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LIVING STANDARDS, NUTRITION AND INEQUALITY IN THE SPANISH INDUSTRIALISATION. AN ANTHROPOMETRIC VIEW

J. M. MARTÍNEZ-CARRIÓN, *Living Standards, Nutrition and Inequality*. H. GARCÍA MONTERO, *The Nutritional Status of Manufacturing Workers*. R. RAMON-MUÑOZ; J. M. RAMON-MUÑOZ, *The Biological Standard of Living in Nineteenth-Century Industrial Catalonia*. J. PUCHE; J. CAÑABATE-CABEZUELOS, *Did Physical Stature Diminish During Spain's Early Industrialisation?* M.ª Á. PÉREZ DE PERCEVAL; J. M. MARTÍNEZ-CARRIÓN; Á. PASCUAL MARTÍNEZ-SOTO, *Biological Welfare and Inequality*. P. M. PÉREZ-CASTROVIEJO, *Biological Welfare during the Economic Development of the Basque Country*.

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Living Standards, Nutrition and Inequality in the Spanish Industrialisation. An Anthropometric View*

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This special issue of *Revista de Historia Industrial* is devoted to the height and standards of living in Spain during the process of industrialisation. The aim is to examine changes in nutrition during the industrial age through anthropometric indicators. The five studies included in this issue provide new evidence on the changes in height among different socioeconomic groups and its relation with health and human well-being in different periods and geographical regions, while exploring inequality even prior to industrialisation and long before the calculation of income distribution became possible in Spain in the late-twentieth century. In addition to tracking the effects of environmental changes on well-being and inequality between the proto-industrial period in the eighteenth century and the industrial leap in the beginning of the second half of the twentieth century, these studies explore the costs of industrialisation in biological standards of living in the short- and the long-term. This introductory article will provide an overview of the study of living standards in Spain from the perspective of anthropometric history, presenting new data and conclusions and an overview of the relevant literature, and finally suggesting future directions of research.

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Nutrition and Human Well-being from the Industrial Revolution Onwards: The Contribution of Anthropometric History

Escaping malnutrition and improving public health standards are among the main human welfare achievements to have occurred since the Industrial Revolution.[1] Industrialisation and urbanisation were decisive processes in the lives of those families who gained access to new opportunities and services, as these resulted ultimately in the improvement of their nutritional state, health and living standards. The economic growth and technological progress achieved by industrialised nations led to an increase in per capita income and life expectancy, and to a decrease in infant mortality. Along with the advances in medical sciences (the dissemination of the germ theory of disease is a significant example), these developments set the stage for the improvement of overall well-being in industrialised nations during the following century. In the long-term, industrialisation had positive effects on public health standards, but at a high social cost, as demonstrated by the debate surrounding the standards of living of the working classes and the negative externalities in urban and industrial environments.[2]

One of the most reliable indicators of past nutrition levels and standards of living is the stature of the different population cohorts. A large body of literature has demonstrated that, over the past 150 years, European populations have undergone an unprecedented increase in stature, of nearly 12 cm, as a direct result of economic progress. These studies have also demonstrated the close link between adult stature and health and development indicators, including productivity.[3] In addition to genetics, stature largely depends on environmental conditions during childhood and adolescence, including diet, physical exertion and infection. Variations in adult stature reflect changes in net nutrition during growth — access to foodstuffs, the quantity and quality of nutrients, and diversification (intake of the necessary calories and proteins) — as well as energy expenditure during physical work and environmental diseases during the first 20 years of life.[4] Studies suggest that improved work organisation, more efficient production and distribution of food, the improvement of sanitary conditions, and the proliferation of institutions that fought against the spread of infection were all determinant factors in the staggering increase in adult height during recent centuries.[5]

1. Fogel (2004); Deaton (2013).
2. For different perspectives on the debate, see Steckel & Floud (1997); Feinstein (1998); Komlos (1998); Szreter & Mooney (1998); Floud, Fogel, Harris & Hong (2011).
3. Steckel (1995); Fogel (2004); Hatton (2014); Komlos & Kelly (2016); Perkins *et al.* (2016). For a global perspective, see NCD Risk Factor Collaboration (2016).
4. Bogin (2001); Silventoinen (2003).
5. Hatton (2014).

Historians and economists have demonstrated that adult stature is not only an excellent proxy for health and living standards. Given the paucity of data concerning inequality and income, stature is one of the better alternative tools for the analysis of income distribution.[6] One of the discipline's key contributions has been to show that stature and income have not always had a parallel evolution, for the former express biological well-being and the later economic well-being. This is one of the most relevant contributions of anthropometrics to social and economic history and the social sciences in general.[7] The so-called 'early-industrial-growth-puzzle' — 'antebellum puzzle' in the USA — indicates that height decreased despite the increase in per capita incomes in the early stages of 'modern economic growth' and the dissemination of industrialisation.[8] The deterioration of the nutritional status observed in Great Britain and other countries as early as the late-eighteenth century, and in the mid-nineteenth century elsewhere, suggests that the take-off of industrialisation was accompanied by an increase of inequality and a reduction in the intake of net nutrients among ample social groups.[9]

The joint analysis of biological and economic variables has decisively improved our understanding of the well-being of both historical and contemporary populations.[10] The use of anthropometric variables has had a transformative effect on economic history, as it has contributed to the development of new approaches which can be used to study the socioeconomic transformation linked to the Industrial Revolution. Nutrition has thus assumed a prominent role in studies of living standards during the spread of industrialisation, especially concerning calorie intake, health and physical-cognitive aspects.[11] Regional patterns and city-countryside variations indicate that height reflects regional differences in diet and, in turn, the availability of nutrients and proximity to animal protein sources.[12]

The European continent escaped malnutrition in the late-nineteenth century. Although privations did not entirely disappear, improvements in public health standards and nutrition began to become noticeable in the 1870s. These improvements were owed especially to urban sanitary reforms and the generalisation of state-sponsored social assistance services. Investment in public sanitary infrastructures (largely sewage systems and the supply of drinking water) was significant in the opening decades of the twentieth cen-

6. Baten & Blum (2012); Blum (2016); Steckel (2013).
7. Komlos (1987); Fogel (1996).
8. Komlos (2012); Craig (2012).
9. Martínez-Carrión (2012); A'Hearn (2016).
10. Komlos & A'Hearn (2016).
11. Floud, Harris & Hong (2015); Kelly, Mokyr & O'Grada (2014); Meredith & Oxley (2014a, 2014b).
12. Baten (2009).

tury.[13] Thenceforth, the overall improvement in diet ran parallel with that of living standards: per capita income, life expectancy and per capita calorie consumption increased, whereas infant mortality and working hours decreased. Average stature increased by 11 cm between the 1870s and the 1980s. Between the cohorts of 1871-75 and 1911-15, the average height increased by 0.76 cm per decade (over 1 cm in Great Britain and the Netherlands). In the twentieth century, the increase was even sharper, with averages of 1.27 cm/decade between 1911-15 and 1951-55 and 1.26 cm/decade between 1951-55 and 1976-80.[14]

Living Standards During the Industrialisation of Spain

Industrialisation in Spain has been viewed in scholarship as a relatively belated and peripheral process of the European Industrial Revolution.[15] Although it had an early start and was accompanied by essential innovations in some regions, especially Catalonia, the spread of industrialisation in Spain was slow, weak and uneven until the early-twentieth century. According to the experts, the main weaknesses in Spanish economic development were shortcomings in the energy supply and the insufficient scope of the market, as well as an economically fragile public sector and the dominance of the primary sector, which presented low levels of investment and productivity and determined low propensity to consumption and demand.[16] The distribution of family expenditure hardly changed until the late-nineteenth century: approximately two-thirds of the expenses corresponded to food, and clothing and shoes corresponded to another fifth,[17] reflecting a typically preindustrial pattern. In general, household consumption, living standards and human development indices in Spain were relatively low compared with those of industrialised Western European countries.[18]

GDP-based per capita estimates reflect a less dynamic trajectory of the Spanish economy compared with the most developed European countries, not only throughout the nineteenth century but up to the 1950s. The picture of the second half of the twentieth century is very different. The Spanish economy made rapid progress in the period that followed World War I (1919-29) and, especially, in the period spanning 1960-1973, the 'economic miracle' period, that followed the liberalisation of the domestic market and the opening

13. Szreter (1988, 2005); Harris (2004); Kunitz (2007); Hatton (2014); Millward & Baten (2010); Millward (2014); Luckin (2015).
14. Hatton & Bray (2010); Hatton (2014); Table I. For the period 1955-80, see Garcia and Quintana-Domeque (2007).
15. Pollard (1981).
16. Nadal (1975); Martín-Aceña & Simpson (1995).
17. Maluquer de Motes (2013).
18. Prados de la Escosura (1988); Crafts (2002); Escudero & Simón (2010).

up to the exterior.[19] Entry into the EU in 1986 inaugurated a new period of economic growth that did not come to an end until the opening decade of the twenty-first century. During this later period of prosperity, Spain grew faster than the European average and reached its highest levels of relative wealth.[20]

In parallel to the process of economic growth, the demographic and epidemiologic transitions and, to a lesser extent, nutritional transition, that had already progressed somewhat in the early-twentieth century, gained momentum in the 1940s and 1950s. Health-related indicators are eloquent: infant mortality, which had been among the highest in Europe, fell by 81% between 1900 and the late 1950s, from 203‰ in 1900 to 43.7‰ in 1960 and 3.9‰ in 2001. Likewise, male life expectancy increased from 34.4 years in 1900-01 to 76.1 years in 2001, while female life expectancy soared from 35.6 to 82.8 years during the same period.[21] The improvement in health conditions towards the end of the period under consideration was directly related to the application of Welfare State policies, the provision of social assistance services, and public investment in healthcare infrastructures. The results of these policies started to become widely visible in cities as early as the first third of the twentieth century, and in rural contexts in the 1960s.[22]

The nutritional transition, for its part, did not kick off until 1960.[23] Calorie intake remained insufficient among several social groups until 1900. It increased in the early decades of the twentieth century as result of the increasing availability of animal protein,[24] but it fell again between the 1930s and 1960s. This drop may be attributed to the effects of the Civil War and the economic policies of early Francoism. The autarchic doctrines adopted in the 1940s and 1950s led to a decrease in the consumption of basic nutrients, especially meat and milk. Calorie intake and the consumption of high-quality protein and micronutrients improved from 1960 onwards, and the process of nutritional transition, and convergence with European consumption patterns, were resumed.[25]

In this context, how did the biological standards of living of the Spanish population evolve? What were the trends in height during the process of industrialisation? In the last two decades, anthropometry has undergone significant advances. The following sections will examine the main contributions to this field, present new data, and propose a new interpretation concerning the nutritional changes undergone during the process of modern economic growth, as well as study the cost of industrialisation.

19. Prados de la Escosura (2003); Maluquer de Motes (2014).
20. Maluquer de Motes (2016).
21. Pérez-Moreda, Reher & Sanz-Gimeno (2015). For 2001, estimates by INE.
22. Vilar & Pons (2015).
23. Cussó (2005, 2010); Cussó & Garrabou (2007).
24. González de Molina, Soto, Infante & Aguilera (2013).
25. Collantes (2014, 2015); González de Molina, Soto, Aguilera & Infante (2014); Pujol & Cussó (2014).

Biological Living Standards and the Relationship to Well-being

Figure 1 illustrates the male height over the last three centuries, calculated on the basis of military draft data.[26] In general, the average height of Spanish males (standardised at the age of 21) was among the lowest in Europe since the Industrial Revolution. By cohorts, male stature underwent the following evolution. 1) In the eighteenth century, the average height was around 163-64 cm; this average fell slightly towards the end of the century. 2) During most of the nineteenth century, the height remained almost stationary at around 162-63 cm; until the 1870s there were slight fluctuations, and the period between 1846 and 1859 witnessed a prolonged depression. 3) Height started to increase around the second half of the 1870s, and this lasted until the eve of WWI, when it reached 165.3 cm. 4) A further deterioration is evident among those born in 1915-1930, which affected conscripts who experienced their adolescent growth spurt in the years of the Civil War (1936-39) and the postwar period (the 'years of hunger'):[27] the average height decreased by just over one centimetre. 5) Finally, the height of those born in 1930 and later increased substantially. The 1981 cohorts (the 2000 draft concluded compulsory military service in Spain) reached an average height of 175.3 cm. Despite the difficulties associated with the data for the late-eighteenth and the early-nineteenth centuries, the increase in average male height between 1840 and 1981 was of nearly 13 centimetres. The most significant increase corresponds to the generations born from 1930 onwards, and especially those of the 1950s. The average increase for conscripts born between 1934 and 1980 is of 1.5 cm/decade.[28] This increase in height parallels the spectacular increase in life expectancy (Figure 1).

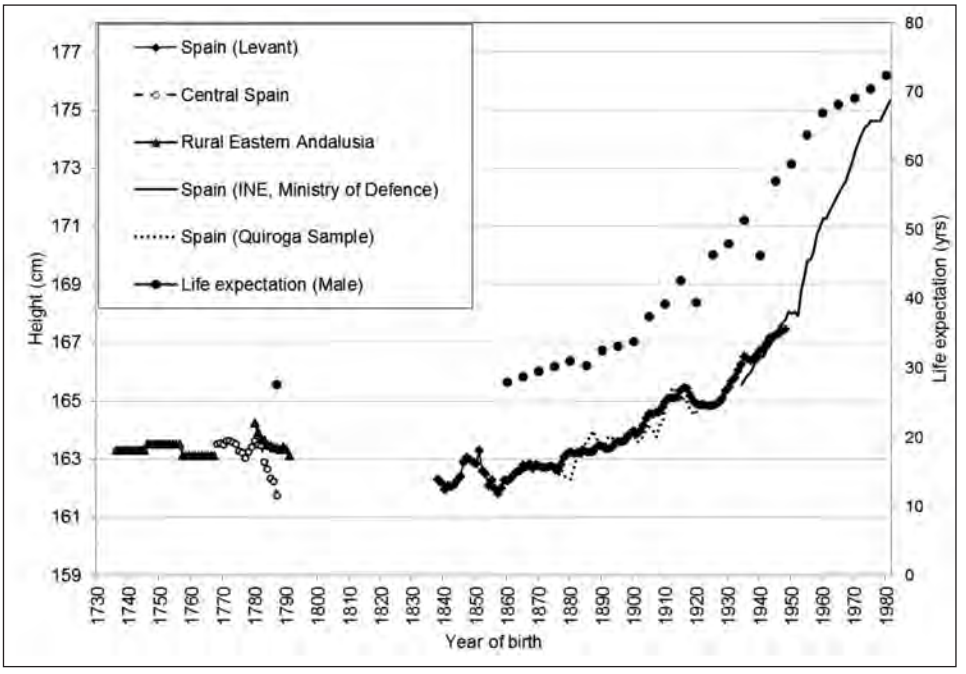
Stature data collected by the *Encuesta Nacional de Salud de España* (ENSE — Spanish National Health Survey) on generations born between 1910 and

26. For the peculiarities of army-based anthropometric data in Spain, see Cámara (2006). The Ministry of Defence and INE have published the data for 1955-2000. For later periods, we have two series constructed on the basis of samples: 1) the longest and more consistent series includes over 350,000 data points concerning individuals born between 1837 and 1949 (drafts of 1857-1969) in five provinces in eastern Spain (Martínez-Carrión & Puche-Gil, 2010, 2011); 2) on a national scale, we have a random sample including the height of 46,385 draftees born between 1874 and 1933 (drafts of 1893-1954), developed by Quiroga (2001). For the closing decades of the *ancien régime*, two regional/local studies provide interesting evidence, although the sample is relatively small and the quality of the data present some problems, which authors have tried to solve with the application of different methodologies. In eastern rural Andalusia, the sample includes 1,500 data points from the towns of Montefrío and Santa Fe (Cámara, 2007). For Central Spain, the sample includes 11,839 data points for 1768-87, see García-Montero (2013).

27. Barciela (2012), pp. 165-166; Comín & Hernández (2013), pp. 271-277.

28. Martínez-Carrión (2005), p. 220; María-Dolores & Martínez-Carrión (2011).

FIGURE 1 ▪ *Evolution of male life expectancy and height (cm) in Spain. Cohorts of 1735-1980 (Height standardised at the age of 21)*



Sources: Male height. Diverse estimates calculated by simple moving averages centred on three years, except for the period 1730-1760 (ten years), because of little data available: Rural Eastern Andalusia (Cámara, 2009); Central Spain (García-Montero, 2013). The most robust data series are: Eastern Spain-Levant (Martínez-Carrión & Puche, 2011); Spain – National Sample of Quiroga (2002); finally, Spain, cohorts of 1934-1980 (Recruitment Statistics, INE-Ministry of Defence). See details in note 60.

Data on male life expectancy: 1787, Dopico & Rowland (1990), p. 597; 1860-1980, Cabré, Domingo & Menacho (2002), p. 127.

1979 reveal that height grew more among males than females.[29] In the early twentieth century, men were on average 10 cm taller than women whereas, of the generations born in the 1970s (which reached physical maturity in the 1990s), sexual dimorphism had increased to approximately 12.5 cm.[30] Using the same methodology and data concerning individuals born between the 1930s and 1980s, average male stature grew by 8 cm (1.6 cm/decade) while female stature increased 4 cm (0.8 cm/decade).[31] Between 1940 and 1960, female height stagnated while male height grew by 3-4 cm. Data from the European Community Household Panel (ECHP) for Spain (up to 2000) indicate that

29. Spijker, Pérez-Díaz & Cámara (2008); Spijker, Cámara & Blanes (2012); Cámara (2015).
30. Spijker, Pérez-Diaz & Cámara (2008); Cámara (2015).
31. Quintana-Domeque, Bozzoli & Bosch (2012), p. 265.

male and female height increased by approximately the same (1.7 cm/decade and 1.6 cm/decade, respectively) in the cohorts for 1950-1980.[32]

Over the last 250 years, the most critical periods for the height of the Spanish population are 1780-90, 1840-70 and 1915-30. The first of these stages, in the late-eighteenth century, corresponds to the decrease in height attested in Europe in 1760-70. This was a more widespread phenomenon than was previously believed: it has been detected in England, Lombardy, France, Saxony, Bavaria, Sweden, Austro-Hungary, Portugal and Spain. The context was one of rapid demographic growth and increasing demand on economic resources, especially in terms of basic nutrients. As aforementioned, climate fluctuations, the increase in food prices and the decrease in real wages all had a negative effect on the nutrition of most Europeans.[33]

Apart from the first 15 years, the hardest times for the biological well-being of the Spanish population in the nineteenth century were the central decades of the century. The drop in height attested in the opening years of the century may be attributed to the great epidemiologic and economic disasters of 1800-1814, the great subsistence crisis of 1803-05, and the effects of the Napoleonic occupation (Peninsular War 1808-12), which contributed to the rise in food prices.[34] The 1820s and the 1830s witnessed a growing trend, which reversed again in the period between the 1840s and 1871-75 because of the rise in basic food prices and the decrease of real wages, and this had a considerable effect on the well-being of the Spanish population in 1850-75.[35] The deterioration in net nutrition can also be explained by the increase in morbidity and, it follows, infant and overall mortality,[36] as well as the problems generated by the dismantling of the charitable institutions of the *ancient régime* and the implementation of liberal reforms.[37] Similarly, the spread of industrialism led to the generalisation of child labour and the strengthening of migration flows towards the cities, which in turn resulted in anarchic processes of urban growth and the habitation of insalubrious dwellings.

During the twentieth century, the generations that suffered the most were those that went through their childhood and adolescence in the 1930s and 1940s. In addition to the deteriorating economic welfare (measured in terms

32. Quintana-Domeque, Bozzoli & Bosch (2012).

33. Komlos & Küchenhoff (2012); Martínez-Carrión (2012). For Portugal, see Stolz, Baten & Reis (2013).

34. For the effects of the two great subsistence crises, see Llopis & Sánchez (2016). For the evolution of living standards indicators in the early-nineteenth century, see García-Montero (2013) and Catalán & Lanza (2015).

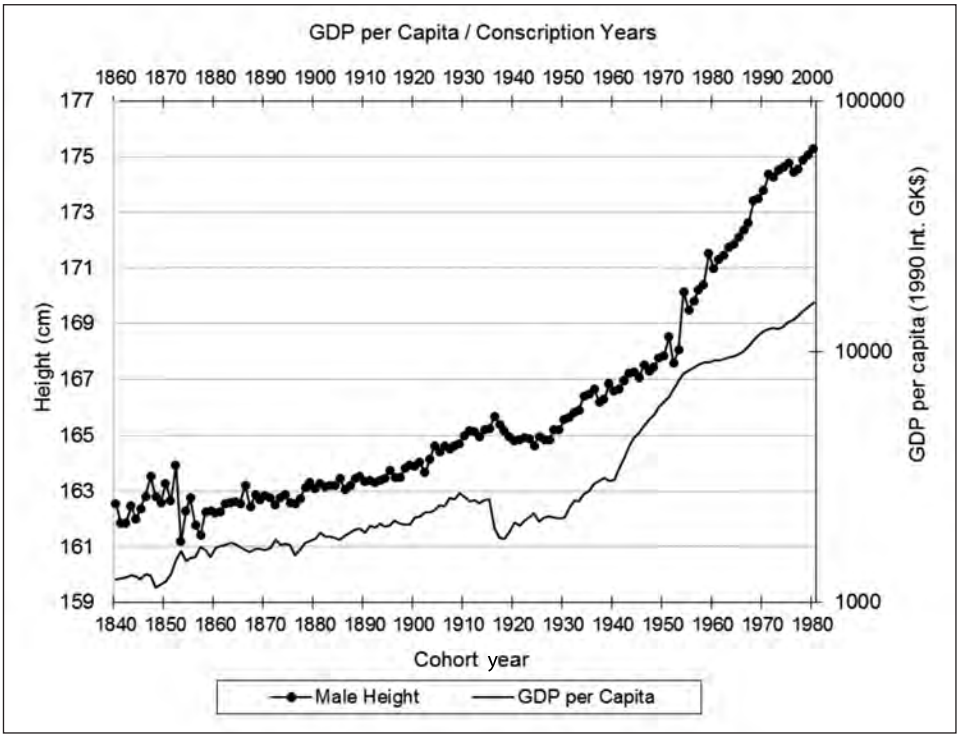
35. Maluquer de Motes (2013, 2016).

36. Pérez-Moreda, Reher & Sanz (2015).

37. The privatisation process of the commons negatively affected the economic situation of a large proportion of rural households and local councils, as well as deteriorating the stock of social capital, Beltrán-Tapia (2016).

of per capita income, real wages and consumption), Spaniards' biological well-being indicators drop, as illustrated in Figure 2, which reflects the average height of military conscripts. This period was characterised by the effects of the Great Depression in the 1930s, the Civil War (1936-1939) and, especially, Francoist autarchic policies. Draftees during the Civil War and the 'years of hunger' (1936-1951) were the shortest of the century.[38] That demonstrates that privations in early puberty and adolescence had a substantial effect on the height of these generations. Although the decrease in height — estimated at slightly over 1 cm in the two most representative national samples (Figure 1) — was not especially dramatic, it is enough to reflect the impact of infant and juvenile malnutrition during the most difficult period in Spain's recent history.

FIGURE 2 ▪ *GDP per capita and male height by cohort & conscription year in Spain, 1840-2000*

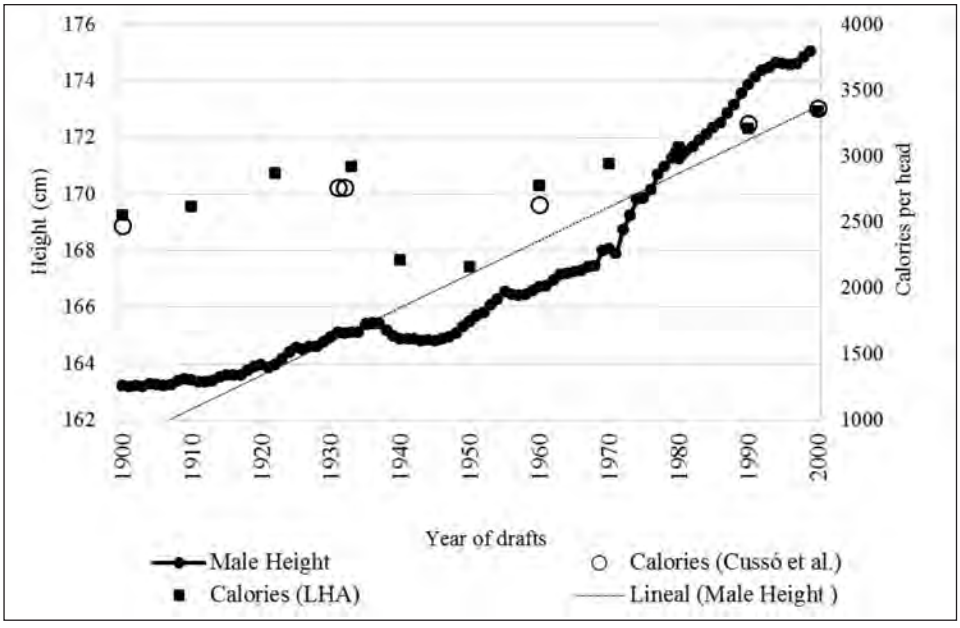


Source: GDP per capita (log scale, per capita GDP levels in 1990 Geary-Khamis dollars from The Maddison-Project, http://www.ggdc.net/maddison/maddison-project/home.htm, 2013 version. Male height: 1840-1969, East-Levant Sample (Martínez-Carrión & Puche, 2011); 1969-2000, Spain (Recruitment Statistics, INE-Ministry of Defence).

38. The sharpest drops correspond to the mid-1940s drafts; see Martínez-Carrión, Martínez-Carrión, Puche, & Ramon (2012); Puche-Gil (2010).

Hunger and infant malnutrition affected large sectors of society during early Francoism, as has recently been confirmed by historical epidemiological studies, supported by infant anthropometric data.[39] The fall in stature among draftees in the 1930-1950 period is related to a loss of economic well-being, especially the fall in private consumption, which dropped sharply between 1935 and 1950; per capita consumption did not recover to previous levels until 1956.[40] Calorie consumption data reveal the severity of the alimentary depression undergone between 1935 and 1960, according to different estimates (Figure 3). After the advances achieved in the first third of the twentieth century, owing to the increased availability of animal protein, between 1933 and 1960, caloric intake decreased by 5.2% according to Pujol and Cussó (2014) and 9.9% according to González de Molina *et al.* (2013). The most dra-

FIGURE 3 ▪ *Calories available for consumption per capita per day and male height by draft date in Spain, 1900-2000*



Source: Estimates for calories per head per day are based on a) Cussó (2010); Pujol and Cussó (2014); b) LHA* (2013). Male height: 1900-1968, East-Levant Sample (Martínez-Carrión & Puche, 2011); 1969-2000, Spain (Recruitment Statistics, INE-Ministry of Defence). Data were estimated by moving averages centred three years.

(*) LHA: Laboratorio de Historia de los Agrosistemas - Agroecosystems History Laboratory (AHL) at the University Pablo de Olavide (Seville); see González de Molina, Soto, Infante and Aguilera (2013).

39. For infant malnutrition during Francoism, see Trescastro, Galiana, Pereyra, Vasallo, Nolasco & Bernabeu (2014).

40. Prados de la Escosura (2003); Maluquer de Motes (2014), Appendix A.3, pp. 626-627.

matic drop in caloric consumption, however, took place in the 1940s, when daily calorie intake fell to 2,209 kcal/day in 1940 and 2160 kcal/day in 1950, more than 25% below the 1930-35 levels.[41]

The lowest estimated data for energy, protein and micronutrient consumption correspond to the mid-1940s.[42] Meat, milk and dairy products, as well as fish, were the hardest to come by during this period of economic autarchy. Economic policies led to rationing, a scarcity of basic products and the rise of the black market (*estraperlo*). Alimentary shortages were aggravated by the restricted supply of water and energy, the sharp fall in wages and the deterioration of labour conditions.[43] Food consumption levels dropped to nineteenth-century levels,[44] and 1930 calorie intake levels were not reached again until 1960. Only after that year did the consumption levels of the most characteristic foodstuffs of the nutritional transition — meat, milk and dairy products — increase significantly in Spain. Convergence with European standards took place in the 1980s.[45]

The corporal mass index is a predictive indicator of health conditions on the basis of height and weight. No significant changes in this index can be attested until the 1980s. Obesity had been hardly relevant until then, but initiated an ascending trend thereafter, increasing from 7.4% in 1987 to 17% in 2012, according to the National Health Survey. It is more common among men than among women, and is especially frequent among the poorer social classes.

Differences in Adult Height in Different Spanish Regions

In Spain, industrialisation was a geographically uneven process, with profound consequences for living standards and height.[46] As well as affecting the speed of economic growth, for better or worse, environmental conditions affected adult height to such an extent that regional differences persisted for a long period afterwards. Catalonia was the first region to follow in the wake of Great Britain in the nineteenth century; Catalonian modern production of

41. González de Molina, Soto, Infante & Aguilera (2013). These estimates are similar to those calculated by García-Barbancho (1960). According to García-Barbancho the greatest fall took place between 1940 and 1947, when the daily intake fell from 2,249 kcal/day to 2,090 kcal/day. The lowest average stature also corresponds to 1947.

42. Villalbí & Maldonado (1996).

43. There are abundant accounts of the harsh living conditions that characterised the period; see Barciela (2013); Comín & Hernández (2013).

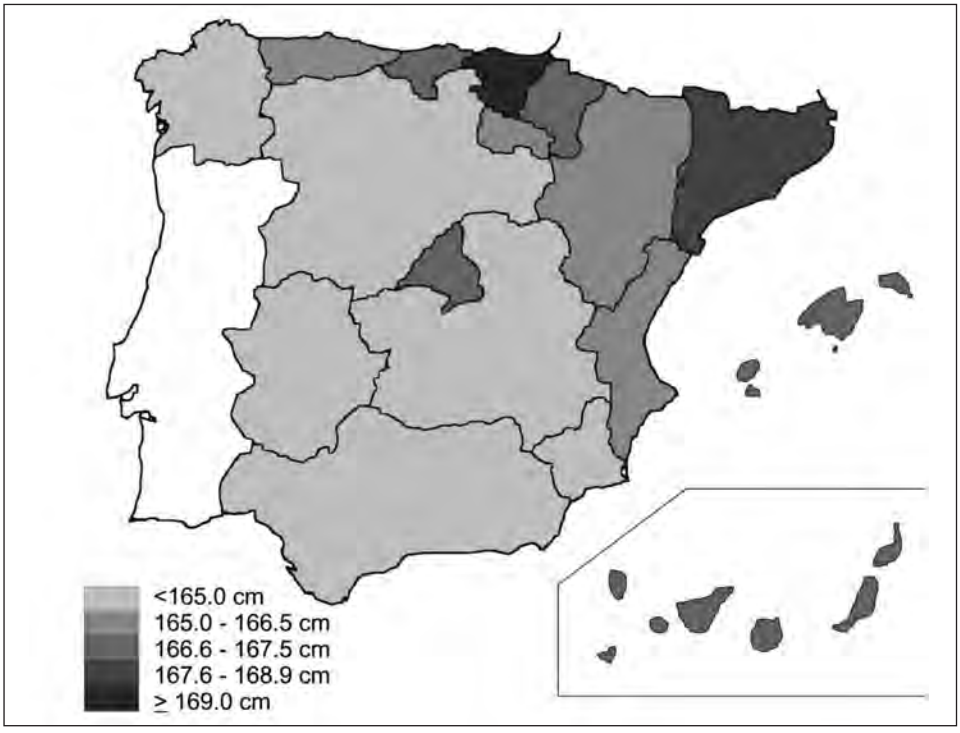
44. Simpson (1995).

45. Pujol & Cussó (2014); Collantes (2014, 2015); Marrodan, Montero & Cherkaoui (2012).

46. Domínguez & Guijarro (2000); Escudero & Simón (2012); Martínez-Galarraga, Rosés & Tirado (2015).

consumer goods soared especially between 1835 and 1861.[47] In the rest of the country, industrialisation was a slow and belated process, despite the fact that some regions and industrial sectors tackled the challenges posed by the second industrial revolution with relative success.[48] By the late-nineteenth century, there was a healthy industrial sector in the Basque Country and the region of Valencia, but industrial expansion did not reach the rest of the country until the 1920s, and was not fully consolidated until around 1960. Economic development and industrial dynamism, and their effect on consumption and diet,[49] resulted in considerable variation in average height, which is well documented from the early-twentieth century onwards.[50]

FIGURE 4 ▪ *Regional male height at 20 years of age in the 1955 draft*

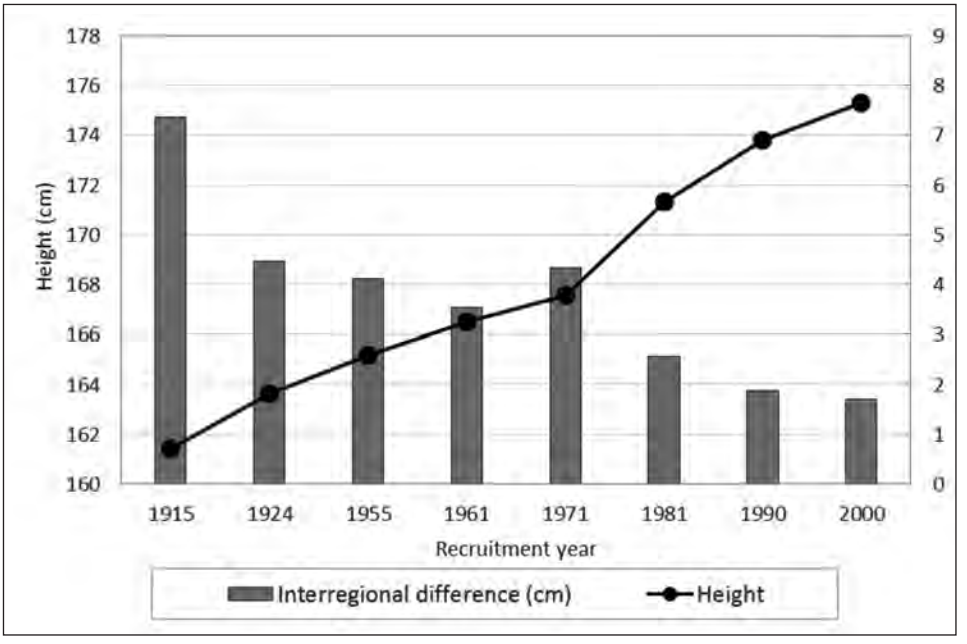


Source: Martínez-Carrión (2005a).

47. Nadal, Benaul & Sudrià (2012); Martínez-Galarraga & Prat (2016).
48. Maluquer de Motes (2014).
49. For the regional distribution of the industrial sector, see Nadal (2003); Parejo-Barranco (2004). For regional variability in the diet, see Nicolau & Pujol (2006, 2015); Pujol & Cusso (2014); and in milk consumption see Muñoz-Pradas (2011).
50. Martínez-Carrión (1994a, 2005a); Gómez-Mendoza & Pérez-Moreda (1985, 1995); González-Portilla (2001); Quiroga (2001, 2010); Quintana-Domeque, Bozzoli & Bosch (2012); Cámara & García (2015).

During the twentieth century, the highest heights were in the Basque Country and Catalonia, along with the island regions of the Canary Islands[51] and the Balearic Islands. Galicia and the interior and southern regions presented the lowest heights.[52] There is a clear pattern between higher statures and industrialised regions with a higher per capita income, and lower statures and predominantly rural, poorer and non-industrialised regions. The net nutrition map based on the 1955 draft (Figure 4) reveals that inequalities still persisted in the late 1960s. In 1955, the Basques were still of the greatest height: 3 cm above the national average. In 2000, the average stature in the Basque Country was 175.7 cm, behind only Navarra and Aragon. In this issue, the study which was undertaken on height in the Basque Country, based on a sample taken in six municipalities of Biscay between 1876 and 2000, demonstrated that a formidable increase of nearly 12 cm occurred.[53]

FIGURE 5 ▪ *Interregional differences in male height in Spain by recruitment year, 1915-2000*



Source: Author's own work, after *Estadísticas del Reclutamiento y Reemplazo del Ejército* and *Anuarios Estadísticos de España*, and Martínez-Carrión (2005a).

51. One study carried out in the municipalities of Santa Cruz (urban) and the Orotava Valley (rural), in Tenerife, reveals that average stature reached 168 cm and 166 cm respectively in the mid-nineteenth century, according to Román-Cervantes (2013).

52. Extremadura, one of the regions studied recently, see Linares & Parejo-Moruno (2015, 2016).

53. Pérez-Castroviejo (2016).