This article was published on-line on April 27, 2017

Essays in
ECONOMIC & BUSINESS HISTORY

The Journal of the Economic & Business History Society

THE ECONOMIC & BUSINESS HISTORY SOCIETY

Editor
Jason E. Taylor
Central Michigan University

ISSN 0896-226X
LCC 79-91616
HC12.E2

REGIONAL VARIATION AND CONVERGENCE OF HEIGHT AND LIVING CONDITIONS IN SWEDEN DURING THE TWENTIETH CENTURY

Stefan Öberg
Unit for Economic History
University of Gothenburg
stefan.oberg@gu.se

Kristoffer Collin
Unit for Economic History
University of Gothenburg
kristoffer.collin@econhist.gu.se

This study investigates regional differences in height in Sweden during the twentieth century using data from universal conscript inspections (for men). We find substantive differences (2-3 cm) in height between the counties. Men in the southern, southeastern and northernmost parts of Sweden were shorter. Men in the Stockholm and Göteborg regions were taller and we find no "urban penalty" in height. The differences in height between counties declined over the course of the twentieth century and the average height increased more in the counties with an initially shorter average height. We find the expected positive associations between height and the real wage in manufacturing and the regional GDP per capita respectively. The real wage in the manufacturing sector is more consistently associated with the county average height than that for the agricultural sector. Contrary to expectations, we find that the men were consistently taller in counties with higher food prices and where the relative price of animal foods was higher. The average height was negatively associated with the infant mortality rate during the men's childhood in the mid-twentieth century. The association was less clear in the early twentieth century.

Introduction

The average height of a population is strongly influenced by its living conditions and life style. Genetic differences, in contrast, have no substantial influence at the population level (WHO Multicentre Growth Reference Study Group and de Onis 2006, 59f; see Öberg 2014a, 20-23 for further discussion). This makes it possible to use the average height of a population to supplement other measures of material living conditions, such as real wages or GDP per capita.

Average height has been increasing almost linearly in most countries that have experienced modern economic growth. Many societal changes and changes in the diet and living environment occurred simultaneously over the same period. Because it is difficult to get accurate and stable results by analyzing the associations between a large number of potentially important and linearly trending factors it is very difficult to disentangle the factors that have had the greatest influence on the secular trend in height. The average height of a population is closely related to changes in the level of material living conditions, measured by the gross domestic product or the real wage (see Öberg 2014a, 24-26 and the references there). But other studies have found that, for example, the infant mortality rate around birth is a better predictor of the development of the average height of populations (Hatton 2014).

To better understand which factors have had the greater influence on the average height some studies have turned to regional variations within countries. The bulk of studies find past or present regional differences in height within countries.[1]

Regional differences in average height are always found to be positively associated with measures of material living conditions, such as regional GDPs. Results are more varied regarding other associations.

---

[1] See for example: Spain (Quintana-Domeque, Bozzoli, and Bosch 2011; 2012; Camara and Garcia-Roman 2014), France (Postel-Vinay and Sahn 2010; Heyberger 2014), Italy (Peracchi and Arcaleni 2011; Lanari and Bussini 2014), the United Kingdom (Floud, Wachter, and Gregory 2006), Germany (Baten 2009; Coppola 2010), Norway (Sunder 2003), Colombia (Meisel and Vega 2007), Brazil (de Oliveira and Quintana-Domeque 2014) and Japan (Bassino 2006).

Some studies find that the infant mortality rate around birth adds significantly to explaining the regional differences (e.g. Peracchi and Arcaleni 2011; Quintana-Domeque, Bozzoli, and Bosch 2011) while others do not (e.g. Bassino 2006; Camara and Garcia-Roman 2014; de Oliveira and Quintana-Domeque 2014). Joerg Baten and his collaborators have argued in a large number of publications that regional differences in the access to animal protein are an important explanation for differences in height both between (Koepke and Baten 2008; Blum 2013; Baten and Blum 2014) and within countries (Baten and Murray 2000; Moradi and Baten 2005; Baten 2009).

Height is a better measure of deprivation than of affluence. Average height does not continue to increase with income past the point when all requirements for growth have been met (see for example the discussion in Steckel 2008). The average height has, for example, stopped increasing in the richest countries in Europe while it is still increasing in the poorer countries (Larnkjær et al. 2006). Generally improving living conditions, across all regions of a country, should therefore lead to declining differences in height. Regional differences in height have indeed been shown to decline over the twentieth century in a number of different countries.[2]

Regional differences in income declined in Sweden during the nineteenth century and until the First World War with the convergence continuing again after the volatile interwar period (Henning, Enflo, and Andersson 2011; Enflo, Lundh, and Prado 2014; Enflo and Rosés 2014; Collin, Lundh, and Prado 2016; see also Lundh and Prado 2015). This is yet another reason to expect the regional differences in height in Sweden to converge during the twentieth century.

This paper explores regional differences in height in Sweden during the twentieth century using data from the universal conscript inspections (for men). We investigate how the differences developed over time to see if we can document a regional convergence of heights in

[2] See for example Norway (Sunder 2003), Japan (Bassino 2006), Colombia (Meisel and Vega 2007), Italy (Arcaleni 2006; Lanari and Bussini 2014).

Sweden. For two cohorts we also estimate the associations between the county average heights with a set of different measures of the living conditions of the people living there.

Based on the results of previous research we expect that the average height in the counties should be positively associated with the measures of material living conditions we have examined: the agricultural and industrial real wages and the regional GDP per capita. We include both the manufacturing and agricultural wages because previous research has sometimes found that they are differently associated with the average height (Heyberger 2014, 119fn12). By including several different similar measures, we can also investigate which one is most closely associated with the average height.

Because a large number of studies find that access to nutrition and especially animal proteins were important factors influencing differences in height we also estimate the associations with regional differences in the relative price of food and animal foods. Based on the results in the previous literature we expect the average height in the Swedish counties to be negatively associated with the relative price of food and especially with the relative price of animal foods.

We also estimate the associations with infant mortality and urbanization rates in the counties. The infant mortality rate is intended to capture variations in the quality of the living environment, including childcare practices, sanitation and health care, between the counties. The direct effect of exposure to disease around birth, as captured by the infant mortality rate, is very weak or non-existent (Öberg 2015). The conflicting results in previous research make it difficult to build clear predictions of these associations, but the average height should, if anything, be negatively associated with the infant mortality rate. The urbanization rates are intended to capture similar aspects of the living environment. It is even more difficult to predict this association. There are both “urban premiums” and “penalties” for height reported in previous research (see Heyberger 2014 and the references therein).

Background

A large number of previous studies have examined regional differences in living conditions in Sweden as measured by wages, prices, GDP and poverty levels (Söderberg 1978; 1985; Jörberg and Bengtsson 1981; Bengtsson 1990; Lundh, Schön, and Svensson 2005; Enflo, Henning, and Schön 2014; Enflo, Lundh, and Prado 2014). In addition, previous studies have also explored differences in mortality within Sweden (e.g. Norberg, Norman, and Åkerman 1979; Rogers and Nelson 1997; Brändström, Edvinsson, and Rogers 2000; 2002; Edvinsson and Nilsson 2000; Molarius and Janson 2001; Willner 2004; 2008).

Previous studies have also examined regional differences in height in Sweden. Lars Sandberg and Richard Steckel (1980; 1987) pioneered the study of heights for historical populations through their studies of recruited soldiers in Sweden in the eighteenth and nineteenth centuries. They found large (about 6 cm) and rapidly changing regional differences in height in the early nineteenth century (Sandberg and Steckel 1988; 1990; see also the critique in Söderberg 1989). In addition they found that men in Stockholm were substantially shorter than men in other parts of Sweden. Their sample, as mentioned, only included recruited soldiers and so it is not certain, or even likely, that these results correspond well to the situation in the general population (Bodenhorn et al. 2017). The regional differences in height are also much reduced and changed when other methods are used on their data (Öberg 2014b) to adjust the estimates of the average for the minimum height requirement that was in place for recruited soldiers.

Studies have also found differences in height between the Swedish counties using data from the universal conscript inspections (for men) (Arbo 1875; Hultkrantz 1897; Retzius and Fürst 1902; Linders and Lundborg 1926).[3] Hultkrantz (1897, tab. 1-3) shows that the average height also varied between both administrative areas ("härad") and

[3] The motivation for some of these works (especially Retzius and Fürst 1902; and Linders and Lundborg 1926) was to investigate the "racial characteristics" of the Swedish population.

parishes within counties. There are unfortunately some potential problems with these results because the data only included the men who were chosen for military training at the conscript inspections. This group constituted only about half the men in each cohort and they were, more importantly, chosen partly based on their height.[4] Some uncertainty therefore exists regarding how well they reflect the true regional averages, but there are still some consistent patterns in the results.

All these studies find that men in the Stockholm and Göteborg regions were taller than the average, along with men in Jämtland and Gävleborg.[5] In the later studies the men in Älvsborg, Skaraborg and on Gotland are also taller than average (Retzius and Fürst 1902; Linders and Lundborg 1926). In contrast, men in Malmöhus, Kristianstad and Blekinge were found to be consistently shorter than the average. Among men born during the nineteenth century the men in Östergötland and Västmanland are also found to be shorter (Arbo 1875; Hultkrantz 1897; Retzius and Fürst 1902). In the later studies (i.e. Retzius and Fürst 1902; Linders and Lundborg 1926) the men in Halland and Örebro are also shorter, as are the men born between 1901-1904 in Kalmar (Linders and Lundborg 1926). Men in the northern part of Sweden (Västerbotten and Norrbotten) were also

[4] J. Vilh. Hultkrantz (1897) studied regional differences in height among the men accepted at the conscript inspections between 1887 and 1894 (most likely adding data on the enlisted soldiers during these years). The included men correspond to about two-thirds of the men inspected at the conscript inspections. Gustaf Retzius and Carl M. Fürst (1902) carried out a study of regional differences in height for the first edition of Anthropologia Suecica. They used data on the men accepted at the conscription inspections in 1897 and 1898 (men born mostly in 1876 or 1877). They corresponded to about half of these birth cohorts. Frans Josua Linders and Herman Lundborg (1926) of the Swedish State Institute for Racial Biology in Uppsala carried out a follow-up study of Retzius and Fürst's work and published a second edition of *Anthropologia Suecica*. They studied men aged 20-21 years who were accepted for military training at the conscript inspections in 1922-1924. The included men corresponded to about half of the birth cohorts.

[5] See Figure A1 in the appendix for a map of the Swedish counties.

consistently shorter than the average. Hultkrantz (1897) surprisingly found that men (born 1866-1873) in Västernorrland were among the tallest in Sweden. The men in Västernorrland are among the shortest in the other, later studies (Retzius and Fürst 1902; Linders and Lundborg 1926).

Birger Broman, Gunnar Fridlizius and A. Lichtenstein (1942) studied regional differences in height among schoolchildren. The children were measured late in 1938 or early in 1939, and were born during the second half of the 1920s and early 1930s. Their results are also in line with the previous studies on conscripted men, in that schoolchildren in Stockholm were significantly taller than schoolchildren in Malmö and the Linköping area (county of Östergötland).

Data

This section briefly introduces our data. For details the reader may consult the appendix. The information on heights by county comes, as mentioned, from the universal conscript inspections (for men). We study the regional variation in height in four cohorts of men; born in 1905/1906, 1952/1953, 1962/1964 and 1972/1973. The cohorts were chosen because of data availability and, for the later groups, so that they are roughly equally spaced. We also investigate the associations between the average height and other measures of living conditions and environment for the men born in 1905/1906 and 1952/1953.

The county-specific information on the average height is organized based on the county of residence at the time of inspection. Migration across the county borders before the inspection could therefore distort the results somewhat. But since the migrants were always a small minority, we expect this bias to be minor. The men born in 1905/1906 were 20 years old at inspection while the men born in 1952/1953 were 19 years old and the men born in 1962, 1964 and 1972/1973 were 18 years old. We include all men born in the specified years who were aged 17-21 years at inspection for the cohorts born 1962/1964 and 1972/1973. We have not adjusted the presented estimates for age at inspection. We did try this, but the results were almost identical.

We have gathered and constructed measures of living conditions and quality of living environment from various sources. Our measures of regional living conditions and quality of living environment include: manufacturing and agricultural wages, cost of living, relative food prices, animal price ratio, GDP per capita, infant mortality rate, and urbanization rates. We test the associations between the county-specific average heights for men born in 1905/1906 with other measures for the years 1910-1920. The average heights for the men born in 1952/1953 are paired with other measures for the years 1950-1960.

We use county-specific hourly real wages for the manufacturing and agricultural sectors. These were made available through a number of recent and ongoing research projects creating county-specific nominal wages for manufacturing (Collin 2016) and agriculture (Enflo, Lundh and Prado 2014; Lundh and Prado 2015; Prado, Collin, Lundh and Enflo 2016), and county-specific cost of living indices (Collin, Lundh and Prado 2016).

We use the regional GDP per capita provided in Kerstin Enflo, Martin Henning and Lennart Schön (2014, tab. C2). The figures provided are indices with the national average set to one for each year. We use the 1910 estimates for the cohort born in 1905/1906 and an average of the indices for 1950 and 1960 for the cohort born in 1952/1953.

To capture regional differences in the price of food we construct a regional relative food price ratio, using the underlying food price data in the cost of living indices. We divide each county’s total cost of food items by the national average food cost (arithmetic mean across counties). In addition we use the county price data and budget weights to construct regional animal price ratios. For this we divide the total cost of animal products by the total food cost in each county.

The data on the infant mortality rate by county comes from Statistics Sweden and are averages by county for the periods 1911-1920 and 1951-1960. The infant mortality rate is expressed as the total number of deaths among children younger than one year (excluding stillbirths) out of the total number of live births (per thousand).

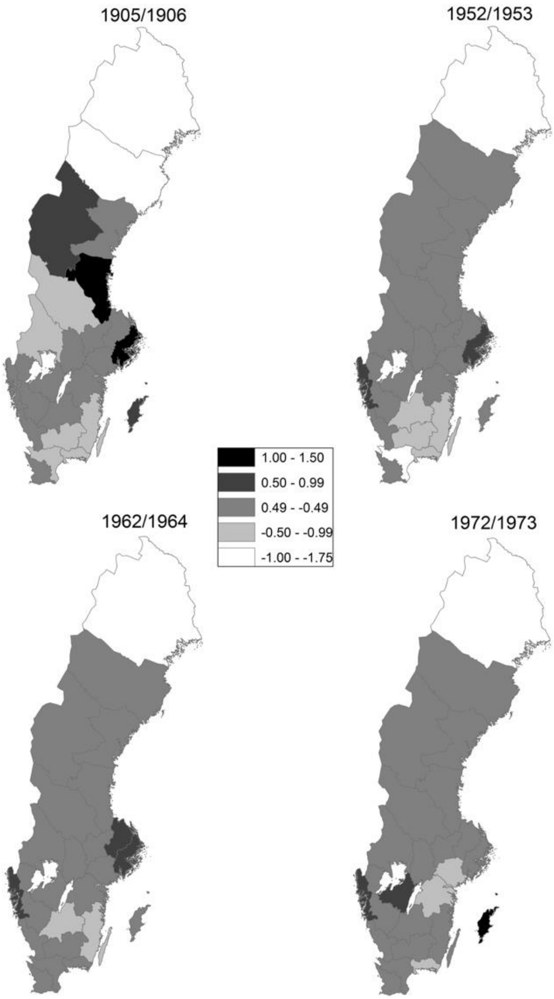
The data on urbanization rates by county are also collected from Statistics Sweden and are expressed as averages for the periods 1911-1920 and 1951-1960. The rates measure the population living in towns divided by the total population in the county.

Regional Differences in Height in Sweden during the 20th Century

We find systematic but relatively small regional differences in the average height (Figure 1).[6] The differences from the overall national average are smaller than ±1.5 cm for all counties, except for cohort 1905/1906 in Norrbotten. The difference in average between the tallest and shortest region are 3.2, 2.3, 1.8 and 2.1 cm for the four cohorts respectively. There are no genetic or other reasons to expect any differences in height between the counties except for differences in living conditions and environments, so the differences we do find are informative. The average height in Sweden increased by about one millimeter per year of birth between 1850 and 1950 (Öberg 2014a, fig. 1). The differences in average height in millimeters between the counties therefore correspond roughly to the number of years of the secular increase, i.e. 18-31 years of secular increase in height.

The men in the county of Stockholm and the county of Göteborgs och Bohus are taller than the average. The men in Stockholm were especially tall early in the twentieth century but gradually lost this advantage over time. The men in Göteborg and Bohus county have a smaller height advantage but are consistently about half a centimeter taller than the national average. The men in the western counties of Älvsborg and Skaraborg are also somewhat taller than the average, while the men in Halland are shorter in the early twentieth century but catch up and surpass the average over time. The counties close to Stockholm are not consistently taller, even if the men in Uppsala county are taller among men born in 1952/1953 and 1962/1964.

[6] The underlying data for Figure 1 is presented in Table A1 in the appendix.



Source: Table A1 in the appendix provides the figures used for the maps.

Note: The average height is the average height of men measured at the conscript inspections.

Figure 1

The Regional Variations in Height in Sweden
During the Twentieth Century

The men in the counties of Blekinge and Kristianstad are shorter than the national average throughout the twentieth century. The men in Kalmar, Kronoberg and Jönköping counties are also shorter in the first three cohorts.

The men in the northernmost counties, Norrbotten and Västerbotten, were also shorter than the national average throughout the twentieth century. The Sami minority population living there could be part of the explanation for this since they were on average substantively shorter than the national average height during the early twentieth century (*The Race Biology of the Swedish Lapps. P. 2, Anthropometrical Survey* 1941).[7]

Regional Convergence in Height in Sweden during the 20th Century

As can be seen from the maps the variation in height within Sweden was larger in the early twentieth century than later (Figure 1). This result is confirmed in a formal analysis. There was an almost continuous σ-convergence in height between the Swedish counties during the twentieth century. Both the coefficient of variation in height across Swedish counties and the maximum absolute value of the difference from the national average decreased over time. The coefficient of variation of the average heights across the counties followed the same pattern as the maximum difference cited above (1925/1926, 0.40%; 1952/1953, 0.30%; 1962/1964, 0.23%; 1972/1973, 0.26%).

Yet another sign of the reduced regional differences in height is that the county differences explain less of the individual variation in height for each cohort (1925/1926, 1.4%; 1952/1953, 1.0%; 1962/1964, 0.5%; 1972/1973, 0.4%).

If the reduced differences result from a general improvement in living conditions in Sweden we would also expect β-convergence, meaning that height increased more in counties that had a lower average height in the earlier period. We estimated the β-convergence in height through a regression, as defined here (Barro and Sala-i-Martin 1992):

---

[7] In this volume Gunnar Dahlberg uses information on the anthropometric differences between the Sami and other people in Sweden to show that this type of information cannot be used to distinguish the two groups as separate "races".

$$\frac{1}{t1-t0}\ln\left(\frac{Height_{i,t1}}{Height_{i,t0}}\right) = \alpha + \theta \ln\left(Height_{i,t0}\right) + \varepsilon_i$$

The convergence rate, β, was then calculated as:

$$\beta = -\left(\frac{1}{t1-t0}\right)\ln(\theta(t1-t0)+1)$$

There was statistically significant β-convergence between the first and last cohorts (1905/1906-1972/1973: β=0.025), as well as between all four periods.[8] The convergence rate also increased over time with each time period (1905/1906-1952/1953: β=0.022; 1952/1953-1962/1964: β=0.042; 1962/1964-1972/1973: β=0.074). Most of the regional differences disappear during the first half of the twentieth century. The rate of convergence is still the smallest for this period because the gap between the first two cohorts is much larger than the subsequent gaps. The important conclusion from the estimates of the β-convergence is that the average height increased more in the counties where the average height was initially lower.

Associations Between the Average Height and other Measures of Living Conditions

We estimated the association between the average height and a set of other measures for living conditions and environment for the cohorts born in 1905/1906 and 1952/1953. We focus on these cohorts because most of the measures we use are not yet available for the later cohorts. Because of the data limitation we estimate the associations for both a reduced sample of 19 counties, excluding the counties of Gotland, Norrbotten, Västerbotten, Västernorrland and Älvsborg (Panels A and C) and, for the measures available, all 24 counties (Panels B and D). We exclude these five counties to cover the same area in both cohorts.

We estimate OLS regressions associating the average height with the other measures, first each separately and then jointly. For the measures of access to nutrition, infant mortality and urbanization rates, we first

[8] Our complete regression estimates are presented in Table A2 in the appendix.

estimate the separate association and then adjust the model for either the real wages or the GDP per capita.

The coefficients shown in Tables 1-4 are standardized beta-coefficients from OLS regressions.[9] The coefficient corresponds to the change in the height (in standard deviations) for a change of one standard deviation in the explanatory variable. The regression coefficients should be interpreted as measures of association rather than as causal impacts.

The average height is, as expected, positively and similarly associated with the regional GDP per capita and the real wage in manufacturing for both cohorts (Table 1). But for the cohort born in 1905/1906 the result depends on which counties are included. The positive association with GDP per capita is reduced in size and loses its statistical significance when the association is estimated across all 24 counties instead of the reduced sample of 19. The explanation for this is that the GDP per capita was above the national average for the northernmost county, Norrbotten, while the average height was the lowest in Sweden. For the later-born cohort the results vary much less between the samples.

The real wage for the manufacturing sector is more closely associated with the average height than the real wage for the agricultural sector. The county average height is even, surprisingly, negatively correlated with the real wage in the agricultural sector for the cohort born in 1952/1953. This indicates that the standard of living, as reflected in the average height, was lower in the less densely populated and less urbanized counties, which had a higher real wage in agriculture.

[9] The non-standardized results are presented in Tables A5-A8 in the appendix.

Table 1
Regional differences in height related to measures of material living conditions

		Model 1	Model 2	Model 3	Model 4
The average height by county for men born 1905/1906 related to other measures from 1910-1913					
Panel A.	Agricultural real wage	+0.24	—	—	+0.08
	Manufacturing real wage	—	+0.53**	—	+0.50**
	GDP per capita	—	—	+0.61***	—
	Counties, *N*	19	19	19	19
	R^2	0.06	0.28	0.37	0.28
Panel B.	Agricultural real wage	–0.18	—	—	—
	Manufacturing real wage	—	—	—	—
	GDP per capita	—	—	+0.32	—
	Counties, *N*	24	—	24	—
	R^2	0.03	—	0.11	—
The average height by county for men born 1952/1953 related to other measures from 1950-1960					
Panel C.	Agricultural real wage	–0.49**	—	—	–0.37*
	Manufacturing real wage	—	+0.61***	—	+0.53***
	GDP per capita	—	—	+0.66***	—
	Counties, *N*	19	19	19	19
	R^2	0.24	0.37	0.43	0.51
Panel D.	Agricultural real wage	—	—	—	—
	Manufacturing real wage	—	+0.45**	—	—
	GDP per capita	—	—	+0.56***	—
	Counties, *N*	—	24	24	—
	R^2	—	0.21	0.32	—

Notes: The numbers presented are standardized beta-coefficients from associative regressions.

Sources: See Section 3 and the detailed data description in the appendix.

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

As described above we use two proxies for the differences in the access to nutrition in the different counties. Firstly, we use the relative price of food in the counties compared to the national average. Secondly, we use the relative price of animal foods compared to the price of the complete food basket in the county. Both indices increase as the cost of food in general increases or the relative cost of animal foods increases. We therefore expect a negative association between these measures and the average height. Instead we find positive associations for both measures and cohorts, meaning that the average height was taller in counties where food was more expensive and where animal foods were relatively more expensive (Table 2). These associations remain when we adjust for real wages or GDP per capita. The associations are especially consistent for the relative price of animal foods. The men were taller in counties where animal foods were more expensive throughout the first half of the twentieth century. These results thus go against the findings in the literature arguing that access to animal proteins was an important factor for increasing the average height.

Next, we investigate the association between the average height and the infant mortality rate in the county during the men's childhood (Table 3). Again we get some surprising results. There is no statistically significant association between the infant mortality rate and the average height for the earlier cohort. The association is actually positive and remains positive even after controlling for the income level through real wages. During this time the infant mortality rate was higher in the areas with a higher GDP per capita (Table A3 in the appendix). When adjusting for the GDP per capita the positive association between the average height and infant mortality rate vanishes. The estimated association changes to become negative when we estimate the association across all 24 counties. It also has a statistically significant negative value when we adjust for the GDP per capita. The association between the infant mortality rate and the average height is more consistent and stable in the later cohort and is negative in all models. The variation in the infant mortality rate apparently captures more relevant variation in the living environment in the mid-twentieth century than in the early twentieth century.

Table 2

Regional differences in height related to measures of access to nutrition

		Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910-1913				
Panel A.	Agricultural real wage	—	+0.07	—
	Manufacturing real wage	—	+0.44*	—
	GDP per capita	—	—	+0.72***
	Relative price for food	+0.36	+0.16	+0.29*
	Relative price for animal foods	+0.41*	+0.35	+0.59***
	Counties, *N*	19	19	19
	R^2	0.21	0.40	0.69
Panel B.	GDP per capita	—	—	+0.47**
	Relative price for food	–0.14	—	–0.17
	Relative price for animal foods	+0.30	—	+0.42**
	Counties, *N*	24	—	24
	R^2	0.14	—	0.34
The average height by county for men born 1952/1953 related to other measures from 1950-1960				
Panel C.	Agricultural real wage	—	–0.21	—
	Manufacturing real wage	—	+0.59***	—
	GDP per capita	—	—	+0.67***
	Relative price for food	+0.44*	+0.38**	+0.30*
	Relative price for animal foods	+0.47*	+0.47**	+0.53***
	Counties, *N*	19	19	19
	R^2	0.29	0.73	0.70
Panel D.	GDP per capita	—	—	+0.65***
	Relative price for food	+0.23	—	+0.08
	Relative price for animal foods	+0.48**	—	+0.55***
	Counties, *N*	24	—	24
	R^2	0.19	—	0.58

Notes: The numbers presented are standardized beta-coefficients from associative regressions.

Sources: See Section 3 and the detailed data description in the appendix.

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 3

Regional differences in height related to the regional infant mortality rate

		Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910-1920				
Panel A.	Agricultural real wage	—	+0.11	—
	Manufacturing real wage	—	+0.37	—
	GDP per capita	—	—	+0.54
	Infant mortality rate	+0.50	+0.38*	+0.08
	Counties, *N*	19	19	19
	R^2	0.25	0.41	0.37
Panel B.	GDP per capita	—	—	+0.61**
	Infant mortality rate	–0.16	—	–0.51**
	Counties, *N*	24	—	24
	R^2	0.03	—	0.28
The average height by county for men born 1952/1953 related to other measures from 1951-1960				
Panel C.	Agricultural real wage	—	–0.16	—
	Manufacturing real wage	—	+0.45**	—
	GDP per capita	—	—	+0.46**
	Infant mortality rate	–0.62***	–0.36	–0.40*
	Counties, *N*	19	19	19
	R^2	0.39	0.58	0.55
Panel D.	GDP per capita	—	—	+0.34**
	Infant mortality rate	–0.71***	—	–0.58***
	Counties, *N*	24	—	24
	R^2	0.50	—	0.60

Notes: The numbers presented are standardized beta-coefficients from associative regressions.

Sources: See Section 3 and the detailed data description in the appendix.

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 4

Regional differences in height related to the regional urbanization rate

		Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910-1920				
Panel A.	Agricultural real wage	—	+0.46**	—
	Manufacturing real wage	—	+0.22	—
	GDP per capita	—	—	+0.38
	Urbanization rate	+0.59***	+0.72***	+0.29
	Counties, *N*	19	19	19
	R^2	0.34	0.65	0.41
Panel B.	GDP per capita	—	—	–0.10
	Urbanization rate	+0.58***	—	+0.65**
	Counties, *N*	24	—	24
	R^2	0.34	—	0.34
The average height by county for men born 1952/1953 related to other measures from 1950-1960				
Panel C.	Agricultural real wage	—	–0.34*	—
	Manufacturing real wage	—	+0.38	—
	GDP per capita	—	—	+0.50
	Urbanization rate	+0.61***	+0.20	+0.19
	Counties, *N*	19	19	19
	R^2	0.37	0.52	0.44
Panel D.	GDP per capita	—	—	+0.29
	Urbanization rate	+0.57***	—	+0.34
	Counties, *N*	24	—	24
	R^2	0.33	—	0.36

Notes: The numbers presented are standardized beta-coefficients from associative regressions.

Sources: See Section 3 and the detailed data description in the appendix.

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The average height is positively associated with the urbanization rate in the counties both in the early and mid-twentieth century (Table 4). The positive association sometimes remains even after adjusting for the real wages or GDP per capita. The urbanization rate is correlated with the real wages and the GDP per capita (Tables A3 and A4 in the appendix). These different measures obviously include overlapping variation which is relevant for explaining the regional differences in height, but the variation available in the data (*N* = 19 or 24) is unfortunately too low to disentangle the associations further.

Concluding Discussion

We find that there was regional variation in the average height in Sweden throughout the twentieth century. Men in the southern, southeastern and northernmost parts of Sweden were shorter than the national average. Men in the counties of Stockholm and Göteborg and Bohus, which include the two largest cities in Sweden, were taller than average. The urbanization rate is also, if anything, positively associated with the average height. We thus find no evidence of an "urban penalty" in height in the largest cities in Sweden during the twentieth century (see also Linders and Lundborg 1926; compare also Martínez-Carrión and Moreno-Lázaro 2007). The taller stature in the Stockholm and Gothenburg regions was not just a result of tall men migrating to these cities. Linders and Lundborg (1926) studied the regional differences in height based on the place of birth and also find that the men were taller in the largest cities.

The taller stature of men in the large cities should not come as a great surprise to us. After the first decades of the twentieth century there was no longer any "urban penalty" in mortality in Sweden (Edvinsson and Nilsson 2000; Lundh and Prado 2015, tab. 2) and people in the cities were at least as well paid and well fed as those living in rural areas (Lundh 2012; 2013).

The men living in the counties of Älvsborg and Skaraborg were taller in the early twentieth century. The men in Kristianstad and Blekinge (south/southeast) and Norrbotten (north) were shorter than average throughout the twentieth century. Men in the counties of Halland (southwest), Kalmar, Kronoberg and Jönköping (southeast) and

Västerbotten (north) were also shorter than average until late in the twentieth century. These patterns, along with the tall stature in the Stockholm and Göteborg regions, fit well with findings in previous studies on regional differences in height using conscript (or schoolchild) data (see Section 2 above for the references).

We find convergence in height within Sweden over the course of the twentieth century. The differences between counties are smaller in the later part of the twentieth century. In addition we find that the average height increased more over time in the counties that were shorter to start with. One plausible explanation of the convergence in height is that the living conditions improved in general in Sweden, with the result that an increasing proportion of men lived in circumstances that allowed them to reach their full height potential.

Donatella Lanari and Odoardo Bussini (2014) analyzed the regional convergence in height in Italy during the twentieth century. They show that internal migration, from the south where the average height was shorter, to the north, where the average height was taller, had contributed to about a quarter of the realized convergence in height. There was substantial internal migration within Sweden during the twentieth century, which might have contributed to the convergence. Immigrants to Sweden could also have contributed to the changes in the average height over time for some regions. Unfortunately, we have no possibility to estimate any of these effects for Sweden.

We find some expected and some surprising associations between the average height and the set of other measures of living conditions that we analyze. The average height is, as expected, positively associated with the real wage in the manufacturing sector and with the regional GDP per capita. This is in line with all previous research on regional differences in height. The real wage in the manufacturing sector and the regional GDP per capita are not very closely correlated around 1910 (Pearson's $r = +0.37$, $p = 0.12$, $N = 19$). Both are still positively associated with the county average heights, even if the association for the GDP per capita is conditioned on excluding the northernmost county, Norrbotten. The measures are much more closely associated in the 1950s

(Pearson's $r = +0.77$, $p = 0.00$, $N = 24$), and the associations with the average height are then also very similar. The real wage for the manufacturing sector is more closely associated with living conditions, as reflected in the county average height, than is the real wage for the agricultural sector (compare Heyberger 2014, 119fn12).

We get surprising results for the associations with our proxy measures for the access to nutrition, especially animal protein. The average height was taller in counties where the price of food was higher and especially in counties where the price of animal foods relative to overall food prices was higher. Our results go against all the previously published studies in this strand of the literature (Baten and Murray 2000; Moradi and Baten 2005; Koepke and Baten 2008; Baten 2009; Blum 2013; Baten and Blum 2014). It could be that access to nutrition and protein was not an important limitation to growth in early and mid-twentieth century Sweden, even if that seems less plausible for the earlier cohort than the later. The surprising associations remain even after controlling for the income level, but residual confounding from the income level is still a possible explanation because we should expect measurement error in the income measures.

Shadow markets could have provided opportunities to access foodstuffs through a barter economy or at lower prices than through the market. We expect that the shadow markets were more developed in the more rural counties. The agricultural wages were higher and the food prices lower on average in these counties while the average height was shorter. Shadow markets therefore do not provide a plausible explanation for the patterns we find.

The associations between infant mortality rate and height are different in the earlier and later cohorts. The infant mortality rate is more consistently negatively associated with the average height in the later cohort. A possible explanation could be that the counties where the infant mortality rate was higher in the mid-twentieth century were still lagging behind the other counties in different ways related to, for example, childcare practices, sanitation and health care. One possible explanation for the different results in previous research could therefore be that they studied different time periods, in which differences in the infant mortality rate have different explanations.

The set of measures of living conditions that we analyze explain less of the variation in height in the earlier cohort than in the later. This is also somewhat surprising since we would expect that the environmental factors overall were more important in the earlier, poorer, situation.

Our results are overall in line with an optimistic story of the development of living conditions in Sweden. Economic growth and improving living conditions over the twentieth century made it less important where in Sweden you were born.

ACKNOWLEDGEMENTS

The authors thank Svante Prado for sharing the county-specific agricultural wages for 1955. Öberg's work was funded through a Wallander Post-Doc scholarship (W2014-0396:1) from Jan Wallander och Tom Hedelius Stiftelse. Collin's work was carried out as a part of his PhD studies at the Unit for Economic History, University of Gothenburg.

WORKS CITED

Arbo, Carl O. E. 1875. *Sessions-Undersøgelsernes Og Recruterings-Statistikens Betydning for Videnskaben Og Staten*. [The importance of the medical inspections and conscription statistics for science and the State.] Christiania.

Arcaleni, Emilia. 2006. "Secular Trend and Regional Differences in the Stature of Italians, 1854-1980." *Economics & Human Biology* 4 (1): 24-38.

Barro, Robert J., and Xavier Sala-i-Martin. 1992. "Convergence." *Journal of Political Economy* 100 (2): 223-251.

Bassino, Jean-Pascal. 2006. "Inequality in Japan (1892-1941): Physical Stature, Income, and Health." *Economics & Human Biology* 4 (1): 62-88.

Baten, Joerg. 2009. "Protein Supply and Nutritional Status in Nineteenth Century Bavaria, Prussia and France." *Economics & Human Biology* 7 (2): 165-180.

Baten, Joerg, and Matthias Blum. 2014. "Why Are You Tall While Others Are Short? Agricultural Production and Other Proximate Determinants of Global Heights." *European Review of Economic History* 18 (2): 144-165.

Baten, Joerg, and J. E. Murray. 2000. "Heights of Men and Women in 19th-Century Bavaria: Economic, Nutritional, and Disease Influences." *Explorations in Economic History* 37 (4): 351-369.

Bengtsson, Tommy. 1990. "Migration, Wages, and Urbanization in Sweden in the Nineteenth Century." In *Urbanization in History: A Process of Dynamic Interactions*, edited by Ad van der Woude, Jan De Vries, and Akira Hayami, 186-204. Oxford: Clarendon.

Blum, Matthias. 2013. "Cultural and Genetic Influences on the 'Biological Standard of Living'." *Historical Methods* 46 (1): 19-30.

Bodenhorn, Howard, Timothy W. Guinnane, and Thomas A. Mroz. 2017. "Sample-Selection Biases and the Industrialization Puzzle." *The Journal of Economic History* 77 (1): 171-207.

Brändström, Anders, Sören Edvinsson, and John Rogers. 2000. "Infant Mortality in Sweden; Creating Regions from Nineteenth-Century Parish Data." *Historical Methods* 33 (2): 105-114.

Brändström, Anders, Sören Edvinsson, and John Rogers. 2002. "Illegitimacy, Infant Feeding Practices and Infant Survival in Sweden 1750-1950. A Regional Analysis." *Hygiea Internationalis* 3 (1): 13-52.

Broman, Birger, Gunnar Fridlizius, and A. Lichtenstein. 1942. "Height and Weight during Growth." *Acta Paediatrica* 30 (1): 1-66.

Camara, Antonio D., and Joan Garcia-Roman. 2014. "Anthropometric Geography Applied to the Analysis of Socio-Economic Disparities: Cohort Trends and Spatial Patterns of Height and Robustness in 20th-Century Spain." *Population, Space and Place* 21 (8): 704-719.

Collin, Kristoffer. 2016. *Regional Wages and Labour Market Integration in Sweden, 1732-2009*. Göteborg: University of Gothenburg.

Collin, Kristoffer, Christer Lundh, and Svante Prado. 2016. "Exploring Regional Wage Dispersion in Swedish Manufacturing, 1860-2009." Working paper, Unit for Economic History. Gothenburg.

Coppola, Michela. 2010. "The Biological Standard of Living in Germany before the Kaiserreich, 1815-1840: Insights from English Army Data." *European Review of Economic History* 14 (1): 71-109.

de Oliveira, Victor Hugo, and Climent Quintana-Domeque. 2014. "Early-Life Environment and Adult Stature in Brazil: An Analysis for Cohorts Born between 1950 and 1980." *Economics & Human Biology* 15: 67-80.

Edvinsson, Sören, and Hans Nilsson. 2000. "Urban Mortality in Sweden During the 19th Century." In *Population Dynamics during Industrialization,* edited by Brändström, Anders, and Lars-Göran Tedebrand, 39-81. Umeå: Umeå University.

Enflo, Kerstin, Martin Henning, and Lennart Schön. 2014. "Swedish Regional GDP 1855-2000: Estimations and General Trends in the Swedish Regional System." *Research in Economic History* 30: 47-89.

Enflo, Kerstin, Christer Lundh, and Svante Prado. 2014. "The Role of Migration in Regional Wage Convergence: Evidence from Sweden 1860-1940." *Explorations in Economic History* 52: 93-110.

Enflo, Kerstin, and Joan Ramón Rosés. 2014. "Coping with Regional Inequality in Sweden: Structural Change, Migrations, and Policy, 1860-2000." *The Economic History Review* 68 (1): 191-217.

Floud, Roderick, Kenneth Wachter, and Annabel Gregory. 2006 [1990]. *Height, Health and History: Nutritional Status in the United Kingdom*, 1750-1980. Cambridge: Cambridge University Press.

Hatton, Timothy J. 2014. "How Have Europeans Grown so Tall?" *Oxford Economic Papers* 66 (2): 349-372.

Henning, Martin, Kerstin Enflo, and Fredrik N. G. Andersson. 2011. "Trends and Cycles in Regional Economic Growth: How Spatial Differences Shaped the Swedish Growth Experience from 1860-2009." *Explorations in Economic History* 48 (4): 538-555.

Heyberger, Laurent. 2014. "Received Wisdom versus Reality: Height, Nutrition, and Urbanization in Mid-Nineteenth-Century France." *Cliometrica* 8 (1): 115-140.

Hultkrantz, J. Vilh. 1897. "Antropologiska Undersökningar å Värnpligtige." [Anthropological examinations of conscripts] *Tidskrift i Militär Hälsovård* 22 (1): 1-31.

Jörberg, Lennart, and Tommy Bengtsson. 1981. "Regional Wages in Sweden during the Nineteenth Century." In *Disparities in Economic Development since the Industrial Revolution*, edited by Paul Bairoch and Maurice Lévy-Leboyer, 226-243. London: Macmillan.

Koepke, Nikola, and Joerg Baten. 2008. "Agricultural Specialization and Height in Ancient and Medieval Europe." *Explorations in Economic History* 45 (2): 127-146.

Lanari, Donatella, and Odoardo Bussini. 2014. "Height Convergence and Internal Migration in Mid-Twentieth-Century Italy." *Biodemography and Social Biology* 60 (1): 101-114.

Larnkjær, Anni, Stine Attrup Schrøder, Ida Maria Schmidt, Marianne Hørby Jørgensen, and Kim Fleischer Michaelsen. 2006. "Secular Change in Adult Stature Has Come to a Halt in Northern Europe and Italy." *Acta Pædiatrica* 95 (6): 754-755.

Linders, Frans Josua, and Herman Lundborg. 1926. *The Racial Characters of the Swedish Nation: Anthropologia Suecica 1926*. Uppsala: Almqvist & Wiksell.

Lundh, Christer. 2012. "Wage Forms, Costs of Living and the Urban–rural Wage Gap: Southern Sweden, 1881-1930." *Scandinavian Economic History Review* 60 (2): 123-145.

Lundh, Christer. 2013. "Was There an Urban-Rural Consumption Gap? The Standard of Living of Workers in Southern Sweden, 1914-1920." *Scandinavian Economic History Review* 61 (3): 233-258.

Lundh, Christer, and Svante Prado. 2015. "Markets and Politics: The Swedish Urban–Rural Wage Gap, 1865-1985." *European Review of Economic History* 19 (1): 67-87.

Lundh, Christer, Lennart Schön, and Lars Svensson. 2005. "Regional Wages in Industry and Labour Market Integration in Sweden, 1861-1913." *Scandinavian Economic History Review* 53 (3): 71-84.

Meisel, Adolfo, and Margarita Vega. 2007. "The Biological Standard of Living (and Its Convergence) in Colombia, 1870-2003: A Tropical Success Story." *Economics & Human Biology* 5 (1): 100-122.

Molarius, Anu, and Staffan Janson. 2001. "Regionala Skillnader i Medellivslängd i Sverige." [Regional differences in life expectancy in Sweden.] *Läkartidningen* 10 (98): 1084-1089.

Moradi, Alexander, and Joerg Baten. 2005. "Inequality in Sub-Saharan Africa: New Data and New Insights from Anthropometric Estimates." *World Development* 33 (8): 1233-1265.

Norberg, Anders, Hans Norman, and Sune Åkerman. 1979. "Regional and Local Variations of Mortality in Sweden, 1750-1900." In *The Fifth Scandinavian Demographic Symposium: 13-16 June at Hurdalssjøen, Norway*, edited by Helge Brunberg and Knut Sørensen, 55-73. Oslo: Scandinavian Demographic Society.

Öberg, Stefan. 2014a. *Social Bodies. Family and Community Level Influences on Height and Weight, Southern Sweden 1818-1968*. Göteborg: University of Gothenburg.

Öberg, Stefan. 2014b. "Regional Variation and Convergence in Height in Sweden, 1870-2000." Paper presented at the Annual Meeting of the Social Science History Association, November 6-9, Toronto, Canada.

Öberg, Stefan. 2015. "The Direct Effect of Exposure to Disease in Early Life on the Height of Young Adult Men in Southern Sweden, 1814-1948." *Population Studies* 69 (2): 179-199.

Peracchi, Franco, and Emilia Arcaleni. 2011. "Early-Life Environment, Height and BMI of Young Men in Italy." *Economics & Human Biology* 9 (3): 251-264.

Postel-Vinay, Gilles, and David E. Sahn. 2010. "Explaining Stunting in Nineteenth-Century France." *The Economic History Review* 63 (2): 315-334.

Prado, Svante, Kristoffer Collin, Christer Lundh, and Kerstin Enflo. 2016. "Regional Wage Convergence of Farm Workers in Sweden, 1732-1980." Working paper, Unit for Economic History. Gothenburg.

Quintana-Domeque, Climent, Carlos Bozzoli, and Mariano Bosch. 2011. "Infant Mortality and Adult Stature in Spain." *Social Science & Medicine* 72 (11): 1893-1903.

Quintana-Domeque, Climent, Carlos Bozzoli, and Mariano Bosch. 2012. "The Evolution of Adult Height across Spanish Regions, 1950-1980: A New Source of Data." *Economics & Human Biology* 10 (3): 264-275.

Retzius, Gustaf, and Carl M. Fürst. 1902. *Anthropologia Suecica: Beiträge Zur Anthropologie Der Schweden*. [Anthropologia Suecica: Contribution to the anthropology of Sweden.] Stockholm: [the authors].

Rogers, John, and Marie C. Nelson. 1997. "The Epidemiologic Transition Revisited: Or What Happens If We Look beneath the Surface?" *Health Transition Review* 7: 241ff.

Sandberg, Lars G., and Richard H. Steckel. 1980. "Soldier, Soldier, What Made You Grow so Tall? A Study of Height, Health, and Nutrition in Sweden, 1720-1881." *Economy and History* 23 (2): 91-105.

Sandberg, Lars G., and Richard H. Steckel. 1987. "Heights and Economic History: The Swedish Case." *Annals of Human Biology* 14 (2): 101-110.

Sandberg, Lars G., and Richard H. Steckel. 1988. "Overpopulation and Malnutrition Rediscovered: Hard Times in 19th-Century Sweden." *Explorations in Economic History* 25 (1): 1-19.

Sandberg, Lars G., and Richard H. Steckel. 1990. "Hard Times in 19th-Century Sweden: A Reply." *Explorations in Economic History* 27 (1): 114-121.

Söderberg, Johan. 1978. *Agrar Fattigdom i Sydsverige under 1800-talet* [Agrarian Poverty in Southern Sweden during the Nineteenth Century]. Stockholm: Almqvist & Wiksell International.

Söderberg, Johan. 1985. “Regional Economic Disparity and Dynamics, 1840-1914: A Comparison between France, Great Britain, Prussia and Sweden.” *Journal of European Economic History* 14 (2): 273-296.

Söderberg, Johan. 1989. “Hard Times in 19th-Century Sweden: A Comment.” *Explorations in Economic History* 26 (4): 477-91.

Steckel, Richard H. 2008. “Biological Measures of the Standard of Living.” *Journal of Economic Perspectives* 22 (1): 129-52.

Sunder, Marco. 2003. “The Making of Giants in a Welfare State: The Norwegian Experience in the 20th Century.” *Economics & Human Biology* 1 (2): 267-76.

The Race Biology of the Swedish Lapps. P. 2, Anthropometrical Survey. 1941. Uppsala: Almqvist & Wiksell.

WHO Multicentre Growth Reference Study Group, and Mercedes de Onis. 2006. “Assessment of Differences in Linear Growth among Populations in the WHO Multicentre Growth Reference Study.” *Acta Pædiatrica* 95 (Suppl. 450): 56-65.

Willner, Sam. 2004. “A Persistent Regional Mortality Pattern in Sweden during the Industrial Age.” In *European Health and Social Welfare Policies* edited by Laurinda Abreu, 216-251. Brno: Compostela group of universities & Phoenix TN.

Willner, Sam. 2008. “Spatial Inequality in Socioeconomic Conditions and Health: Experiences from 20th Century Sweden.” In *The Price of Life: Welfare Systems, Social Nets and Economic Growth* edited by Laurinda Abreu and Patrice Bourdelais, 109-126. Évora: CIDEHUS/UE, Phoenix TN.

APPENDIX

Detailed data description

Height

The information on heights by county comes from universal (male) conscript inspections. We study the regional variation in height in four cohorts of men; born in 1905/1906, 1952/1953, 1962/1964 and 1972/1973. These cohorts were chosen because of data availability and, for the later cohorts, to be approximately equally spaced.

Inspection results, including the heights, were published each year from the mid-nineteenth century onwards, but are only available for geographical entities resembling the Swedish counties for two years, 1925 and 1926 (Arméförvaltningens sjukvårdsstyrelse, Kungl. 1926, tab. 3; 1927, tab. 3). Only men aged 20 years at the inspections were included in the tabulated results, thus these men were born in 1905 or 1906. Because the tables only include data on the 20-year-olds, they exclude the minority inspected earlier or later than the age for compulsory inspection (as well as the enlisted military who were exempted from conscription). The inspected 20-year-old men in 1925 and 1926 made up 86 percent of the total number of 19-year-old men in Sweden on December 31 the year before (Human Mortality Database 2016).

The statistics from 1925/1926 are not presented by county, but rather 26 enlistment areas (SV. inskrivningsområde). These areas correspond closely, but not perfectly to the county borders. We counted the Malmöhus Norra enlistment area as Kristianstad county. We also merged the figures presented for the eastern and western enlistment areas of Östergötland, and the northern and southern parts of the Älvsborg enlistment area.

The men were inspected in the enlistment area they were residing in in the year they turned the age for conscription. The regional heights are therefore not calculated by the county the men grew up in. Long-distance migrants could therefore distort the patterns. We should also expect that the migrants were on average somewhat taller than the stayers (e.g. Lanari and Bussini 2014), which also could create slight distortions. Because the migrants always constituted a minority, the biases created by them will be relatively minor.

The height of the men born in 1952/1953, 1962/1964 and 1972/1973 were estimated from the public use digital file of the results from the conscript inspections of 1969–1997 (Värnpliktsverket/Pliktverket 2013). We include the men born in 1964 instead of 1963 because most of the records from the inspections of the men born in 1963 are not available in the file.

The men born in 1905/1906 were 20-years-old at inspection, the men born in 1952/1953 were 19-years-old and the men born in 1962, 1964 and 1972/1973 were 18-years-old (Öberg 2014a, 229). We include all men born in the specified years that were aged 17-21 years at the inspection. We have not adjusted the presented estimates for age at inspection. An adjustment for age of the averages of the cohorts born in 1952/1953, 1962/64 and 1972/1973 does not change the regional pattern, and the adjusted averages are almost identical to the unadjusted ones (Pearson's $r \geq +0.98$). The standard deviations of the regional averages also change by at most three percent from the unadjusted values when we adjust for age either linearly or including also a squared term.

We determined the place of residence from the county codes included in the file. We excluded everyone with codes that did not correspond to a county in Sweden (3.8 percent of the available observations). The men are assigned to the county they resided in at the conscript inspection, thus the same qualifications regarding migrants apply also to the later cohorts.

Again comparing the number inspected to the population estimates from the Human Mortality Database shows that the sample includes on average 87 percent (81-99 percent) of the men in the age group on December 31 the year before the year for (most) inspections.

Manufacturing wages

Swedish official statistics started from 1931 to publish average county wages for manufacturing workers.[1] A previous effort by Kristoffer Collin (2016) provides pre-1931 hourly county-specific manufacturing wages. These wage series were constructed from three sources. First, wages were extracted from *The Tariff Commission*'s (SV. *Tullkommittén*) archive for the period 1860-1879; 963 firms were

[1] These wages are collected in the Historical Labour Database (HILD). The database is available at: http://es.handels.gu.se/english/units/unit-for-economic-history/the-historical-labour+-database--hild-

surveyed in 1880 and asked to report information on the labor force for four consecutive intervals of five years: 1860-64, 1864-69, 1870-74 and 1875-79. Furthermore, information on wages was also reported for 1879. Second, wages were extracted from *The Swedish Metal Trades Association*'s (SV. *Sveriges Verkstadsförening*) archive for 1910, 1912 and 1913. The association had between 147 and 166 member firms these years. Third, in order to narrow the gap between 1913 and 1931, a benchmark was constructed from the original surveys of the official wage statistics in 1922, which include 2,071 firms. Moreover, a benchmark was also constructed for 1955 since there is a dearth of county wages in the official statistics wage series during the 1950s, 3,416 firms were used for this benchmark. The detailed stepwise procedure and method for constructing the county-specific wages is described in Collin (2016).

Agricultural wages

Swedish official statistics published, between 1865 and 1945, agricultural wages for farm servants, contract workers and day laborers. These worker groups performed similar tasks but differed in employment terms and wage forms. In this study, we use wages for agricultural day laborers, as their employment terms resemble those in the manufacturing industry. Day laborers were paid cash wages on a daily basis and only a minor share of the earnings consisted of benefits in kind.

They were often employed for seasonal work during the summer half-year and regularly combined agricultural employment with manufacturing employment during the winter half-year (Enflo, Lundh, and Prado 2014; Lundh and Prado 2015). Over time, an increasing number of day laborers became permanently employed in agriculture for the entire year (Lundh 2012, 128).

A previous effort by Kerstin Enflo, Christer Lundh and Svante Prado (2014) provides the county-specific wages for agricultural day laborers.[2] The data include workers who brought their own food and did not belong to the employer's household. County wages are calculated as an arithmetic mean of summer and winter wages, and an arithmetic mean of

[2] The authors have kindly provided the wage data. These are also available through the Historical Labour Database (HILD).

permanently and temporarily employed workers (Enflo, Lundh, and Prado 2014). We transform the daily wages into hourly wages by information based on the typical number of working hours in agriculture (Lundh and Prado 2015, Appendix S1, 3-4). A recent effort by Prado, Collin, Lundh and Enflo (2016) provides post-1945 regional agricultural wages for day laborers. We use the regional benchmarks for 1955 to extend the agricultural wage series.

Regional cost of living

We transform the nominal regional wages into real wages by county-specific cost of living indices constructed by Collin, Lundh and Prado (2016). The indices are constructed from four sub-periods between 1860 and 1959 that are spliced together.

The first sub-period, between 1860 and 1913, provided by Enflo, Lundh and Prado (2014), are constructed from market price scales that Gunnar Myrdal and Sven Bouvin (1933) gathered to compute a national cost-of-living index. The cost-of-living indices include 11 food items that account for approximately 60 percent of household expenditure in the 1860s; household budget weights constructed to reflect the working classes were used. The budget weights multiplied by each year's county-specific prices yield annual weighted price levels for all counties, de facto 24 Laspeyres indices with 1865 as the base year.

For the second sub-period, between 1913 and 1930, we extracted prices and budget weights from *Detaljpriser och indexberäkningar åren 1913-1930* (Socialstyrelsen, Kungl. 1933), which reports food, fuel and lighting prices for 53 towns and the consumed quantities of 31 items. Prices pertaining to towns were weighted by population to form county-specific prices. Budget weights multiplied by country-specific prices yield Laspeyres indices for each county using 1913 as the base year.

For the third sub-period, between 1930 and 1946, budget weights for 45 items were extracted from *Konsumentpriser och indexberäkningar 1931-1959* (Socialstyrelsen 1961, 96-97). Prices were extracted from *Sociala meddelanden* for 49 cities until 1943 and additionally 11 cities from 1943 to 1946 (Socialstyrelsen 1931-1947, issues 1-6 each year). Again, population-weighted city prices forms county prices. Budget weights multiplied by country-specific prices yield Laspeyres indices for each county using 1930 as the base year.

Price observations by city cease to exist after 1946, so for the fourth sub-period were prices used for eight regions for every fifth year beginning in 1945 extracted from *Konsumentpriser och indexberäkningar 1931-1959*. Linear interpolation was used to provide annual observations. The same budget weights as in the previous period were used to calculate Laspeyres indices for each region with 1945 as the base year. The regional price indices were then spliced with the county-specific cost-of-living indices.

To capture cross-county price variations, Collin, Lundh and Prado (2016) calculated a county relative price level for 1935, since budget weights pertained to this year and most consumables were included. The county cost of living indices were then spliced together with 1935 as the relative level.

Regional relative food price

To capture regional differences in the price of food, we construct a regional relative food price ratio, using the underlying food prices used for the cost of living indices, by dividing each county's total cost of food items with the national average food cost (arithmetic mean across regions) for every sub-period. We then spliced the different sub-periods together. The index thus captures variation across counties in the price of food, and is higher for the counties where the prices were higher.

Regional animal price ratio

We use the county food price data and budget weights for the sub-periods to construct regional animal price ratios. We multiply the county price of animal product with the corresponding consumed quantities to yield the total cost of animal product. In every sub-period, we exclude the price and budget weights for fuel and lighting and then calculate the county total cost of food items. Finally, we divide the total cost of animal products with the total food cost in each county for every sub-period. Finally, the animal price ratios for the different sub-periods are spliced together. The index is higher for counties where the relative price of animal foods compared to foods in general was higher.

Regional GDP per capita

We use the regional GDP per capita provided in Enflo, Martin Henning and Lennart Schön (2014, tab. C2). The figures provided are indices, with the national average set to one for each year. We use the 1910 estimates for the cohort born in 1905/1906, and an average of the indices for 1950 and 1960 for the cohort born in 1952/1953.

Regional infant mortality rates

The data on the infant mortality rate by county comes from Statistics Sweden, and are averages by county for the periods 1911-1920[3] and 1951-1960 (Statistiska Centralbyrån 1929, deaths: tab. 40, live births: tab. 37; 1964, deaths: tab. 22, live births: tab. 18). The rates were calculated as the total number of deaths among children younger than one year (excluding stillbirths) divided by the total number of live births. The rate is then expressed as a rate per thousand. The infant mortality rate is intended to capture variations in the quality of the living environment, including childcare practices, sanitation and health care, between the counties. The direct effect from exposure to disease around birth, as captured by the infant mortality rate, is very weak or non-existent (Öberg 2015).

Regional Urbanization rates

The data on urbanization rates by county are also collected from Statistics Sweden and are expressed as averages for the periods 1911-1920 and 1951-1960 (Statistiska Centralbyrån 1929, tab. 4; 1964, tab. 4). The rates were calculated as the population living in towns divided by the total population in the county.

---

[3] We also tried using the average infant mortality rate for the years 1901-1910. The results are similar or show even less of a consistent association with the average heights of the men born 1905/1906.

WORKS CITED IN THE APPENDIX

Arméförvaltningens sjukvårdsstyrelse, Kungl. 1926. *Hälso- och Sjukvård Vid Armén 1925*. [Healthcare in the Army 1925.] Sveriges Officiella Statistik. Hälso- Och Sjukvård. Stockholm.

Arméförvaltningens sjukvårdsstyrelse, Kungl. 1927. *Hälso- och Sjukvård Vid Armén 1926*. [Healthcare in the Army 1926.] Sveriges Officiella Statistik. Hälso- Och Sjukvård. Stockholm.

Collin, Kristoffer. 2016. *Regional Wages and Labour Market Integration in Sweden, 1732-2009*. Göteborg: University of Gothenburg.

Collin, Kristoffer, Christer Lundh, and Svante Prado. 2016. "Exploring Regional Wage Dispersion in Swedish Manufacturing, 1860-2009." Working paper, Unit for Economic History. Gothenburg.

Enflo, Kerstin, Martin Henning, and Lennart Schön. 2014. "Swedish Regional GDP 1855-2000: Estimations and General Trends in the Swedish Regional System." *Research in Economic History* 30: 47-89.

Enflo, Kerstin, Christer Lundh, and Svante Prado. 2014. "The Role of Migration in Regional Wage Convergence: Evidence from Sweden 1860-1940." *Explorations in Economic History* 52: 93-110.

Human Mortality Database. 2016. University of California, Berkeley (USA) and Max Planck Institute for Demographic Research (Germany). www.mortality.org.

Lanari, Donatella, and Odoardo Bussini. 2014. "Height Convergence and Internal Migration in Mid-Twentieth-Century Italy." *Biodemography and Social Biology* 60 (1): 101-114.

Lundh, Christer. 2012. "Wage Forms, Costs of Living and the Urban–Rural Wage Gap: Southern Sweden, 1881-1930." *Scandinavian Economic History Review* 60 (2): 123-145.

Lundh, Christer, and Svante Prado. 2015. "Markets and Politics: The Swedish Urban–rural Wage Gap, 1865-1985." *European Review of Economic History* 19 (1): 67-87.

Myrdal, Gunnar, and Sven Bouvin. 1933. *Wages, Cost of Living and National Income in Sweden 1860-1930. Vol. 1, The Cost of Living in Sweden 1830-1930*. London: P.S. King.

Öberg, Stefan. 2014. *Social Bodies. Family and Community Level Influences on Height and Weight, Southern Sweden 1818-1968*. Göteborg: University of Gothenburg.

Öberg, Stefan. 2015. "The Direct Effect of Exposure to Disease in Early Life on the Height of Young Adult Men in Southern Sweden, 1814-1948." *Population Studies* 69 (2): 179-199.

Prado, Svante, Kristoffer Collin, Christer Lundh, and Kerstin Enflo. 2016. "Regional Wage Convergence of Farm Workers in Sweden, 1732-1980." Working paper, Unit for Economic History. Gothenburg.

Socialstyrelsen. 1931-1947. *Sociala Meddelanden*. [Social announcements.] Statistiska Meddelanden. Ser. F. Stockholm: Norstedts.

Socialstyrelsen, Kungl. 1933. *Detaljpriser Och Indexberäkningar åren 1913-1930* [Retail Prices and Index Calculations for the Years 1913-1930]. Sveriges Officiella Statistik. Stockholm.

Socialstyrelsen. 1961. *Konsumentpriser Och Indexberäkningar. 1931/1959* [Consumer Prices and Index Calculations. 1931/1959]. Stockholm: Socialstyrelsen.

Statistiska Centralbyrån. 1929. *Befolkningsrörelsen. Översikt för åren 1911-1920*. [Population changes. Overview of the years 1911-1920.] Stockholm: Statistiska centralbyrån.

Statistiska Centralbyrån. 1964. *Befolkningsrörelsen. Översikt för åren 1951-1960*. [Population changes. Overview of the years 1951-1960.] Stockholm: Statistiska centralbyrån.

Värnpliktsverket/Pliktverket. 2013. "Inskrivningsarkivregistret INSARK." [Archived digital records from the conscript inspections.] Riksarkivet. http://www.oppnadata.se/node/57.

Figures and tables

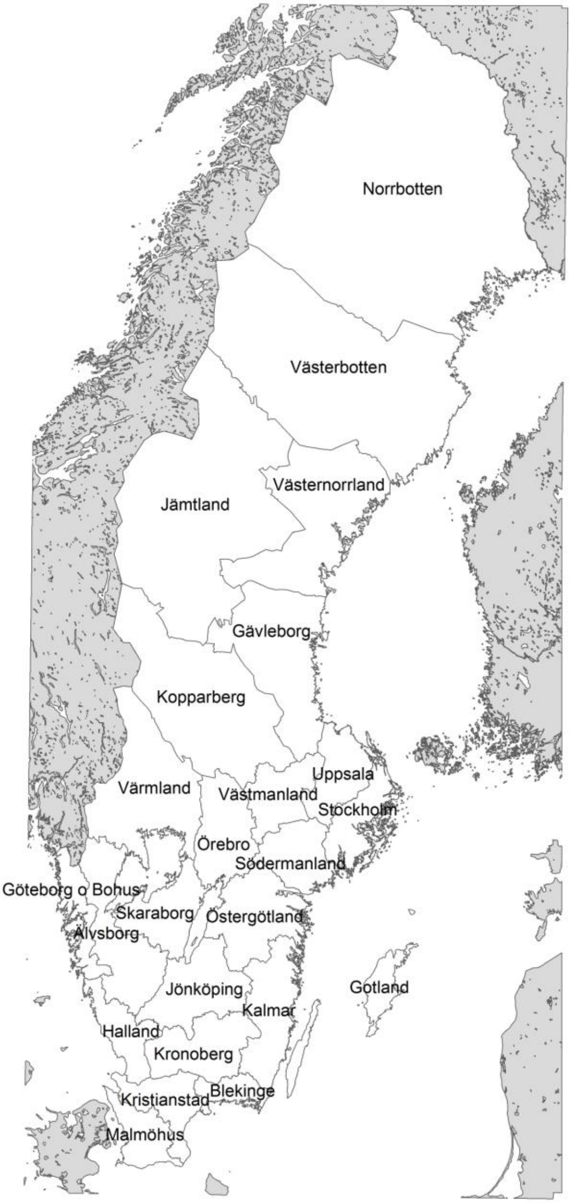


Figure A1
Map of Sweden

Table A1

The regional variation in Sweden during the twentieth century

Years of birth	1905/1906	1952/1953	1962/1964	1972/1973
County of residence	**Difference from the national average height (cm)**			
Stockholms län	+1.43*	+0.97*	+0.61*	+0.03
Uppsala län	–0.20	+0.46*	+0.55*	–0.09
Södermanlands län	+0.14	+0.12	–0.11	–0.52*
Östergötlands län	+0.21*	–0.16	–0.39*	–0.89*
Jönköpings län	–0.24*	–0.65*	–0.61*	+0.02
Kronobergs län	–0.62*	–0.51*	–0.29*	+0.44*
Kalmar län	–0.76*	–0.87*	–0.96*	+0.06
Gotlands län	+0.54*	–0.14	–0.22	+1.10*
Blekinge län	–0.62*	–0.92*	–0.45*	–0.52*
Kristianstads län	–0.66*	–1.06*	–0.33*	–0.22*
Malmöhus län	+0.13	–0.39*	+0.03	–0.05
Hallands län	–0.25*	–0.49*	+0.13	+0.40*
Göteborgs och Bohus län	+0.38*	+0.61*	+0.59*	+0.56*
Älvborgs län	+0.41*	+0.27*	+0.16	+0.42*
Skaraborgs län	+0.02	+0.34*	+0.04	+0.65*
Värmlands län	–0.71*	–0.17	–0.02	–0.28*
Örebro län	–0.29*	–0.14	–0.23*	–0.16*
Västmanlands län	–0.15	+0.33*	–0.10	–0.31*
Kopparbergs län	–0.50*	–0.28*	–0.19	–0.33*
Gävleborgs län	+1.28*	–0.05	+0.02	+0.39*
Västernorrlands län	–0.18*	–0.11	–0.22*	–0.18
Jämtlands län	+0.62*	–0.13	–0.21	+0.02
Västerbottens län	–1.06*	–0.50*	–0.22*	–0.02
Norrbottens län	–1.74*	–1.34*	–1.16*	–1.01*
Sweden, average height (cm)	172.6	178.7	179.2	179.4

Notes: The average height is the average height of men measured at the conscript inspections.

Sources: See the section on data above.

Statistical significance: * $p < 0.05$

Table A2

Regression results from estimating the β convergence of the average height by region in Sweden

Time period	Regression coefficient	Standard error	*p*-value	R^2	Implied β
1925.5-1972.5	–0.0149	0.00267	0.000	0.585	0.025536
1925.5-1952.5	–0.0168	0.00410	0.000	0.432	0.022333
1952.5-1963.0	–0.0340	0.00825	0.000	0.435	0.042023
1963.0-1972.5	–0.0531	0.02335	0.033	0.190	0.073863

Table A3

The correlation between height and the other measures of living conditions in the regions of Sweden in the 1910s.

Panel A. 19 counties

	Height	Agricultural real wage	Manufacturing real wage	GDP per capita	Relative price for food	Relative price for animal foods	Infant mortality rate	Urbanization rate
Height	1							
Agricultural real wage	+0.242 n.s.	1						
Manufacturing real wage	+0.528 **	+0.331 n.s.	1					
GDP per capita	+0.608 ***	+0.082 n.s.	+0.371 n.s.	1				
Relative price for food	+0.238 n.s.	+0.273 n.s.	+0.380 n.s.	+0.184 n.s.	1			
Relative price for animal foods	+0.303 n.s.	–0.059 n.s.	+0.002 n.s.	–0.282 n.s.	–0.304 n.s.	1		
Infant mortality rate	+0.503 **	+0.037 n.s.	+0.325 n.s.	+0.772 ***	+0.123 n.s.	–0.376 n.s.	1	
Urbanization rate	+0.587 ***	–0.402 *	+0.216 n.s.	+0.762 ***	+0.173 n.s.	–0.086 n.s.	+0.582 ***	1

Panel B. 24 counties

	Height	Agricultural real wage	Manufacturing real wage	GDP per capita	Relative price for food	Relative price for animal foods	Infant mortality rate	Urbanization rate
Height	1							
Agricultural real wage	–0.185 n.s.	1						
Manufacturing real wage	—	—	—					
GDP per capita	+0.325 n.s.	+0.111 n.s.	—	1				
Relative price for food	–0.255 n.s.	+0.524 ***	—	+0.154 n.s.	1			
Relative price for animal foods	+0.357 *	–0.115 n.s.	—	–0.272 n.s.	–0.375 *	1		
Infant mortality rate	–0.160 n.s.	+0.488 **	—	+0.568 ***	+0.483 **	–0.298 n.s.	1	
Urbanization rate	+0.579 ***	–0.497 **	—	+0.658 ***	–0.049 n.s.	–0.073 n.s.	+0.105 n.s.	1

	Height	Agricultural real wage	Manufacturing real wage	GDP per capita	Relative price for food	Relative price for animal foods	Infant mortality rate	Urbanization rate

Statistical significance: n.s. $p \geq 0.10$, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table A4

The correlation between height and the other measures of living conditions in the regions of Sweden in the 1950s.

Panel A. 19 counties

Height	1							
Agricultural real wage	–0.491 **	1						
Manufacturing real wage	+0.612 ***	–0.220 n.s.	1					
GDP per capita	+0.656 ***	–0.374 n.s.	+0.869 ***	1				
Relative price for food	+0.297 n.s.	+0.001 n.s.	+0.108 n.s.	+0.236 n.s.	1			
Relative price for animal foods	+0.334 n.s.	–0.313 n.s.	–0.143 n.s.	–0.155 n.s.	–0.306 n.s.	1		
Infant mortality rate	–0.625 ***	+0.641 ***	–0.366 n.s.	–0.486 **	–0.172 n.s.	–0.117 n.s.	1	
Urbanization rate	+0.611 ***	–0.334 n.s.	+0.781 ***	+0.852 ***	+0.206 n.s.	–0.261 n.s.	–0.579 ***	1
	Height	Agricultural real wage	Manufacturing real wage	GDP per capita	Relative price for food	Relative price for animal foods	Infant mortality rate	Urbanization rate

Panel B. 24 counties

Height	1			
Agricultural real wage	—	—		
Manufacturing real wage	+0.455 **	—	1	
GDP per capita	+0.563 ***	—	+0.772 ***	1

	Height	Agricultural real wage	Manufacturing real wage	GDP per capita	Relative price for food	Relative price for animal foods	Infant mortality rate	Urbanization rate
Relative price for food	+0.029 n.s.	—	+0.113 n.s.	+0.266 n.s.	1			
Relative price for animal foods	+0.384 *	—	–0.179 n.s.	–0.204 n.s.	–0.413 **	1		
Infant mortality rate	–0.711 ***	—	–0.171 n.s.	–0.387 *	+0.047 n.s.	–0.203 n.s.	1	
Urbanization rate	+0.573 ***	—	+0.700 ***	+0.800 ***	+0.038 n.s.	–0.209 n.s.	–0.451 **	1

Statistical significance: n.s. $p \geq 0.10$, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table A5

Regression results underlying Table 1

			Model 1	Model 2	Model 3	Model 4
The average height by county for men born 1905/1906 related to other measures from 1910–1913						
Panel A.	Agricultural real wage	Coeff.	+4.61	—	—	+1.43
		St.err.	4.49			4.27
	Manufacturing real wage	Coeff.	—	+4.10	—	+3.90
		St.err.		1.60		1.74
	GDP per capita	Coeff.	—	—	+2.69	—
		St.err.			0.85	
	Constant	Coeff.	170.95	170.03	169.97	169.64
		St.err.	1.59	1.00	0.83	1.54
	Counties, *N*		19	19	19	19
	F-test, *p*-value		0.319	0.020	0.006	0.069
Panel B.	Agricultural real wage	Coeff.	–3.52	—	—	—
		St.err.	3.99			
	Manufacturing real wage	Coeff.	—	—	—	—
		St.err.				
	GDP per capita	Coeff.	—	—	+1.63	—
		St.err.			1.01	
	Constant	Coeff.	173.76	—	170.93	—
		St.err.	1.44		0.98	
	Counties, *N*		24	—	24	—
	F-test, *p*-value		0.388	—	0.122	—
The average height by county for men born 1952/1953 related to other measures from 1955						
Panel C.	Agricultural real wage	Coeff.	–5.99	—	—	–4.57
		St.err.	2.58			2.20
	Manufacturing real wage	Coeff.	—	+3.17	—	+2.75
		St.err.		0.99		0.93
	GDP per capita	Coeff.	—	—	+3.57	—
		St.err.			1.00	
	Constant	Coeff.	185.76	173.01	175.13	179.28
		St.err.	3.13	1.72	0.95	3.40
	Counties, *N*		19	19	19	19
	F-test, *p*-value		0.033	0.005	0.002	0.003
Panel D.	Agricultural real wage	Coeff.	—	—	—	—
		St.err.				
	Manufacturing real wage	Coeff.	—	+2.54	—	—
		St.err.		1.06		
	GDP per capita	Coeff.	—	—	+3.32	—
		St.err.			1.04	
	Constant	Coeff.	—	174.09	175.34	—
		St.err.		1.83	0.98	
	Counties, *N*		—	24	24	—
	F-test, *p*-value		—	0.026	0.004	—

Table A6

Regression results underlying Table 2

			Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910–1913					
Panel A.	Agricultural real wage	Coeff.	—	+1.39	—
		St.err.		4.25	
	Manufacturing real wage	Coeff.	—	+3.44	—
		St.err.		1.81	
	GDP per capita	Coeff.	—	—	+3.20
		St.err.			0.67
	Relative price for food	Coeff.	+5.56	+2.40	+4.37
		St.err.	3.56	3.68	2.33
	Relative price for animal foods	Coeff.	+12.03	+10.30	+17.26
		St.err.	6.77	6.39	4.53
	Constant	Coeff.	161.79	163.07	157.60
		St.err.	5.26	5.02	3.53
	Counties, *N*		19	19	19
	F-test, *p*-value		0.149	0.110	0.0004
Panel B.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	+2.34
		St.err.			0.95
	Relative price for food	Coeff.	–1.95	—	–2.33
		St.err.	3.00		2.69
	Relative price for animal foods	Coeff.	+10.67	—	+14.75
		St.err.	7.64		7.05
	Constant	Coeff.	169.78	—	166.14
		St.err.	5.26		4.94
	Counties, *N*		24	—	24
	F-test, *p*-value		0.194	—	0.035

Table A6

Regression results underlying Table 2, continued

			Model 1	Model 2	Model 3
The average height by county for men born 1952/1953 related to other measures from 1950–1960					
Panel C.	Agricultural real wage	Coeff.	—	–2.62	—
		St.err.		1.85	
	Manufacturing real wage	Coeff.	—	+3.06	—
		St.err.		0.75	
	GDP per capita	Coeff.	—	—	+3.63
		St.err.			0.79
	Relative price for food	Coeff.	+3.86	+3.29	+2.64
		St.err.	1.94	1.28	1.32
	Relative price for animal foods	Coeff.	+8.21	+8.18	+9.28
		St.err.	3.89	2.75	2.60
	Constant	Coeff.	170.62	169.07	167.86
		St.err.	3.11	4.02	2.16
	Counties, *N*		19	19	19
	F-test, *p*-value		0.067	0.001	0.0003
Panel D.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	+3.85
		St.err.			0.89
	Relative price for food	Coeff.	+1.81	—	+0.67
		St.err.	1.73		1.30
	Relative price for animal foods	Coeff.	+8.93	—	+10.31
		St.err.	4.04		2.99
	Constant	Coeff.	172.22	—	169.06
		St.err.	3.14		2.42
	Counties, *N*		24	—	24
	F-test, *p*-value		0.110	—	0.001

Table A7

Regression results underlying Table 3

			Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910–1920					
Panel A.	Agricultural real wage	Coeff.	—	+2.01	—
		St.err.		4.01	
	Manufacturing real wage	Coeff.	—	+2.87	—
		St.err.		1.72	
	GDP per capita	Coeff.	—	—	+2.41
		St.err.			1.38
	Infant mortality rate	Coeff.	+2.69	+2.03	+0.44
		St.err.	1.12	1.12	1.67
	Constant	Coeff.	170.05	168.18	169.83
		St.err.	1.06	1.65	1.01
	Counties, *N*		19	19	19
	F-test, *p*-value		0.028	0.042	0.024
Panel B.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	+3.08
		St.err.			1.13
	Infant mortality rate	Coeff.	–0.68	—	–2.15
		St.err.	0.89		0.95
	Constant	Coeff.	173.16	—	171.64
		St.err.	0.88		0.96
	Counties, *N*		24	—	24
	F-test, *p*-value		0.457	—	0.032

Table A7

Regression results underlying Table 3, continued

			Model 1	Model 2	Model 3
The average height by county for men born 1952/1953 related to other measures from 1950–1960					
Panel A.	Agricultural real wage	Coeff.	—	–2.00	—
		St.err.		2.68	
	Manufacturing real wage	Coeff.	—	+2.31	—
		St.err.		0.94	
	GDP per capita	Coeff.	—	—	+2.51
		St.err.			1.04
	Infant mortality rate	Coeff.	–4.79	–2.73	–3.07
		St.err.	1.45	1.76	1.47
	Constant	Coeff.	183.35	179.70	179.23
		St.err.	1.47	3.27	2.15
	Counties, *N*		19	19	19
	F-test, *p*-value		0.004	0.004	0.002
Panel B.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	+1.99
		St.err.			0.88
	Infant mortality rate	Coeff.	–4.81	—	–3.92
		St.err.	1.02		1.01
	Constant	Coeff.	183.34	—	180.56
		St.err.	1.03		1.55
	Counties, *N*		24	—	24
	F-test, *p*-value		0.0001	—	0.0001

Table A8
Regression results underlying Table 4

			Model 1	Model 2	Model 3
The average height by county for men born 1905/1906 related to other measures from 1910–1920					
Panel A.	Agricultural real wage	Coeff.	—	+8.78	—
		St.err.		3.59	
	Manufacturing real wage	Coeff.	—	+1.70	—
		St.err.		1.37	
	GDP per capita	Coeff.	—	—	+1.70
		St.err.			1.32
	Urbanization rate	Coeff.	+2.34	+2.89	+1.17
		St.err.	0.78	0.73	1.19
	Constant	Coeff.	172.00	167.72	170.64
		St.err.	0.23	1.21	1.08
	Counties, *N*		19	19	19
	F-test, *p*-value		0.008	0.001	0.016
Panel B.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	–0.50
		St.err.			1.18
	Urbanization rate	Coeff.	+2.73	—	+3.04
		St.err.	0.82		1.11
	Constant	Coeff.	171.90	—	172.31
		St.err.	0.22		1.00
	Counties, *N*		24	—	24
	F-test, *p*-value		0.003	—	0.013

Table A8

Regression results underlying Table 4, continued

			Model 1	Model 2	Model 3
The average height by county for men born 1952/1953 related to other measures from 1950–1960					
Panel A.	Agricultural real wage	Coeff.	—	–4.15	—
		St.err.		2.32	
	Manufacturing real wage	Coeff.	—	+1.99	—
		St.err.		1.49	
	GDP per capita	Coeff.	—	—	+2.70
		St.err.			1.94
	Urbanization rate	Coeff.	+1.79	+0.58	+0.55
		St.err.	0.56	0.87	1.05
	Constant	Coeff.	177.72	179.85	175.71
		St.err.	0.27	3.57	1.47
	Counties, *N*		19	19	19
	F-test, *p*-value		0.006	0.010	0.010
Panel B.	Agricultural real wage	Coeff.	—	—	—
		St.err.			
	Manufacturing real wage	Coeff.	—	—	—
		St.err.			
	GDP per capita	Coeff.	—	—	+1.71
		St.err.			1.72
	Urbanization rate	Coeff.	+1.75	—	+1.04
		St.err.	0.53		0.89
	Constant	Coeff.	177.75	—	176.43
		St.err.	0.24		1.35
	Counties, *N*		24	—	24
	F-test, *p*-value		0.003	—	0.009