerians taller or shorter? It is worth asking to what extent Algeria was like India, that other European colonial "jewel", where in the first half of the twentieth century, in a context of population growth and declining agricultural production per capita, the stature of Indians stagnated or even declined slightly (Guntupalli 2007, 33-43). Or to what extent Algeria was like South Africa, the other great European colonial settlement of Africa, where in the first three decades of the century, in a context of population growth, land confiscation by Whites and discriminatory labour practices in the second largest employer after agriculture -mining sector, the stature of Blacks seems to have decline slightly (Mpeta, Fourie and Inwood 2017, 4 and 10)[7].

When the land could no longer feed those who farmed it, the rural exodus became massive. The Muslim population in cities swelled in the twentieth century, especially from the 1930s onwards. The French language owes the word "*bidonville*" (slum) to the impoverished districts that mushroomed on the outskirts of Algiers. The Third World – and nuanced – vision of these neighbourhoods advanced by the famous Descloitres survey supports the idea that a strong urban penalty will be apparent in anthropometric terms (Descloitres, Reverdy and Descloitres 1961). I wish therefore to examine whether there was a major divergence in terms of an urban penalty between the Muslim and European urban populations. On the contrary, one can wonder whether Algeria – which according to Kamel Kateb then benefitted from some of the best medical facilities in the Third World, and where the major cities at least also benefitted from a modern water supply and sewage system – fitted into the pattern that seems to have emerged for the countries of the Global South in the twentieth century. By that, one means namely that there was no decrease in stature as had occurred in the northern countries during the process of industrialization in the eighteenth and nineteenth centuries because, in a classical pattern, latecomers benefitted from the advances, and especially the medical advances, of the pioneers (Brinkman and Drukker 1998). Without any question of mixing morality and history and mentioning the "positive role of the French presence overseas", we can therefore test the hypothesis for the Muslim population of an urban bonus in the twentieth century, taking into account possible biases (migration, structural effects, etc.).

On the side of European Algerians, or citizens[8], incoming migratory flows decreased very significantly after the First World War (see table 1) and it could be expected that, with the development of the colonial extraction economy, then based on viticulture and the production of fruit and vegetables for the metropole, the standard of living and stature would both rise. The question arises as to whether the "colonial compact" (*pacte colonial*, see Meynier 2015, 53), which was particularly favourable to European winegrowers between the world wars (Marseille 2005, 90; Lefeuvre 1997, 55), resulted in an anthropometric bonus for some of the settlers, or whether colonization paid off in terms of net nutrition in the twentieth century for all the settlers. In other words, it is worth examining whether the stature of the latter increased at the same rate as for inhabitants of the metropole, or whether

there was a faster rise, particularly because the European Algerian population was more highly urbanized than the metropolitan population, at a time when Western urbanization was associated with better medical care, a favourable epidemiological environment and occupations that were both less physically demanding and better paid. A further question is whether change occurred in fits and starts because of the particular difficulties the colony encountered during the world conflicts, given that the colonial economy relied heavily on its maritime links with the metropole which were badly disrupted at those times (Meynier 2015, 56 and 287). According to contemporaries like Albert Camus or the Jean Moulin think tank, it is not certain that the standard of living of the *pieds-noirs*[9] improved in the twentieth century; or rather it is likely that the standard of living of European Algerians lagged behind that of inhabitants of the metropole[10].

To sum up – setting aside any question of a teleological vision of history – I examine whether the evidence points to a great divide between the net nutritional levels of Algerians and Europeans on the eve of Independence in the country that was the main settlement colony of the French Empire.

2. The sources and their representativeness

I have already used French military sources to study the change in the stature of citizens (settlers, birth decades 1850-1880) and subjects (indigenous, birth decades 1800-1880) in Algeria for the nineteenth century (Heyberger 2019b). Conscription was introduced for citizens in 1875, after France's defeat by Prussia in 1870. The series for Europeans is therefore homogeneous over the entire period studied (mandatory service). On the other hand, for the subjects, out of fear of arming a mass of indigenous people who might revolt against the colonial order, conscription only came into force in 1912 as a result of international tensions with Germany in the early twentieth century (Meynier 2015, 89-104).

The indigenous recruitment system was therefore based on volunteerism (nineteenth century) before becoming mixed (conscription/voluntary service) from 1912 to 1962 (Recham 1996, 15-65). The series exploited here for the indigenous population therefore straddles, from a sociological point of view, a major divide between the beginning (1903-1912) and the end (1913-1961) of the study period. For reasons of time, I have been unable to proceed as in my previous work on the nineteenth century, *i.e.* by continuous sampling of all the registers kept at the ANOM[11] in Aix-en-Provence (citizens, up to the 1937 class) and at the CAPM[12] in Pau (citizens from 1943 onwards, subjects, 1903 to 1961 classes). Indeed, the CAPM estimates its Algerian base – not classified at the time I consulted it – at about three million individual files, whereas for comparison, the Service Historique de la Défense of Vincennes reportedly maintains "only" 1.4 million files of infantrymen for the metropole before 1789. I therefore sampled one year out of six from 1903 to 1961 and, within each of these years, a random sampling rate was defined to obtain a sufficient number of individuals (Table 2 and Figure 2)[13].

Tab. 1. *Descriptive statistics, citizens (i.e. settlers), 1907-1961 classes (i.e. examination cohorts)*

classes	1907	1913	1919	1925	1931	1937	1943	1949	1955	1961	Total N 1907-1961
variable (*)											
height of citizens											
mean height (cm)	166.8	166.8	165.3	167.1	167.5	167.1	168.9	168.7	169.0	170.1	2,256
standard deviation (cm)	5.9	6.1	6.0	6.3	5.8	5.7	6.3	6.2	6.5	6.9	2,256
not measured	23.6	16.7	10.1	28.2	23.1	22.3	31.2	22.7	27.9	38.6	753
age	age										
mean age (years)	20.8	20.3	20.2	20.7	20.7	20.0	20.0	20.0	20.0	20.0	2,870
standard deviation (years)	2.9	1.2	1.4	2.1	3.3	0.1	0.1	0.0	0.4	0.1	2,870
age unknown	1	0.3	0.0	0.7	1.7	8.2	4.5	10.8	11.1	6.5	139
birthplace											
born countryside [1*]	31.5	38.5	41.9	32.6	36.7	30.1	30.7	24.5	27.1	26.6	955
born small cities [2*]	11.5	12.5	13.7	11.9	11,8	7.9	9.4	13.8	10.2	9.8	337
born medium-sized cities [3*]	19.6	18.2	14.1	22.8	18.3	19.5	19.3	18.1	16.5	19.6	563
born Oran	12.5	9.8	12.3	12.9	10.5	11.3	15.0	12.6	15.9	17.0	394
born Algiers	11.1	9.2	11.9	11.9	11.5	15.4	11.0	14.4	15.6	17.6	390
born metropole	6.7	8.5	4.8	3.1	4.4	5.5	7.3	3.6	3.0	2.6	151
born other countries	5.1	2.6	1.3	4.1	5.1	2.4	2.6	1.8	0.6	0.3	78
place of birth unknown	1.0	0.7	0.0	0.7	1.7	7.9	4.7	11.2	11.1	6.5	141
mobility[4*]											
mobility yes	45.2	44.7	44.5	44.6	43.4	34.9	30.9	33.2	33.9	29.7	1,147
mobility unknown	14.1	11.8	8.4	11.9	12.9	16.1	25.9	15.5	18.0	16.7	470
educational level											
illiterate	14.1	5.6	6.6	6.5	5.1	2.4	0.8	4.7	2.1	2.0	144
read & write	17.2	24.8	17.2	27.2	31.2	25.0	5.8	20.9	5.4	4.9	524
primary education	32.0	13.7	8.8	33.3	17.6	21.2	18.1	37.5	36.3	33.3	765
baccalauréat[5*]	4.0	3.3	2.2	7.1	5.1	5.8	10.5	10.5	18.3	18.0	265
education unknown	32.7	52.6	65.2	25.9	41.0	45.6	64.8	26.4	37.9	41.8	1,311
occupation											
agriculture	25.6	18.6	22.0	15.3	13.6	7.5	10.7	8.3	8.7	4.6	397
industry	33.0	34.0	32.2	34.7	35.9	30.2	22.3	37.9	34.0	24.8	950
services	24.9	28.8	26.9	33.0	25.4	26.0	22.8	14.8	20.7	32.4	767
students	1.0	2.6	7.0	5.1	5.8	9.2	9.9	15.2	14.1	7.8	237
occupation unknown	15.5	16.0	11.9	11.9	19.3	27.1	34.3	23.8	22.5	30.4	658
military status											
fit for military service	60.2	56.6	48.5	59.1	52.2	48.0	5.2	42.5	58.9	56.8	1,438
absentee fit for service	18.9	13.1	14.1	16.7	14.2	13.4	1.0	2.2	12.3	26.8	391
fit for auxiliary service	4.7	5.2	3.1	3.1	4.1	3.4	0.3	0.0	0.9	1.0	75
exempted[6*]	8.1	12.4	7.0	11.9	6.4	6.5	2.6	13.4	5.7	2.0	223
volunteer	8.1	11.1	26.4	8.2	19.7	16.4	16.5	1.8	9.6	4.9	363
military status unknown	0.0	1.6	0.9	1.0	3.4	12.3	74.4	40.1	12.6	8.5	519

(*) % unless otherwise stated.
1* countryside: less than 5,000 inhabitants (indigenous and citizens), 1936 census (see Service de statistique générale 1937)
2* small cities: 5,000-19,999 inhab.
3* medium-sized cities: 20,000-80,873 inhab.
4* mobility commune of birth-commune of residence
5* or primary school certificate
6* or dispensed, automatically registered, reformed, crossed out, postponed (without further decision), maritime registered, other military status
Sources: 1903-1937 classes: ANOM, registers of serial numbers: sub-series 1RM (Algiers), 2 RM (Oran) and 3 RM (Constantine); 1943-1961 classes: CAPM, registers of serial numbers (unquoted archives).

Tab. 2. *Descriptive statistics, subjects (i.e. indigenous), 1903-1961 classes (i.e. examination cohorts)*

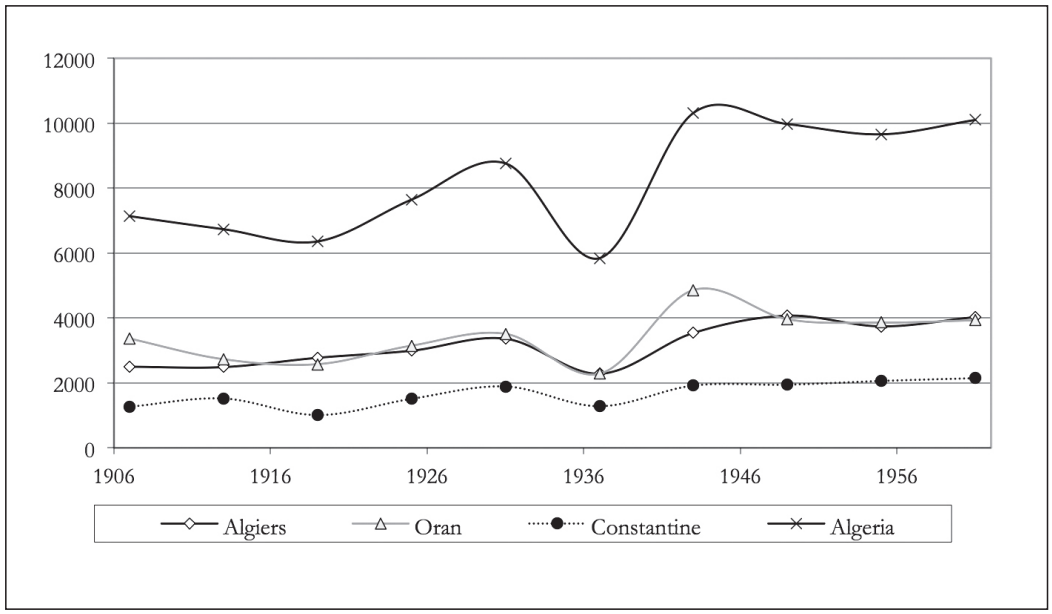
classes	1903	1907	1913	1919	1925	1931	1937	1943	1949	1955	1961	Total N 1903-1961
variables (*)												
height of subjects												
mean height (cm)	167.8	167.3	167.4	165.7	166.0	166.3	167.9	166.9	164.0	167.1	167.0	6,180
standard deviation (cm)	5.4	5.3	5.5	5.6	5.4	6.3	5.5	5.7	7.0	6.1	5.8	6,180
not measured	19.8	13.3	6.1	5.7	5.4	2.6	6.6	6.7	33.0	43.9	58.4	1,476
age												
mean age (years)	21.7	22.3	21.0	20.5	20.8	21.3	21.8	21.3	20.2	20.2	20.1	
standard deviation (years)	3.7	3.7	3.5	1.6	1.5	1.8	2.1	1.8	1.2	0.9	1.0	
precise age	0.9	1.0	24.0	50.6	56.9	58.2	51.6	56.4	73.0	59.1	88.6	3,876
known age year-round	98.7	98.6	73.4	48.9	43.0	41.3	47.5	42.3	22.6	28.3	8.8	3,572
unknown age	0.4	0.4	2.6	0.5	0.1	0.5	0.9	1.3	4.4	12.6	2.6	208
birthplace												
born countryside 1*	92.3	92.2	92.2	92.2	94.6	93.4	90.6	91.3	88.4	75.5	86.5	6,846
born small cities 2*	4.5	1.8	3.0	2.5	2.7	2.8	3.8	2.3	1.8	4.3	4.3	239
born medium-sized cities 3*	2.1	4.6	4.3	3.4	1.8	2.4	3.8	2.7	2.4	4.6	4.4	256
born big cities 4*	1.1	1.4	0.2	1.2	0.5	0.9	0.9	1.5	2.4	2.2	2.0	103
place of birth unknown	0.0	0.0	0.3	0.7	0.4	0.5	0.9	2.2	5.0	13.4	2.8	212
mobility5*												
mobility yes	15.1	14.3	11.5	8.0	9.6	8.8	10.3	6.5	14.6	17.8	25.4	993
mobility unknown	17.3	13.5	4.3	0.9	8.5	8.1	2.3	4.6	22.6	22.9	16.5	845
educational level												
illiterate	0.9	3.2	0.2	0.3	16.9	22.5	20.2	40.5	17.7	28.5	4.5	1,170

classes	1903	1907	1913	1919	1925	1931	1937	1943	1949	1955	1961	Total N 1903-1961
variables (*)												
read and/or write (in Arabic or/and in French)	0.0	0.2	0.0	0.0	1.5	1.8	3.4	3.6	4.1	8.2	16.6	310
baccalauréat6*	0.0	0.0	0.0	0.0	0.1	0.1	0.5	1.2	1.1	3.4	1.8	67
education unknown	99.1	96.6	99.8	99.7	81.5	75.6	75.9	54.7	77.1	59.9	77.1	6,109
occupation												
agricultural workers	16.6	13.3	10.3	17.1	25.1	30.6	31.6	40.9	34.9	38.1	39.2	2,169
farmers	13.2	7.9	26.8	28.6	37.2	35.3	29.9	29.2	15.6	11.9	5.8	1,707
student	0.2	0.0	0.0	0.1	0.4	0.7	1.9	1.5	1.1	2.0	1.4	71
industry & trades	0.6	0.2	0.9	0.7	1.5	3.0	3.8	4.6	5.7	9.5	6.2	280
occupation unknown	68.3	77.2	61.0	50.6	33.9	26.7	27.8	19.1	39.1	34.4	44.0	3,189
services	1.1	1.4	1.0	2.9	1.9	3.7	5.0	4.7	3.6	4.1	3.4	240
military status												
absentee fit for service	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	24.0	51.5	635
fit for military service	0.0	0.0	15.1	24.7	47.0	30.3	38.7	47.7	22.9	39.5	38.4	2,294
fit for auxiliary service	0.0	0.0	0.0	0.4	1.8	11.0	3.3	0.7	0.0	0.1	0.8	133
conscript	0.0	0.0	25.3	58.5	27.3	16.5	26.1	29.0	60.9	1.4	2.1	1,728
volunteer	100	100	51.0	13.5	12.3	16.9	22.4	12.4	5.8	11.7	3.6	2,077
exempted	0.0	0.0	8.3	2.9	11.6	25.3	9.5	10.2	9.1	11.7	0.5	656
military status unknown	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	11.6	3.1	133

(*) % unless otherwise stated.
1* countryside: less than 5,000 inhabitants (indigenous and citizens), 1936 census (see Service de statistique générale 1937)
2* small cities: 5,000-19,999 inhab.
3* medium-sized cities: 20,000-80,873 inhab.
4* big cities: Oran and Algiers
5* mobility commune of birth-commune of residence
6* or primary school certificate
Note: subjects are conscripts or volunteers, see the first two paragraphs of section 2.
Sources: CAPM, conscription and voluntary enlistment (indigenous) 1903-1961 classes: registers of serial numbers and booklets (unquoted archives).

The data collected for European conscripts suggest that the number of conscripts evolved in line with the civilian population (Figure 1)[14]: global growth in enrolments over the twentieth century, a phenomenon of the "depleted" class in 1937 caused by the birth deficits of the First World War, less European settlement in the East (Constantine department) than in the West (Oran and Algiers department)[15]. For the subjects[16], the introduction of conscription from 1912 did not

Fig. 1. *Conscription of French citizens (settlers), total estimated N, 1907-1961 classes (examination cohorts)*

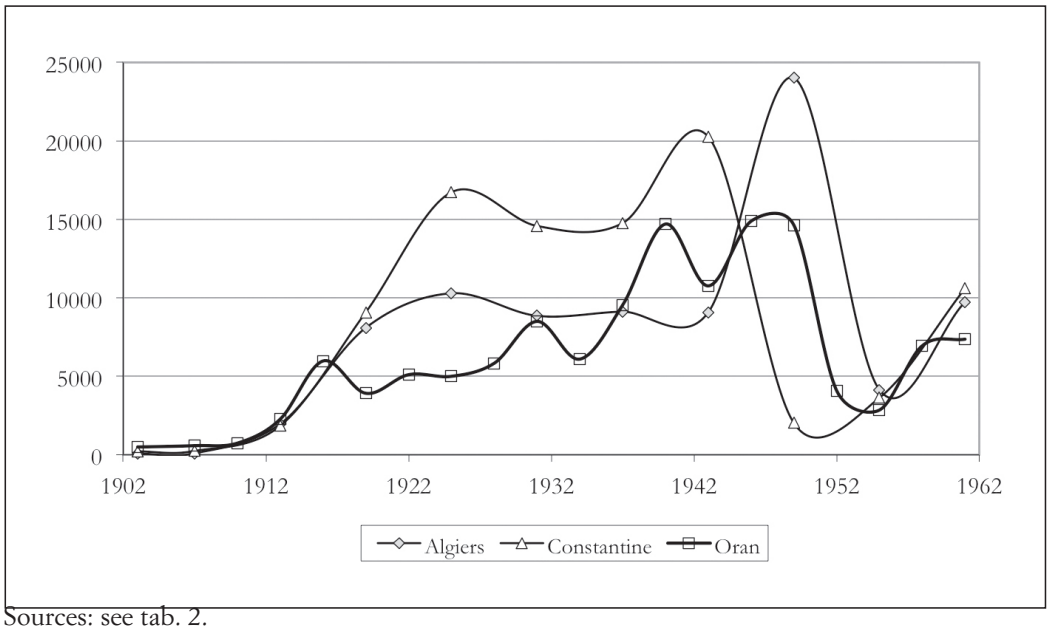


Sources: see Tab. 1.

guarantee a change in numbers in line with that of the civilian population (Figure 2). Admittedly, the overall growth in military personnel can partly be explained by the growth in the civilian population, especially between the 1919 and 1943 classes. But subsequent fluctuations in the number of registered recruits did not track the strong natural growth of the civilian population. These fluctuations were probably attributable more to administrative than political reasons. At the outbreak of the Algerian War (1955-1962), the French authorities distrusted Algerian recruits, and the use of conscription of Algerians declined, while on the contrary, at the end of French colonization, the military authorities wanted to rouse and show the Algerians' armed "support" for French Algeria. Finally, the number of "absentees fit for armed service" (BASA, or *bon absent service armé*) exploded from the 1950s onwards, due to the war of independence, but also to migration to metropolitan France – BASAs are part of our sample, but are not measured.

Some contributions by Bodenhorn *et al.* challenged the results of anthropometric history, arguing that the declines in stature observed in the eighteenth and nineteenth centuries might result not from a deterioration in biological standards of living but instead from labour market changes resulting from early industrialization, in a context where only the archives of volunteer armies were available (Bodenhorn *et al.*, 2013, 2015 and 2017; Komlos 2019). For the nineteenth century, I showed that sociological biases existed for indigenous Algerian people because of the colonial nature of the archives used, but the "recruitment" variables introduced did not react in the way predicted by Bodenhorn's theory – in addition, methodologically, the inclusion of such variables raised problems (Heyberger 2019b, 160 and 291-294)[17].

Fig. 2. *Recruitment of French subjects (indigenous), conscripts and volunteers, total estimated N, 1903-1961 classes (examination cohorts)*



Sources: see tab. 2.

Tab. 3. *Comparison of the 1955 conscription records with the 1954 census (settlers)*

occupations	1955 class	1954 census (Breil)
farmers	3.9	5.2
agricultural workers	4.5	4.0
industry	32.1	31.8
shopkeepers	2.4	8.5
professionals & executives	24.4	21.1
public services*	8.1	20.7
services (state)	2.1	4.7
unemployed	0.0	4.0
unknown	22.5	0.0

* customer-oriented
Sources: see tab. 1.

On the other hand, within this volunteer population, the colonial specificity appeared, in particular, by the near unique fact in anthropometric history that farmers were shorter than agricultural workers[18]. The colonial situation meant that, in nineteenth-century Algeria, only the poorest, and therefore the shortest among the farmers, resigned themselves to joining the ranks of the French army[19]. I have therefore introduced control variables for the status of individuals in relation to

military service: farmers were taller than agricultural workers in the twentieth century sample, which was mainly composed of conscripts, and the coefficients associated with the birth year variables were unaffected by the inclusion of these control variables[20].

Moreover, according to Bodenhorn, Guinnane and Mroz (2013, 16), the influence of the labour market on military recruitment is visible through changes in the variance of stature. The greater the selection at the barrack gates (and so the taller a given generation), the lower the variance (deviation from this high average stature), due to a continuous selection of recruits, and vice versa, regardless of the existence of a minimum legal stature: the case of Great Britain illustrates this phenomenon very well (Floud, Watcher and Gregory, 2004, 190). Komlos recommends that 6.9 cm be used as the value for the "standard" standard deviation, regardless of the human population considered; the values reported by Floud *et al.* (2004) vary between this value and 3.6 cm – almost 50% amplitude compared to 6.9 cm. On the other hand, in the case of the citizen population, the maximum variation is only 17.4% between the class of 1937 and the class of 1961 (Table 1) and the maximum variation is even lower for subjects (14.5% between 1907 and 1931, Table 2), at least if observations are excluded for the year 1949, for which recruits are unusually small and for which the actual age of height measurement cannot correspond to the age indicated by the sources[21]. The observed values of the standard deviation are also very close to those observed for the metropole, which are lower than the value used by Komlos[22].

3. Descriptive statistics: one country, two populations

Descriptive statistics for citizens (settlers) are consistent with those observed among the civilian population of European Algerians (Table 1). Thus, during the twentieth century, the European population became increasingly concentrated in the two major Algerian coastal ports (Oran and Algiers), the agricultural population declined sharply, testifying to the failure[23] of agrarian colonization, and finally the proportion of students multiplied by 14 between the classes of 1907 and 1955: the *baccalauréat*, then the "badge of the middle classes" (*brevet de bourgeoisie*) became more commonplace especially after the First World War (Charle and Verger 2012, 112-113; Stora 2004, 99). The comparison between the 1954 census and the occupations reported by conscripts in the class of 1955 shows a very good match, despite the relatively high proportion of conscripts whose occupations are recorded as unknown (Table 3).

For the subjects ("French Muslims"), French demographers at the end of the colonial era used military sources to compensate for the approximation of vital records, and sometimes the age of the inhabitants recorded in these sources was confirmed by measuring the height of children (Chevalier 1947, 21). Vital records were introduced for indigenous people living outside the cities – that is, for the overwhelming majority of the population – from 1882 onwards. Table 2 clearly illustrates this growth in vital records: the proportion of indigenous soldiers whose age is known only to the nearest year decreases almost continuously from 1903 to 1961. The proportion of rural people decreases slightly between the same dates,

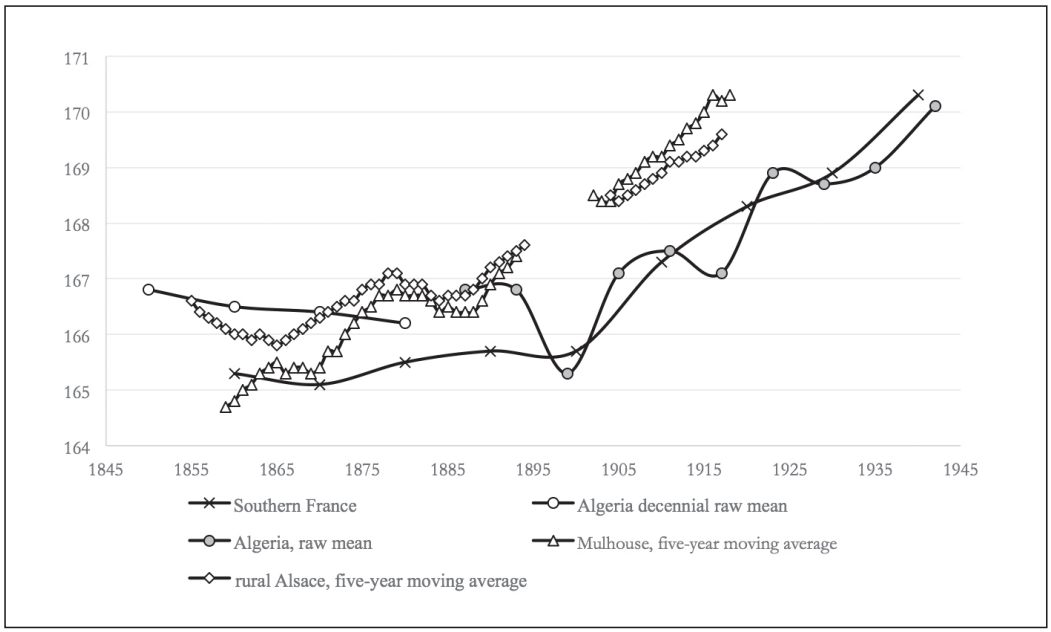
partially reflecting the rural exodus of the Muslim population. Data on the occupations held by the Algerian soldiers are subject to approximation because of the high proportion of individuals for whom the occupation is unknown, although the high proportion of Algerians who were unemployed at the end of the colonial period may largely account for this phenomenon. In addition, the sample of subjects seems fairly representative, as evidenced by the growth of agricultural workers, also observed through the various statistical surveys of colonial authorities. The modest growth in industrial and craft activities, and the even more modest increase in the proportion of soldiers reporting themselves as students, starting with the class of 1925, confirm the reliability of these data.

4. A moderate ... or a large divergence and its explanatory factors

4.1. Citizens (settlers): growth in line with the metropole… and a first colonial specificity. To provide an answer to the debate on the relative poverty of Algerian settlers compared to inhabitants of metropolitan France, I compare the stature and statural growth of each in relation to the other up to the 1961 class. However, over this period, only aggregate data are available for metropolitan residents (Chamla 1964). Thus, the comparison can only relate to gross averages, because including control variables in the sample of Algerian settlers alone strongly modifies the pattern identified and so distorts the terms of the comparison. According to these raw data (Figure 3)[24], not only did the statural growth of Algerian settlers take place at a rate equivalent to that of the metropole, but also the absolute values of the two series were very close, at least if we consider the areas from which most citizens of metropolitan origin came, *i.e.* the South of France[25]. Thus, in anthropometric terms, the human development of Algerian settlers was very similar to that of inhabitants of the metropolitan France between the birth years 1905 and 1942. Only the earlier period introduced a marked nuance: from the birth years 1887 to 1905, or even, if we consider the data previously studied, from the years 1860 to 1905, Algerian settlers were taller than southern metropolitan inhabitants; their stature was rather comparable to that of urban or rural Alsatians, while Alsace-Moselle was the second-largest source region for settlers of metropolitan origin in the nineteenth century. On the one hand, from the early 1890s onwards, Alsatians (then Germans) grew significantly faster than Algerian settlers, and on the other hand, from the 1900s onwards, the southerners of metropolitan France began a strong catch-up growth, which meant that settlers, initially closer to Alsatians, followed a "Mediterranean" development path for the first half of the twentieth century.

Finally, the decline observed for the 1917 birth cohort (class of 1937) was much more marked for the settlers than for the inhabitants of the European continent, even for Alsatian city dwellers, despite the food supply difficulties encountered by the Second Reich at the end of the First World War. This was probably the consequence of wartime shortages, and more specifically of Algeria's strong colonial reliance on the metropole*, i.e.* the consequences of the policy of non-industrialization of the colony, while the disruption of maritime links deprived the settlers of many basic necessities (soap, medicine, various foodstuffs, textiles, building materials). On average, imports fell by 50% in inflation-adjusted francs during the war, and 1917 saw the introduction of days without meat.

Fig. 3. *Stature (cm) of Southern French, Alsatians and Algerians settlers, 1850-1942 birth cohorts)*



Sources: see tab. 1 and the raw mean from Heyberger 2019b for Algeria 1850-1886; rural Alsace and Mulhouse: Heyberger 2005, 605-607; Southern France: Chamla 1964, 259-267.

4.2. Citizens: the gradual disappearance of the urban malus in the twentieth century. In order to estimate the evolution of the stature of settlers and indigenous and to identify some possible explanatory factors, linear regressions (OLS) are run where the height h_i (expressed in cm) of an individual i is the variable explained by the x_i explanatory variables, which are all binary here. Thus, for the entire population of citizens, the equation in model 1 of table 4a is written:

$$h = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 \ldots + \beta_{n1} x_{n1} + \varepsilon$$

where β is obtained by the Ordinary Least Squares (OLS) method and where x_1 represents the "other ages" variable, x_2 the "small cities" variable, x_3 the "medium-sized cities" variable… and x_{n1} the "class 1937" variable.

Model 2 is similar to model 1, except that the variables in section 5 (educational level) are added:

$$h = \alpha + \beta_1 x_1 + \beta_2 x_2 \ldots + \beta_{n2} x_{n2} + \varepsilon$$

where x_1 represents the "other ages" variable, x_2 the "small cities" variable… and x_{n2} the "baccalauréat" variable (see also Table 6).

Model 3 is similar to model 1, except that the variables in section 6 (occupation) are added:

$$h = \alpha + \beta_1 x_1 + \beta_2 x_2 \ldots + \beta_{n3} x_{n3} + \varepsilon$$

where x_1 represents the "other ages" variable, x_2 the "small cities" variable… and x_{n3} the "unknown occupation" variable (see also Table 6).

Model 4 is similar to model 3, except that the variables in section 5 (educational level) are added:

$$h = \alpha + \beta_1 x_1 + \beta_2 x_2 \ldots + \beta_{n4} x_{n4} \cdots + \beta_{n5} x_{n5} + \varepsilon$$

where x_1 represents the "other ages" variable, x_2 the "small cities" variable… x_{17} the "baccalauréat" variable and x_{21} the "unknown occupation" variable.

The regressions in Tables 4 and 5, calculated as they are on the basis of observations at the individual level, serve as a fine filter for the analysis of the influence of one or another explanatory factor (coefficient associated to each explanatory variable). However, and it is a very classical phenomenon in anthropometric history (see for instance Heyberger 2014, 134 or A'Hearn 2003, 363-364 for Italy), when one takes into account the vast quantity of individual observations, the total variance in height is more a matter of genetics than of socio-economic factors. The adjusted R^2s are therefore very weak – and therefore, here as elsewhere, not reported – even if the coefficients of each variable considered individually are of great interest.

The introduction of control variables partly explains the statural growth of settlers (Figures 3 and 4). The regressions were run by distinguishing two periods, because over the entire period considered (1887-1941), the effect of urban variables changed: the typical nineteenth-century urban malus gradually changed into a typical twentieth-century urban bonus. First (1887-1917), the "small cities" effect (5,000-19,999 inhabitants) was null compared to the "rural" reference group (less than 5,000 inhabitants), as was also the case in metropolitan France for the 1848 birth cohort (Heyberger 2014, 129). On the other hand, the "medium-sized cities" effect (20,000-80,873 inhabitants) was negative before, but also after, control for structural effects relating to occupations and levels of education. Finally, the inhabitants of the largest cities, Algiers and Oran, were beginning to benefit from the fruits of urban sanitation at the turn of the century, when drinking water supply works had been carried out: compared to the reference group, there was no longer any urban malus for conscripts born in these cities[26].

Subsequently (1923-1941), still compared to the reference group (conscripts born in the Algerian countryside), Algiers even benefitted from a strong urban bonus (+1.5 cm)[27], half of which is explained by the effects of occupational structures and levels of education (differences between models 1 and models 2, 3 and 4), half by other factors that probably related to the epidemiological and health context that continued to improve. This model of urban modernity spread to the inhabitants of medium-sized cities, who also benefitted from an urban bonus before controlling for structural effects, even if this bonus becomes almost null after control. Finally, the inhabitants of small cities paradoxically experienced a regression towards the model of large nineteenth-century metropolitan cities (Heyberger

Tab. 4. *Regressions (OLS, dependant variable: individual height in cm), citizens, birth cohorts 1887-1941.* 4A: *Birth cohorts 1887-1917*

	model 1	P*	model 2	P*	model 3	P*	model 4	P*
constant	166.6	0.00	166.9	0.00	166.2	0.00	166.4	0.00
age								
20 years	reference		reference		reference		reference	
other ages	-0.7	0.12	-0.6	0.24	-0.5	0.25	-0.5	0.34
birthplace								
countryside	reference		reference		reference		reference	
small cities	0.0	0.93	0.0	1.00	0.0	0.99	0.0	0.95
medium-sized cities	-0.9	0.04	-0.9	0.04	-1.0	0.03	-0.9	0.04
Oran	0.5	0.39	0.4	0.50	0.4	0.53	0.3	0.55
Algiers	0.1	0.81	0.0	0.94	0.0	0.93	0.0	0.95
metropole	0.4	0.60	0.3	0.71	0.2	0.76	0.2	0.81
mobility	mobility							
sedentary	reference		reference		reference		reference	
mobile	0.7	0.05	0.6	0.09	0.7	0.06	0.6	0.08
mobility unknown	1.4	0.20	1.3	0.24	1.2	0.30	1.1	0.33
examination cohort								
class 1907	0.1	0.88	0.1	0.86	0.1	0.86	0.1	0.84
class 1913	reference		reference		reference		reference	
class 1919	-1.6	0.00	-1.6	0.00	-1.7	0.00	-1.7	0.00
class 1925	0.3	0.59	0.3	0.65	0.2	0.69	0.2	0.71
class 1931	0.7	0.20	0.7	0.18	0.6	0.25	0.6	0.23
class 1937	0.2	0.69	0.2	0.69	0.1	0.87	0.1	0.84
educational level								
illiterate			-0.7	0.27			-0.7	0.33
read & write			-0.6	0.19			-0.4	0.42
primary education			-0.1	0.84			0.0	0.96
baccalauréat*1			1.3	0.10			0.7	0.39
education unknown			reference				reference	
occupation								
agriculture					0.5	0.31	0.5	0.28
industry					reference		reference	
services					0.7	0.09	0.5	0.19
student					2.5	0.00	2.1	0.01
occupation unknown					0.9	0.19	0.8	0.24

*: P = p-value; *1 or primary school certificate
Sources: see Tab. 1.

Tab. 4B. *Birth cohorts 1923-1941*

model 1	model 1	P*	model 2	P*	model 3	P*	model 4	P*
constant	168.4	0.00	167.9	0.00	167.1	0.00	166.6	0.00
age								
20 years	reference		reference		reference		reference	
other ages	-2.8	0.54	-4.1	0.36	-1.9	0.67	-2.9	0.51
birth place								
countryside	reference		reference		reference		reference	
small cities	-0.2	0.80	-0.8	0.29	-0.5	0.53	-0.8	0.25
medium-sized cities	1.1	0.09	0.4	0.55	0.5	0.44	0.2	0.80
Oran	0.2	0.75	-0.1	0.89	-0.1	0.88	-0.1	0.81
Algiers	1.5	0.03	1.0	0.12	0.9	0.20	0.8	0.25
metropole	1.6	0.12	0.3	0.73	0.6	0.54	0.1	0.94
mobility								
sedentary	reference		reference		reference		reference	
mobile	0.2	0.74	0.0	0.97	0.2	0.60	0.1	0.75
mobility unknown	-1.2	0.21	-0.6	0.52	-0.9	0.32	-0.4	0.64
examination cohort								
class 1943	reference		reference		reference		reference	
class 1949	-0.3	0.62	-0.4	0.50	-0.2	0.77	-0.4	0.49
class 1955	0.0	0.96	-0.5	0.43	0.0	0.95	-0.3	0.57
class 1961	1.1	0.07	0.6	0.32	1.1	0.07	0.7	0.27
educational level								
illiterate			-4.9	0.00			-4.4	0.00
read & write			1.2	0.12			1.7	0.03
primary education			1.0	0.05			1.3	0.02
baccalauréat*1			4.1	0.00			2.9	0.00
education unknown	reference		reference		reference		reference	
occupation								
agriculture					1.0	0.25	1.4	0.08
industry					reference		reference	
services					2.7	0.00	2.2	0.00
student					4.3	0.00	3.4	0.00
occupation unknown					0.6	0.35	1.1	0.14

* P = p-value; *1 or primary school certificate
Sources: see Tab. 1.

2014, 129): an urban – and statistically no significant – malus appears after control for the structural effects of educational levels.

These contrasting anthropometric effects between large and medium-sized cities on the one hand (more than 20,000 inhabitants) and small cities on the other (fewer than 20,000 inhabitants), as well as this two-step chronology, can be partly explained by advances in the provision of clean drinking water and the gradual generalization of sewage treatment. Indeed, in the case of European countries, sanitation and sewerage, especially when combined, had a negative impact on mortality rates (Harris, Helgertz 2019) and therefore potentially a positive impact on stature, especially as chronic diarrhoea caused by poor quality water jeopardized the survival[28] and the statural growth of young children. However, from 1924 onwards, French legislation required monthly bacteriological control of drinking water for towns of 20,000 inhabitants or more, whereas control in smaller towns was less restrictive (Pezon 2000, 45). In Algeria, where this legislation also applied, the Pasteur Institute carried out these controls, which also led to a decline in typhoid fever, which had been particularly widespread[29]. From the mid-1920s onwards, major investments were made in the water supply systems of medium-sized and large towns[30].

4.3. Citizens: structural effects as explanatory factors for growth… and a second colonial specificity. Structural effects are important in explaining the evolution of the famous "urban malus" of anthropometric history. They also play an important role in explaining the statural growth of settlers from 1887 to 1941: between model 1 and model 4 of tables 4 and figure 4, secular growth declines from 2.8 to 0.8 cm (see Table 6). The structural effects (occupations and educational levels) are even more important in explaining the longstanding growth in stature, since the difference between model 1 and model 4 is 0.2 cm in 1887, but it increases to 2.2 cm in 1941[31]. Thus, more than 70% of statural growth between 1887 and 1941 is explained by the fact that settlers worked in better paid and less exacting occupations, and by the fact that their level of education – although very imperfectly identified by sources – was increasing. The results of Table 6 which compares the coefficients associated with birth cohorts for citizens and indigenous in the different models (from Tables 4 and 5)[32] show that it is mainly educational variables that modified the trend: it can be suspected that if educational levels were better known, the effect of educational variables would be even more significant. These results also suggest that the longstanding increase in stature in the southern metropolitan departments, and by extension throughout metropolitan France, should be put into perspective.

Finally, compared to the other positive coefficients associated with the occupational variables, the coefficient associated with the variable "agriculture" is the only one that increases after the introduction of the education level variables (Table 4b), which would tend to prove that for the 1923-1941 birth cohorts, there is still an anthropometric bonus of proximity to nutrient resources, partly hidden by the low level of education of farmers and agricultural workers. However, colonial specificity must also be invoked. After the Great War, the prosperity of the European population of Algeria was based on the vine, a pillar of the ever-expanding econ-

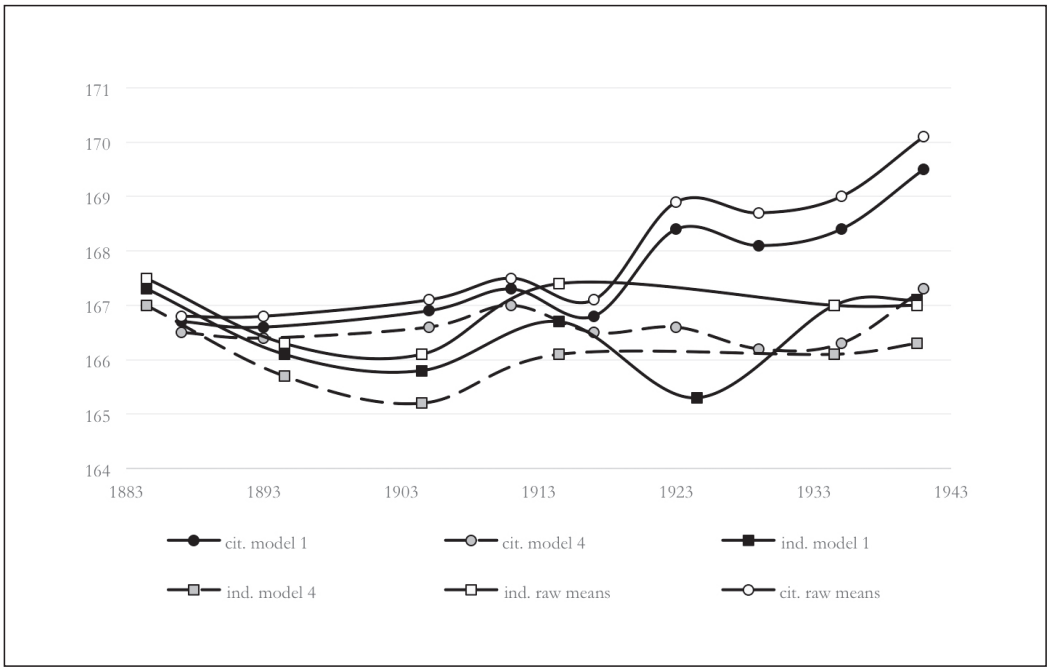
omy – Algeria became the third largest producer in the world in 1934, while 90% of the vineyards were owned by the settlers on the eve of the war of independence – but also on fruit and vegetable crops, and secondarily on tobacco. The "colonial compact" thus worked in favour of the farmers.

The anthropometric bonus of farmers and agricultural workers compared to craftsmen and workers confirms this idea (Tables 4a and 4b). The Algerian case then appears in all its singularity through these results, because in the twentieth century, in the countries of origin of the settlers (Spain and France, Heyberger 2020, 53-55), although white collar workers literally looked down on blue collar workers, this was no longer the case with farmers. On the one hand, industrialization, hampered by the quasi-colonial compact, was not a good deal in anthropometric terms for the settlers. On the other hand, the agricultural "vocation" of the country, encouraged by the same colonial compact with special tariffs and a no less special trade regime, and which was then based on wine growing for export, sustained an Algerian exception in the twentieth century: Algeria was probably the only "Western" country where agricultural labourers were still taller than manual labourers and tradesmen.

4.4. The indigenous population: erosion of stature and population growth. The importance of educational levels as explanatory factors is reflected in the indigenous population, which was much less literate than the settlers until the end of the colonial period, and whose level of education is very imperfectly known from military sources. The advantage of having a secondary or primary school certificate[33], a privilege much rarer among the natives than among the settlers, thus resulted in a significant bonus of more than 2 cm (Table 5, models 2 and 4, compared to the reference group – educational level unknown). In addition, the coefficients associated with the occupational variables were significantly affected by the introduction of the education level variables: part of the bonus associated with the more urban occupations (services, industry, trades) can therefore be explained by a greater human capital. The coefficients associated with urban variables are slightly less affected, but nevertheless show a lower urban bonus when allowance is made for the structural effects of educational levels, whereas, in the nineteenth century, the coefficient associated with cities was negative for indigenous people (Heyberger 2019b, 156-157).[34]

Last but not least, the decline in stature between the birth years 1910 and 1920, and its increase between the 1920s and the early 1940s, visible from the raw data (Figure 4 and Table 5, model 1)[35], is not confirmed after control for the effects of occupational and educational structures. In the end, between the decades of birth 1880 and 1900, there was a great decline in the heights of the indigenous soldiers (1.8 cm, model 4), in a context of strong demographic pressure (Kateb 2001, 122) and of a drier Algerian climate (Davis 2007, 223), and therefore a probable decrease in indigenous own-consumption[36], then a fairly rapid – but partial – recovery phase between the decade 1900 and 1910, as the climate became wetter. Finally, a three-decade period of stagnation in terms of stature closed the period, in a context of low rainfall variation, but also very strong demographic pressure. The decline in

Fig. 4. *Comparison of stature (cm): settlers and indigenous, birth cohorts 1883-1941*



Sources: tab. 4 and 5.

certain diseases, particularly malaria[37], must have played a role in improving living conditions to explain why stature did not collapse, but the income from paid work in Algeria and even more so in metropolitan France must also have had an effect. The evolution of stature during this latter period is very similar to what Guntupalli observes in the Indian case, in a similar context, but for heights varying between 163 and 164 cm according to the *All India Anthropometric Survey* of 1960 (Guntupalli 2007, 39-41)[38].

Over the whole period (birth cohorts 1880 to 1940), there was globally an erosion of stature of very low (model 1) or low amplitude (model 4) indicating that, in a context of very strong demographic pressure, the stunting factors already evoked and associated with the notion of gross nutrition (diet) prevailed over the growth factors relating to the notion of net nutrition (improvement of the epidemiological and health context). Among many examples, the Guernut Commission set up by the Popular Front in the late 1930s estimated that half of the Algerian population, although very young, nevertheless lived on 1,375 calories per day per inhabitant (adults and children)[39].

5. Conclusion

Over the entire period, *ceteris paribus*, the indigenous soldiers lost 0.7 cm (Table 5, model 4), while the European conscripts in Algeria gained 0.8 cm (Tables 4, model 4): this is not a "great colonial divergence", but a divergence of very moderate amplitude, and which only really became apparent between the years of birth

Tab. 5. *Regressions (OLS, dependant variable: individual height in cm), subjects (i.e. indigenous), birth cohorts 1870-1941*

	model 1	P*	model 2	P*	model 3	P*	model 4	P*
constant	166.7	0.00	166.5	0.00	166.2	0.00	166.1	0.00
age								
adolescents	0.4	0.57	0.5	0.50	0.5	0.44	0.6	0.41
age 18	-0.8	0.07	-0.7	0.09	-0.6	0.19	-0.6	0.20
age 19	0.7	0.03	0.7	0.02	0.7	0.02	0.7	0.02
age 20	reference		reference		reference		reference	
age 21	1.1	0.00	1.1	0.00	1.1	0.00	1.1	0.00
age 22	0.6	0.02	0.6	0.02	0.6	0.03	0.6	0.02
age 23	1.0	0.00	1.0	0.00	1.0	0.00	1.0	0.00
adults	0.1	0.79	0.1	0.70	0.2	0.58	0.2	0.53
birthplace								
countryside	reference		reference		reference		reference	
small cities	0.3	0.55	0.1	0.85	0.2	0.61	0.1	0.79
medium-sized cities	0.7	0.08	0.5	0.21	0.6	0.13	0.5	0.22
Oran-Algiers	0.1	0.92	-0.2	0.79	-0.1	0.91	-0.2	0.78
unknown	0.7	0.53	0.6	0.53	0.5	0.60	0.6	0.59
mobility								
sedentary	reference		reference		reference		reference	
mobile	-0.1	0.53	-0.2	0.40	-0.1	0.50	-0.2	0.45
mobility unknown	-0.7	0.04	-0.6	0.07	-0.6	0.06	-0.6	0.09
birth cohort								
1861-1879	1.8	0.00	1.9	0.00	2.0	0.00	2.0	0.00
1880-1889	0.6	0.04	0.7	0.01	0.8	0.00	0.9	0.00
1890-1899	-0.6	0.01	-0.5	0.06	-0.5	0.05	-0.4	0.12
1900-1909	-0.9	0.00	-0.9	0.00	-0.9	0.00	-0.9	0.00
1910-1919	reference		reference		reference		reference	
1920-1929	-1.4	0.00	-1.5	0.00	-1.4	0.00	-1.5	0.00
1930-939	0.3	0.32	0.0	0.99	0.2	0.51	0.0	0.97
1940-1941	0.4	0.30	0.1	0.77	0.4	0.27	0.2	0.64
educational level								
illiterate			0.5	0.03			0.4	0.08
literate			1.6	0.00			1.5	0.00
bachelor degree*1		2.2	0.00			2.0	0.01	
educ. level unknown		reference				reference		
occupation								

	model 1	P*	model 2	P*	model 3	P*	model 4	P*
constant	166.7	0.00	166.5	0.00	166.2	0.00	166.1	0.00
farm-worker				0.5	0.01	0.4	0.05	
farmer					0.7	0.00	0.6	0.00
student					1.1	0.13	0.5	0.50
industry & trades				1.0	0.01	0.6	0.13	
services					1.0	0.02	0.7	0.12
occupation unknown				reference			reference	

* P = p-value; *1 or primary school certificate

Note: The presence of a high proportion of volunteers in the population of subjects implies a greater dispersion of examination ages (see Table 2) than in the population of citizens (see Table 1). Birth cohorts therefore correspond less to examination cohorts minus 20 years than in the population of citizens, and thus birth cohorts, not examination cohorts, are used here. It should be noted, however, that the presence or absence of variables for volunteers does not affect the other coefficients of the regression (see above and note 20).
Sources: Table 2.

Tab. 6. *Comparison of the difference between the coefficients (expressed in cm) in section 4 of the models of tables 4 and 5 (citizens and indigenous)*

models	citizens increase 1887-1941	indigenous decrease 1884,5-1940,5
model 1: urban/rural (+ age & migration)	2.8	-0.2
model 2: model 1 + education	1.5	-0.6
model 3: model 1 + occupation	1.9	-0.4
model 4: model 1 + education + occupation	0.8	-0.7

Note: for citizens (settlers) who are almost all conscripts and not volunteers, given the small dispersion of ages around 20 (see Table 1) and the fact that 20 is the reference age specified in all models, it is assumed that the effect of examination cohort (e.g. 1907) can be equated with the effect of birth cohort (e.g. 1887).
Sources: Tables 4 and 5.

1930 and 1940. Moreover, it is no easy matter, and a ground for disqualification even, to compare two samples with very different selection effects: indigenous conscripts were far more stringently selected based on physical criteria than European conscripts, who performed their military service in much greater proportions.[40] The divergences observed among conscripts probably reflect therefore even greater differences between indigenous civilian populations and citizens. Moreover, in terms of gross averages, and this, after all, is what contemporaries were likely to see – not the results of "*ceteris paribus*" regressions – the colonial divergence was much more significant: at the end of the period, the difference stood at 2.4 cm, *i.e.* as much as between the holder of a "badge of the middle

classes" (the *baccalauréat*) and a conscript whose level of education was unknown, *i.e*. very probably illiterate. However, this difference is much smaller than the one observed at the same time between Blacks and Whites in South Africa (about 6 cm minimum), where even before apartheid discriminatory policies are more advanced than in Algeria[41].

If in statistical terms (*ceteris paribus*), the divergence can therefore ultimately be described as "moderate", in reality (gross averages) it was much greater because Europeans were far more urbanized and educated than indigenous people and were in the better-paid industrial, trade or service occupations. Metropolitan writers who directly witnessed the war of independence in Algeria were not mistaken (Nora 1961). They denounced the glaring inequalities between Algeria's indigenous and European populations, that the latter could not – and did not want to – see… because the few were concentrated in modern Oran and Algiers, which they would soon have to abandon, while the many still lived in another world, that of the illiterate, largely overcrowded and underserved countryside.

[1] From the 1880s onwards, the intercensal growth rate was above 1%, rising to above 2% from the 1930s, except between 1911 and 1921 (due to migration) and during the Second World War (Kateb 2001, 122 and 242).
[2] For a perspective on European conventional wisdom of population growth in Africa at the end of the colonial period and the beginning of the national period, see Ittmann, 2010.
[3] Indigenous (population) will be used without quotation marks, as a legal category of colonial Algeria, just as slave without quotation marks was used in the American context until the nineteenth century.
[4] I do not use the GDP per capita – for example the one calculated by Maddison and expressed in GK$ – to approximate the standard of living of the natives, because this index is constructed for the whole country and therefore confuses the (high) income of the settlers with the (low) income of the colonized, whereas there were about 1 million settlers for 8.4 million natives (1954).
[5] As late as the 1950s, the administration estimated that own-consumption represented 42% for the indigenous population and 3.5% for the settlers (ANOM -for Archives Nationales d'Outre-Mer, see archival references – 10 CAB 122 *Revenus bruts et revenus nets de l'agriculture algérienne*, 14).
[6] In 1954, one in seven adult males migrated to metropolitan France.
[7] This decline is assessed from raw data, not from regressions. It can therefore only be compared to the Algerian data in Table 2.
[8] Europeans were full citizens, the natives were only subjects of French nationality, before later obtaining (1947) a second-class citizenship. The citizens were of European origin or descendants of the indigenous Jews who became citizens in 1870. Only a tiny proportion of indigenous Muslims held citizenship: fewer than 1,000 out of a population of more than 4 million at the beginning of the twentieth century.
[9] "Black feet", as the settlers were then called.
[10] See Camus's famous sentence in his *Chroniques algériennes* (*Algerian Chronicles)*: "*reading a certain press, it would really seem that Algeria is populated by a million whip and cigar settlers, mounted on Cadillacs*" (Camus 2020, 139) – and it is true that on the eve of the First World War the rate of car ownership among the population of Europeans in Algeria was higher than in metropolitan France. According to a study by the Jean Moulin Club, 3% of settlers had significantly greater purchasing power than their counterparts in metropolitan France, 25% had equal purchasing power, and 72% had purchasing power 20% lower than the equivalent socio-occupational categories in metropolitan France.
[11] Archives Nationales d'Outre-Mer, see archival references.
[12] Centre des Archives du Personnel Militaire, see archival references.

[13] N = 3,009 observations for citizens, N = 7,656 for subjects.
[14] Figures 1 and 2 set out the results in terms of the estimated population size. As the sampling rates varied across *départements* and years, showing the actual sample sizes would distort the analysis.
[15] For more details on the representativeness of sources relating to (European) citizens in nineteenth-century Algeria, see Heyberger 2019b, 233-249.
[16] French recruitment continued until the end of the colonial period to distinguish on the one side "Native French" (*Français de souche*) – followed by "native European French" (*Français de souche européenne*) for citizens and on the other side "Muslim French" (*Français musulman*) – followed by "native North African French" (*Français de souche nord-africaine*) for Algerians, formerly indigenous people.
[17] Other means of control were used: study of variations in the standard deviation, etc.
[18] Only other known case, for similar reasons: colonial India (Brennan *et al.* 1994 and 1997).
[19] On the sociology of recruitment: Recham 1996, 50-59 and Christelow 2012, 67.
[20] Regressions not reproduced here.
[21] For a similar case during the Napoleonic Wars, see Heyberger 2005, 213. Same remark for the 1919 class concerning citizens, due to an early call-up during the First World War (value excluded from Figure 4, but not from Figure 3). As in the case of the metropole, I have refrained from correcting the data on the basis of standardized growth, which may not correspond to the growth of adolescents in the country concerned during wartime. For the indigenous recruits, it proved impossible to define the actual age of examination from the available documents with certainty.
[22] Melun district, 1908-1940 classes, Sélestat district, 1922-1940 and Bellac and Saint-Yrieix districts, 1907-1940: 6.1 cm in all three cases, Mulhouse city, 1920-1940: 6.5 cm, our calculations based on Heyberger databases, 2005.
[23] In demographic not anthropometric terms (see below). Among the many economic, demographic and cultural factors that explain the failure of agrarian colonization by Europeans, malaria undoubtedly played a role. Indeed, at the end of the 19th century, when anti-malaria campaigns intended above all to improve the health of the settlers began to be effective -at least for the settlers, the idea appeared that the indigenous population constituted a "reservoir" for malaria, as opposed to the European population, which was supposed to be "healthy" and therefore contaminable by this indigenous "reservoir". However, in a sample of the 1936-1937 recruitment classes, it is noted that rural Europeans are still highly malaria-affected (28.5% of the conscripts, as opposed to 7.2% for all European conscripts; to be compared to 41.6% of malaria-affected among the conscripts and voluntary indigenous rural recruits).
[24] On the outlier for the year of birth 1899, see note 21.
[25] On the metropolitan origins of Algerian citizens in the nineteenth century, see Isnard 1954, 211 and 482; Julien 1964, 250; Baroli 1976, 109; Fischer 1999, 15; Sessions 2011, 292; Heyberger 2019b, 240-244.
[26] For the previous period (birth cohorts 1850-1886), the city effect was negative for Algiers, while it was already positive for Oran, a more modern city (Heyberger 2019b, 259 and 263). Initially, following the installation of 15,000 Chamberland filters between 1886 and 1891 – the filter was invented in 1884 – admissions to military hospitals fell by more than 50% and mortality among the military population by 38% (Curtin 1989, 37, 52, 56, 124, 150). Algiers was the first city to benefit from the bacteriological treatment of drinking water from 1914-1916 onwards and consequently typhoid fever declined (ANOM Guernut 40 *Problème de l'eau*, 4).
[27] See table 4B, model 1, coefficients of section 2.
[28] ANOM Guernut 40, *Maladies à étiologie alimentaire*, 3.
[29] ANOM Guernut 40 *Organisation sanitaire*, 28.
[30] The quantity of drinking water per inhabitant thus increased in Algiers from 78 (1928) to 106 litres (1934). Of the 14 cities with more than 20,000 inhabitants in our sample, the Guernut report details the developments carried out in eight towns (ANOM Guernut 40 *Problème de l'eau*, 3-9).
[31] For instance, value for the 1941 birth cohort: model 1 : 168,4 (constant) +1,1 (coefficient for class 1961, born in 1941) = 169,5; model 2: 166,6 + 0,7 = 167,3. Difference between model 1 and model 2: 169,5-167,3 = 2,2 cm.
[32] This comparison must be considered with caution, because for the different sets of explanatory variables (age, place of birth, mobility, birth cohorts, educational level, occupation) it is not possible to propose strictly identical coefficients for the population of citizens and for the population of subjects (for example, there is no birth in metropole for subjects), even if, apart from the birth cohort variables, the constant includes the same variables for both populations (individuals aged

20, born in the countryside, sedentary, unknown level of education, unknown occupation, except for model 4b where the occupation that includes the most toised conscripts is "industry" and not "unknown" as in the other regressions).

[33] So much more difficult to obtain for the offspring of modest families than the baccalaureate for the children of the bourgeoisie.

[34] To ascertain whether, compared to the settler population, the lower positive coefficient associated with cities refers to a phenomenon of unequal access to sanitation, sewerage, health and medical facilities within colonial cities, or whether this coefficient is partly due to the lack of distinction between the period 1880-1910 and 1920-1940, it would be necessary, given the very low rate of urbanization of the indigenous population, to have a much larger sample of indigenous soldiers in order to test the two assumptions.

[35] In Figure 4, as J. Komlos suggests, the value of the first decade of birth studied has not been plotted on the graph because, in the case of a sample of volunteers, this value is likely to have an outlier value (in addition, the number of people measured is very small for this decade).

[36] On the correlations between 1. rainfall and agricultural production; 2. food availability and prices, rainfall on the one hand, and the stature of indigenous people in the nineteenth century on the other hand, see Heyberger 2019b, 191-199.

[37] The anti-malaria campaigns of the mid-twentieth century led to a sharp decline in the number of sick conscripts, even in the most infested regions (ANOM 3 R 246: *conseil de révision de la classe 1953*).

[38] On the other hand, the average gross stature of Algerian conscripts is slightly lower in absolute value than that of Black South African soldiers, who are however measured as adults (Mpeta, Fourie and Inwood, 10).

[39] ANOM Guernut 40 *Enquête algérienne sur le niveau de vie*, 21. For the post-war period, see also the surveys on indigenous family budgets in ANOM 12 CAB 224 *Niveau de vie et comportement économique* 8-13 (1955) and other local surveys in 10 CAB 28 *L'Algérie du demi-siècle vue par les autorités locales* 47-48 (1954).

[40] Although the standard deviation values and their small variations for both groups tend to show that there is no continuous selection on anthropometric criteria for indigenous people.

[41] For example, Algerians (indigenous) own 75% of the agricultural surface, against only 13% of Blacks in South Africa.

Archives

CAPM Pau, Centre des Archives du Personnel Militaire (Military Personnel Archives Centre):
- Conscription and voluntary enlistment, indigenous, 1903-1961 classes: registers of serial numbers and booklets (unquoted archives)
- Conscription, citizens, 1943-1961 classes: registers of serial numbers (unquoted archives)

ANOM Aix-en-Provence, Archives Nationales d'Outre-Mer (Overseas National Archives):
- Conscription, citizens, 1903-1937 classes, registers of serial numbers: sub-series 1RM (Algiers), 2 RM (Oran) and 3 RM (Constantine)
- 3 R 246: *conseil de révision de la classe 1953*, 10 June 1953, the sub-prefect of Tizi-Ouzou to the prefect of Algiers
- Guernut 40, *Enquête algérienne sur le niveau de vie et la mobilité des populations*
- Guernut 40, *Problème de l'eau (dans les villes, dans les campagnes)*
- Guernut 40, *Organisation sanitaire et plus spécialement contrôle sanitaire de l'eau et des denrées alimentaires qui a pu être organisé dans les villes*
- Guernut 40, *Maladies à étiologie alimentaire*
- 10 CAB 28: *L'Algérie du demi-siècle vue par les autorités locales* (1954)
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Summary

A great colonial divergence in biological standards of living? The secular trend of stature among the indigenous people and settlers in Algeria, 1880-1940

The socio-economic consequences of the demographic pressure that occurred among the indigenous population of Algeria during the first half of the twentieth century are much talked of, yet little studied. This demographic phenomenon could have resulted in a decrease in the biological standard of living (BSL, or mean height) among the Algerian population, whereas at the same time the European settler population could have experienced an increase in height, just like all other Western populations of that time. This paper analyses the secular trend in height of both populations for birth cohorts 1880-1940 (N = 10 665 individual observations, randomly selected from colonial conscription records), in order to test this hypothesis of a great colonial divergence in the

BSL. Over the period, *ceteris paribus*, the indigenous population lost 0.7 cm, while the European population gained 0.8 cm, thanks mostly to urbanization: this is a divergence of moderate amplitude, and which only really became apparent after the 1920 birth decade. Nevertheless it is difficult to compare two samples with different selection effects: indigenous conscripts underwent stricter selection based on physical criteria than European conscripts. The divergences observed between conscripts might therefore refer to probably greater divergences between indigenous civilian populations and citizens.

Riassunto

Una grande divergenza coloniale negli standard di vita biologici? Il trend secolare della statura tra gli indigeni e i coloni in Algeria, 1880-1940

Le conseguenze socio-economiche della pressione demografica verificatasi tra la popolazione indigena dell'Algeria durante la prima metà del XX secolo sono state molto discusse, ma poco studiate. Questo fenomeno demografico avrebbe potuto comportare una diminuzione del tenore di vita biologico (BSL, o altezza media) tra la popolazione algerina, mentre allo stesso tempo avrebbe potuto causare un aumento di statura nella popolazione dei coloni europei, proprio come accadeva per tutte le altre popolazioni occidentali di quel tempo. Questo articolo analizza l'andamento secolare dell'altezza di entrambe le popolazioni per le coorti di nascita 1880-1940 (N = 10.665 osservazioni individuali, estratte casualmente dai record di coscrizione coloniale), al fine di verificare l'ipotesi di una grande divergenza coloniale in termini di BSL. Durante il periodo considerato, *ceteris paribus*, la popolazione autoctona perse 0,7 cm, mentre quella europea ha guadagnato 0,8 cm, per effetto soprattutto all'urbanizzazione: si tratta di una divergenza di moderata ampiezza, che si è realmente manifestata solo dopo il decennio di nascita relativo al 1920. Tuttavia, è difficile confrontare due campioni basati su criteri di selezione diversi: i coscritti indigeni sono stati sottoposti a una selezione più rigorosa sulla base di criteri fisici rispetto ai coscritti europei. Le divergenze osservate tra i coscritti potrebbero quindi riferirsi a divergenze probabilmente maggiori tra popolazioni civili di indigeni e cittadini.

Parole chiave

Algeria; Statura; Indigeni; Coloni; Nutrizione; Urbanizzazione; Colonizzazione.

Keywords

Algeria; Stature; Indigenous; Settlers; Nutrition; Urbanization; Colonization.