# Analyzing the effects of the Spanish Civil War on biological well-being through new anthropometric indicators

**Abstract**

Numerous studies have demonstrated the negative impact of severe economic shocks (such as those associated with wars) on the growth of children and adolescents. Individuals exposed to these shocks during their developmental years exhibited shorter average heights compared to both previous and subsequent generations. Anthropometric research has highlighted the sensitivity of the height variable in understanding the biological well-being of children and adolescents. However, little attention has been paid to the evolution of other anthropometric variables. This study investigates the impact of the famine following the Spanish Civil War on biological well-being in nine municipalities of the Region of Valencia (with over 120,000 observations of individuals born between 1890 and 1955) using two indicators: chest circumference, and the percentage of individuals of short stature. Our findings confirm that both of these anthropometric indicators were responsive to the economic shock of the Civil War. The well-being levels prior to the war took twenty years to recover.

**Keywords.**

Height, Chest perimeter, Short in stature, Spanish Civil War, Anthropometry

## 1. Introduction

Studies conducted since the late twentieth century have shown that anthropometric measurements are excellent indicators for assessing the health and nutritional status of populations from a historical perspective (Steckel, 2008; NCD-RisC, 2016; Marco-Gracia and Puche, 2021). As a marker of net nutritional status, anthropometric measurements are dependent on food consumption and healthcare, and are influenced by energy expenditure due to diseases, labor, and environmental conditions during different stages of growth (Silventoinen, 2003). The critical moments for anthropometric indicators are the fetal stage, infancy (from birth to around two years), and adolescence (Bogin, 2020).

Research in recent decades has also paid special attention to the negative effects of wars, authoritarian and autarchic regimes on biological well-being. For example, it has been documented that at the start of the Allied blockade during World War I, German children began to experience malnutrition, resulting in a loss of height and weight (Cox, 2019). The impact of World War II is also evident in physical consequences in different European countries (Daniele & Guezzi, 2019).

Parallel studies have focused on analyzing the impact that authoritarian regimes and policies had on the health and nutrition conditions of populations in the twentieth century (i.e. Martínez-Carrión and María-Dolores, 2017). Cameron (2003) reveals that during the years of apartheid, white children were consistently taller than black children. In another study, Pak, Schwekendiek, and Kim (2011) find that the average height of the North Korean population was greater than that of their counterparts in the South before the division of the Korean Peninsula in 1948. Anthropometric literature has revealed similar situations in former communist countries in Europe (Komlos & Kriwy, 2004). Baten and Wagner (2003) reveal that Germany experienced a substantial increase in mortality rates and a stagnation in the heights of children during the early years of the Nazi regime (1933-1938).

In Spain, the years of the Spanish Civil War from 1936-1939 and the early Franco regime provide an excellent historical context for analyzing the impact of war and subsequent famine (Cámara et al., 2021). One of the main objectives of the early Franco regime was to achieve economic self-sufficiency. To do this, an isolationist economic policy with respect to the outside world was promoted, replacing the free market with state intervention in the economy. Both wages and prices were regulated by channels outside the market (del Arco, 2020). With respect to wages, between 1936 and 1939 there was a reduction of approximately 30% in purchasing power (Maluquer de Motes, 2014). In addition, the undervaluation of official food prices led to a decrease in agricultural production and widespread food shortages (del Arco, 2020). The reduction in real wages and the increase in prices translated into a significant rise in the cost of living.

Between the years of the Spanish Civil War and the early 1950s, the majority of the Spanish population experienced a significant regression in their living conditions and well-being (del Arco, 2020). This decline in quality of life was mirrored in the heights of the population (Cámara et al., 2021). Using data from a national sample, Quiroga (2002) reveals a deterioration in average height for those who endured the war and the early

Franco period. This evidence aligns with the documented decrease in energy and protein consumption between the 1930s and 1950s (Cussó, 2005).

This study focuses on analyzing the nutritional aftermath of the Spanish Civil War and the long post-war period in the Spanish Levante region. However, it does so using an alternative approach, introducing two anthropometric indicators that have received little attention from the social sciences: 1. The percentage of individuals declared as short in stature;[1] 2. Individual chest circumference. These indicators are important because they are sometimes recorded when height is not.

## 2. Material and methods

This study uses the Military Conscription Records from nine municipalities in the Region of Valencia covering military conscriptions from 1910 to 1975 (cohorts born between 1890 and 1955). Therefore, the data allow for an assessment of the nutritional impact of the Spanish Civil War and the autarky policies of the 1940s during the Franco era. These municipalities span from north to south, with two of them located in the province of Castellón (Castellón de la Plana and Villarreal), four in the province of Valencia (Alzira, Gandía, Requena, and Sueca), and three in the province of Alicante (Alcoy, Pego, and Villena). In addition to providing excellent historical anthropometric data series, these nine municipalities are representative in terms of their productive specialization, social factors, and environmental characteristics. They include urban areas (a provincial capital and an industrial city) as well as rural areas (irrigated and rainfed agriculture). See Table A.1 in the Appendix for a description of the data.

The average height of Valencian young men closely resembles the average height of Spanish recruits (Martínez-Carrión and María-Dolores, 2017). Moreover, in several indicators measuring the standard of living (per capita income, real wages, and consumption), industrialization, occupational structure, literacy, and economic inequality, the Region of Valencia was situated at the middle threshold of Spanish indices in the first half of the twentieth century (Martínez Garralaga et al., 2015).

The anthropometric data in the sample are derived from two indicators: on the one hand, we have used information from 4,447 individuals who were classified as "short in stature" (of a total of 128,957 conscripts who were enlisted in these municipalities, for whom we

[1] For Spain, this indicator has previously been used by Moreno-Lázaro and Martínez-Carrión (2009) and Linares-Luján and Parejo-Moruno (2016).

have their complete data). These individuals were exempt from military service due to being shorter than the minimum height requirement. On the other hand, data on chest circumference are analyzed for 103,925 individuals measured.[2]

To study inequality, the statistical analysis has been carried out while considering the educational level and occupational category of the recruits at the time of measurement. For the latter, we have used the HISCLASS 5 occupational classification distinguishing five categories: His1 (skilled non-manual), His2 (semi-skilled non-manual), His3 (farmers), His4 (manual workers), and His5 (landless agricultural workers).

Two additional considerations: 1. The first relates to the successive changes in the minimum height required. Although this varied throughout the nineteenth century, starting from the 1870s, the minimum height requirement was set at around 155 cm (or lower). This minimum height was maintained with variations in the twentieth century. Therefore, in this study, any conscript with a height equal to or less than 155 cm has been considered as "short in stature." 2. The second consideration pertains to potential distortions in the conscription age (set at 21 years since 1907). According to recent studies, variations occurred during the years of the conflict in relation to the stipulation in the legislation whereby recruits could be called up at a slightly younger age (Matthews, 2013).

The sample presents some limitations. First, it is an exclusively male sample. Therefore, we do not know whether there were differences in the impact depending on the gender. Second, although the Valencian region is relatively average for the Spanish case, it dispalys differences, especially in relation with the interior of the country. Finally, between 2% and 5% of the conscripts did not present themselves for recruitment (as shown in Table A.2 of the Appendix), which could be partially biasing the results (although there is no evidence that suggests that the fugitives were individuals with extreme anthropometric measurements).

The article is based on a combination of descriptive statistics, probit models, and ordinary least squares (OLS) linear regressions with heteroskedasticity-robust estimation analyses.

[2] The conscripts were measured in all municipalities with homogeneous standardized tools and had to report accurate measurements (although there may be a certain tendency to rounding).

## 3. Results

### 3.1 Short in stature

Table 1 displays the cumulative percentage increase of recruits of short stature that occurred between the years of the Civil War and the immediate post-war period, and the years required to recover the minimum percentage achieved prior to the post-war era. In summary, it may be observed that between the drafts of 1937 and 1942, the regional percentage of recruits of short stature increased by 1.7% (on average, 2.2% at the provincial level and 3.2% at the municipal level), and it took 13 years to recover the minimum percentage achieved in 1937. In other words, the conscripts who were young when the impact began were not able to recover the previous levels in the medium term. Only those affected in their childhood were able to reach a similar level in their final adult biological well-being to that of the pre-impact generations.

The impact of the Civil War and the post-war famine was not evenly distributed. While the percentage of literate recruits of short stature increased by 1.7% between the conscriptions of 1937 and 1940, that of illiterate recruits of short stature between the cohorts of 1934 and 1946 increased by 6%. Furthermore, the latter group needed more years (21) to recover the minimum percentage reached in 1934, while the literate group needed only 13 to regain the minimum achieved in 1937. In terms of occupational status, the data reveal that recruits of short stature in his5 (landless agricultural workers) were the most affected by the war and post-Civil War period and required more years (18 years) to regain the minimum percentage achieved in 1938.

TABLE 1

The results with descriptive statistics have been tested with advanced multivariate regression models. In Table 2, four probit models have been employed to analyze the probability of being of short stature based on the year of birth (conscription). We have used the dichotomous variable "being of short stature" as the dependent variable, which takes the value of 1 if the individual was rejected from military service due to their short stature.

TABLE 2

The results from the probit models in Table 2 confirm the impact of the Civil War on the probability of having a height below 155.5 cm. Therefore, we can confirm that for those born between 1920 (1941 cohort) and 1925 (1946 cohort), the chances of being of short

stature increased by 13-15% in 1920 and 18-22% in 1921. Regarding socioeconomic status, using individuals with the lowest category as a reference, the results indicate that improvements in HISCLASS were associated with a lower probability of being of short stature.

### 3.2 Chest perimeter

Table 3 presents the evolution of the average chest circumference of Valencian recruits based on their educational level and professional qualifications.[3] For both variables, there is evidence of long-term chest growth, which was once again interrupted by the Civil War and immediate post-war period. The data indicate that the drop in average chest circumference was more pronounced among illiterate recruits, with a decrease of 2.8 cm between the drafts of 1937 and 1941 (versus 2.2 cm among literates). Moreover, illiterate recruits required more time (17 years) to recover the previous post-war peak average reached in 1937. As in the case of short stature, the time in the life cycle when the worst part of the food shortage hit and the margin to recover later partially explain the results. In terms of occupational groups, the data reveal differences in the cumulative decline, but not in the time required to recover the previous post-war peak average. The possession of crops could have been a beneficial factor for a less detrimental impact of the economic crisis.

TABLE 3

Once again, in Table 4, we have analyzed the determinants of chest circumference in young men born between 1910 and 1928 (that is, those who were conscripted between 1931 and 1949). To do so, we have conducted five multiple regression models using Ordinary Least Squares (OLS).

TABLE 4

The results in Table 4 confirm the negative impact of the Spanish Civil War on the chest circumference. While in most years, we can observe an increase in chest circumference compared to the reference year (those born in 1910) due to improvements in hygiene, living standards, and economic modernization, for those born between 1919 (1940 conscription) and 1924 (1945), we can see negative and highly significant coefficients

[3] In Figure A.3 of the Appendix, we can observe the comparative evolution of the average height and average chest circumference in the conscripts of the sample.

ranging from -0.379 in 1919 to -1.111 in 1921 (equivalent to approximately -0.5 to -1.5 cm less chest circumference on average). These results remain consistent even in model 2 when we simultaneously control for height. More crucial are the individual effects of literacy, as this seems to favor better biological well-being among young men (close to an average of 0.5 cm).

## 4. Discussion

Based on the analysis of two little used anthropometric indicators, namely the percentage of conscripts classified as "short in stature" and chest circumference, this study provides new evidence regarding the impact that the Spanish Civil War and the post-war period had on the biological status of the population in the Spanish Levante area. The results obtained reveal the nutritional setbacks and hardships experienced by conscripts during both of these periods:

a) The regional percentage of individuals classified as "short in stature" in the region increased between the drafts of 1937 and 1942 (from 3.4% to 5.1%, respectively), and the minimum percentage achieved in 1937 was not recovered until 1950.

b) Between the drafts of 1937 and 1943, the average chest circumference fell by approximately 2.1 cm, and the maximum average chest circumference achieved in 1937 was not regained until 1952.

c) It is evident that nutritional inequality increased in the region during the Francoist autarky of the 1940s, as the percentage of individuals classified as "short in stature" rose, and the average chest circumference declined more among illiterate conscripts and those with manual occupations.

d) The time in the life cycle at which the effect of a shock is experienced (especially if it is long-term) affects the chances of recovering previous levels of biological well-being (Bogin, 2020). Thus, in the case analyzed, young people who received the shock in their adolescence or even in late childhood were unable, on average, to recover the levels of biological well-being of pre-war generations.

The results for the years of the Civil War could have been affected by the increase in the number of fugitives (Table A.2 in the Appendix shows how they doubled in this period). However, the percentages of fugitives are too low to have such an intense effect on the results (the most extreme value barely reaches 5%). In addition, the individuals with better

biological levels would have fled in greater proportion, although we have no evidence of this either.

The results obtained in this article for the Valencian region are not exceptional for the Spanish case (Linares-Luján and Parejo-Moruno, 2016; Cámara et al., 2021). However, we should also bear in mind that the Spanish Civil War was suffered in different ways depending on the region, the side to which it belonged at each moment of the conflict and the previous conditions. Thus, in the interior region of *Castilla y León*, the impact during the war was less intense, with the negative effect increasing in the 1940s (Moreno-Lázaro and Martínez-Carrión, 2009).

The implications of this article are linked to increasing our knowledge about the effect of economic and war shocks on biological welfare. The Valencian case is particularly interesting given the many scenarios and the broad spectrum of the sample. The results show that autarkic policies caused problems of access to food that affected the majority of the population, but especially the poorest socioeconomic groups and the least educated. This could also possibly be the effect of the current wars. However, since the 1930s, the capacities to produce food have also increased enormously, so the extrapolation of the results to current contexts should be performed with caution.

**Declaration of interest statement**

No competing interests to declare.

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Table 1. Impact and recovery of the Spanish Civil War and post-war period on recruits with short stature, Region of Valencia, birth cohorts from 1914-1945. 3-year moving averages.

| | | Year (replacement) with best records up to 1940 | Year (replacement) with worst records | Percentage increase between best and worst year | Year (replacement) in which the value of the best year up to 1940 was reached again | Years taken to return to the best pre-1941 value |
|---|---|---|---|---|---|---|
| Province | | | | | | |
| | Alicante | 1939 | 1942 | 2,3 | 1954 | 15 |
| | Castellón | 1937 | 1940 | 2,2 | 1948 | 11 |
| | Valencia | 1937 | 1940 | 2,2 | 1951 | 14 |
| | **Average** | **1938** | **1941** | **2,2** | **1951** | **13** |
| Municipality | | | | | | |
| | Alcoy | 1939 | 1943 | 3,1 | 1955 | 16 |
| | Alzira | 1934 | 1940 | 4,8 | | |
| | Castellón de la Plana | 1937 | 1940 | 2,6 | 1948 | 11 |
| | Gandía | 1939 | 1943 | 2,6 | 1965 | 26 |
| | Pego | 1938 | 1943 | 3,3 | 1947 | 9 |
| | Requena | 1937 | 1942, 1947 | 2,9 | 1949 | 12 |
| | Sueca | 1938 | 1944 | 3,9 | | |
| | Villarreal | 1938 | 1943 | 2,3 | 1946 | 8 |
| | Villena | 1939 | 1945 | 3,0 | 1950 | 11 |
| | **Average** | **1938** | **1943** | **3,2** | **1951** | **13** |
| Education | | | | | | 0 |
| | literate | 1937 | 1940 | 1,7 | 1950 | 13 |
| | Illiterate | 1934 | 1946 | 6,0 | 1955 | 21 |
| | **Average** | **1936** | **1943** | **3,9** | **1953** | **17** |
| Hisclass | | | | | | |
| | His1 (non-manual skilled) | 1940 | 1944 | 2,4 | 1947 | 7 |
| | His2 (non-manual semi-skilled) | 1936 | 1940 | 1,6 | 1947 | 11 |
| | His3 (farmers) | 1938 | 1941 | 1,8 | 1947 | 9 |
| | His4 (manual workers) | 1937 | 1942 | 2,3 | 1948 | 11 |
| | His5 (landless agricultural laborers) | 1938 | 1948 | 5,0 | 1956 | 18 |
| | **Average** | **1938** | **1943** | **2,6** | **1949** | **11** |

Note: Figure A.1 in the Supplementary Online Materials shows the evolution of the indicator over time.
Source: Military recruitment records from the municipalities included in the anthropometric sample.

Table 2. Probit models on probability of being short in stature, birth cohorts 1915-1938.

| Variable | Categories | (1) | (2) | (3) | (4) |
|---|---|---|---|---|---|
| Birth year (conscription year) | 1915 (1936) | (ref.) | | | |
| | 1916 (1937) | -0.025 | -0.044 | -0.022 | -0.022 |
| | | (0.08) | (0.08) | (0.09) | (0.09) |
| | 1917 (1938) | -0.333*** | -0.344*** | -0.322*** | -0.323*** |
| | | (0.10) | (0.10) | (0.12) | (0.12) |
| | 1918 (1939) | -0.041 | -0.049 | 0.038 | 0.040 |
| | | (0.09) | (0.09) | (0.11) | (0.11) |
| | 1919 (1940) | 0.029 | 0.019 | 0.100 | 0.107 |
| | | (0.08) | (0.08) | (0.10) | (0.10) |
| | 1920 (1941) | 0.141* | 0.132* | 0.171* | 0.168* |
| | | (0.08) | (0.08) | (0.09) | (0.09) |
| | 1921 (1942) | 0.225*** | 0.217*** | 0.186** | 0.185** |
| | | (0.07) | (0.07) | (0.08) | (0.08) |
| | 1922 (1943) | 0.218*** | 0.210*** | 0.174** | 0.172** |
| | | (0.07) | (0.07) | (0.08) | (0.08) |
| | 1923 (1944) | 0.170** | 0.160** | 0.097 | 0.101 |
| | | (0.07) | (0.07) | (0.08) | (0.08) |
| | 1924 (1945) | 0.209*** | 0.197*** | 0.131 | 0.126 |
| | | (0.07) | (0.07) | (0.08) | (0.08) |
| | 1925 (1946) | 0.152** | 0.139* | 0.064 | 0.068 |
| | | (0.08) | (0.08) | (0.09) | (0.09) |
| | 1926 (1947) | 0.134* | 0.123 | 0.040 | 0.046 |
| | | (0.08) | (0.08) | (0.09) | (0.09) |
| | 1934 (1955) | -0.064 | -0.069 | -0.158* | -0.156* |
| | | (0.08) | (0.08) | (0.09) | (0.10) |
| | 1935 (1956) | -0.189** | -0.193** | -0.327*** | -0.327*** |
| | | (0.09) | (0.09) | (0.11) | (0.11) |
| | 1936 (1957) | -0.045 | -0.046 | -0.171* | -0.172* |
| | | (0.09) | (0.09) | (0.10) | (0.10) |
| | 1937 (1958) | -0.085 | -0.091 | -0.144 | -0.150 |
| | | (0.08) | (0.09) | (0.09) | (0.09) |
| | 1938 (1959) | -0.042 | -0.049 | -0.085 | -0.099 |
| | | (0.08) | (0.08) | (0.09) | (0.09) |
| Hisclass | His1 (non-manual skilled) | (ref.) | | | |
| | His2 (non-manual semi-skilled) | | | 0.250*** | 0.251*** |
| | | | | (0.07) | (0.07) |
| | His3 (farmers) | | | 0.372*** | 0.376*** |
| | | | | (0.07) | (0.07) |
| | | | | 0.479*** | 0.480*** |
| | His4 (manual workers) | | | (0.07) | (0.07) |
| | His5 (landless agricultural laborers) | | | 0.394*** | 0.389*** |
| | | | | (0.08) | (0.08) |
| Literacy | No | (ref.) | | | |
| | Yes | | | -0.398*** | -0.393*** |
| | | | | (0.05) | (0.05) |
| Immigrant | No | (ref.) | | | |
| | Yes | | | | 0.077** |
| | | | | | (0.03) |
| | Unknown | | | | 0.063 |
| | | | | | (0.09) |
| | Intercept | -1.958*** | -1.968*** | -1.862*** | -1.884*** |
| | | (0.05) | (0.06) | (0.11) | (0.11) |

| | | | | |
|---|---|---|---|---|
| Municipality Control | YES | YES | YES | YES |
| Sample size | 44,719 | 44,719 | 34,819 | 34,819 |
| Adjusted $R^2$ | 0.009 | 0.012 | 0.028 | 0.029 |

Notes: OLS estimates; *se* denotes robust standard error.
Source: Parish registers, censuses and conscription and call-up records; historical municipal and parish archives.
* Statistical significance at 10% level.
** Statistical significance at 5% level.
*** Statistical significance at 1% level.

Table 3. Impact and Recovery of the Spanish Civil War and Postwar Period on the Chest Circumference of Recruits, Region of Valencia, Birth Cohorts from 1915-1947. 3-Year Moving Averages.

| | | Year (replacement) with best registers up to 1940 | Year (replacement) with worst registers | Cm perimeter reduction between the best and worst year | Year (replacement) in which the value of the best year up to 1940 is reached again | Years taken to recover the best pre-1941 value |
|---|---|---|---|---|---|---|
| Province | | | | | | |
| | Alicante | 1937 | 1943 | 2,7 | 1953 | 16 |
| | Castellón | 1938 | 1944 | 2,8 | 1955 | 17 |
| | Valencia | 1936 | 1941 | 2,1 | 1950 | 14 |
| | **Average** | **1937** | **1943** | **2,5** | **1953** | **16** |
| Municipality | | | | | | |
| | Alcoy | 1935 | 1943 | 3,4 | 1953 | 18 |
| | Alzira | 1937 | 1944 | 1,8 | 1952 | 15 |
| | Castellón de la Plana | 1938 | 1944 | 2,6 | 1949 | 11 |
| | Gandía | 1937 | 1941 | 2,7 | 1950 | 13 |
| | Pego | 1937 | 1941 | 2,1 | 1944 | 7 |
| | Requena | 1936 | 1941 | 2,2 | 1945 | 9 |
| | Sueca | 1936 | 1944 | 2,5 | 1954 | 18 |
| | Villarreal | 1938 | 1943 | 3,3 | 1967 | 29 |
| | Villena | 1938 | 1943 | 2,0 | 1954 | 16 |
| | **Average** | **1937** | **1943** | **2,5** | **1952** | **15** |
| Education | | | | | | |
| | literate | 1937 | 1943 | 2,2 | 1951 | 14 |
| | Illiterate | 1937 | 1941 | 2,8 | 1954 | 17 |
| | **Average** | **1937** | **1942** | **2,5** | **1953** | **16** |
| Hisclass | | | | | | |
| | His1 (non-manual skilled) | 1937 | 1944 | 3,4 | 1951 | 14 |
| | His2 (non-manual semi-skilled) | 1937 | 1943 | 2,6 | 1952 | 15 |
| | His3 (farmers) | 1936 | 1944 | 1,7 | 1950 | 14 |
| | His4 (manual workers) | 1938 | 1943 | 2,4 | 1953 | 15 |
| | His5 (landless agricultural laborers) | 1936 | 1942 | 2,7 | 1951 | 15 |
| | **Average** | **1937** | **1943** | **2,6** | **1951** | **15** |

Note: Figure A.2 in the Supplementary Online Materials shows the evolution of the indicator over time.
Source: Military recruitment records from the municipalities included in the anthropometric sample.

Table 4. Determinants of chest perimeter, birth cohorts 1910-1928.

| Variable | Categories | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| Birth year (conscription year) | 1910 (1931) | (ref.) | | | | |
| | 1911 (1932) | 0.545*** | 0.491*** | 0.495*** | 0.312 | 0.421* |
| | | (0.18) | (0.17) | (0.17) | (0.20) | (0.20) |
| | 1912 (1933) | 0.552*** | 0.473*** | 0.472*** | 0.751*** | 0.745*** |
| | | (0.18) | (0.17) | (0.16) | (0.19) | (0.19) |
| | 1913 (1934) | 0.655*** | 0.582*** | 0.593*** | 0.679*** | 0.762*** |
| | | (0.18) | (0.17) | (0.17) | (0.19) | (0.19) |
| | 1914 (1935) | 0.841*** | 0.774*** | 0.681*** | 1.073*** | 0.995*** |
| | | (0.19) | (0.17) | (0.17) | (0.19) | (0.19) |
| | 1915 (1936) | 1.256*** | 1.176*** | 1.133*** | 1.282*** | 1.292*** |
| | | (0.17) | (0.16) | (0.16) | (0.18) | (0.18) |
| | 1916 (1937) | 1.556*** | 1.356*** | 1.307*** | 1.368*** | 1.343*** |
| | | (0.18) | (0.17) | (0.17) | (0.19) | (0.19) |
| | 1917 (1938) | 1.265*** | 1.139*** | 0.960*** | 1.296*** | 1.271*** |
| | | (0.22) | (0.21) | (0.21) | (0.23) | (0.23) |
| | 1918 (1939) | 0.479** | 0.373* | 0.466** | 0.677*** | 0.719*** |
| | | (0.23) | (0.21) | (0.21) | (0.23) | (0.23) |
| | 1919 (1940) | -0.379* | -0.497** | -0.465** | -0.235 | -0.143 |
| | | (0.20) | (0.19) | (0.19) | (0.20) | (0.20) |
| | 1920 (1941) | -0.635*** | -0.727*** | -0.633*** | -0.578*** | -0.591*** |
| | | (0.20) | (0.19) | (0.18) | (0.20) | (0.20) |
| | 1921 (1942) | -1.001*** | -1.111*** | -1.069*** | -1.053*** | -1.050*** |
| | | (0.17) | (0.16) | (0.16) | (0.18) | (0.18) |
| | 1922 (1943) | -0.759*** | -0.830*** | -0.844*** | -0.728*** | -0.726*** |
| | | (0.18) | (0.17) | (0.16) | (0.17) | (0.17) |
| | 1923 (1944) | -0.615*** | -0.743*** | -0.719*** | -0.723*** | -0.640*** |
| | | (0.17) | (0.16) | (0.16) | (0.17) | (0.17) |
| | 1924 (1945) | -0.498*** | -0.578*** | -0.568*** | -0.539*** | -0.539*** |
| | | (0.17) | (0.16) | (0.16) | (0.17) | (0.17) |
| | 1925 (1946) | 0.730*** | 0.570*** | 0.533*** | 0.630*** | 0.717*** |
| | | (0.18) | (0.17) | (0.16) | (0.17) | (0.18) |
| | 1926 (1947) | -0.084 | -0.209 | -0.224 | -0.110 | -0.019 |
| | | (0.17) | (0.16) | (0.16) | (0.17) | (0.17) |
| | 1927 (1948) | 0.681*** | 0.528*** | 0.518*** | 0.576*** | 0.575*** |
| | | (0.18) | (0.17) | (0.17) | (0.18) | (0.18) |
| | 1928 (1949) | 1.098*** | 0.852*** | 0.805*** | 0.953*** | 0.953*** |
| | | (0.18) | (0.17) | (0.17) | (0.18) | (0.18) |
| Height (cm) | Continuous var. | | 0.269*** | 0.271*** | 0.272*** | 0.272*** |
| | | | (0.00) | (0.00) | (0.00) | (0.00) |
| Hisclass | His1 (non-manual skilled) | (ref.) | | | | |
| | His2 (non-manual semi-skilled) | | | | 0.078 | 0.077 |
| | | | | | (0.13) | (0.13) |
| | His3 (farmers) | | | | 1.307*** | 1.314*** |
| | | | | | (0.13) | (0.13) |
| | His4 (manual workers) | | | | 0.055 | 0.053 |
| | | | | | (0.12) | (0.12) |
| | His5 (landless agricultural laborers) | | | | -0.776*** | -0.764*** |
| | | | | | (0.16) | (0.16) |
| Literacy | No | (ref.) | | | | |
| | Yes | | | | 0.306** | 0.307** |
| | | | | | (0.13) | (0.13) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Immigrant | No | (ref.) | | | | |
| | Yes | | | | | 0.060 |
| | | | | | | (0.08) |
| | Unknown | | | | | 0.684*** |
| | | | | | | (0.17) |
| | Intercept | 84.85*** | 40.41*** | 39.07*** | 38.33*** | 38.29*** |
| | | (0.13) | (0.76) | (0.76) | (0.85) | (0.85) |
| Municipality Control | | YES | YES | YES | YES | YES |
| | Sample size | 26,601 | 26,586 | 26,586 | 22,574 | 22,574 |
| | Adjusted $R^2$ | 0.025 | 0.138 | 0.159 | 0.176 | 0.176 |

Notes: OLS estimates; *se* denotes robust standard error.
Source: Parish registers, censuses and conscription and call-up records; historical municipal and parish archives.
* Statistical significance at 10% level.
** Statistical significance at 5% level.
*** Statistical significance at 1% level.