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Anthropometric History:
What's in it for Ireland?

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ANTHROPOMETRIC HISTORY: WHAT'S IN IT FOR IRELAND?¹

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This young man (Patrick Murphy) was admittedly the tallest man in the world at this time - at the time of his death his exact height was eight feet one inch. He was born in the townland of Ballincurry in this parish just beside Killowen chapel, and was baptised by the Rev. C. McEvoy on the 15th June 1834. He died at Marseilles in France of smallpox on Good Friday (April 18) 1862.

Entry in Kilbroney (Dromore) parish register

The links between how well a community is fed (and by extension its health and, some argue, living standards) on the one hand, and stature, body-mass index, or birth-weight on the other, are pretty well attested in historical work by now. It is axiomatic in this research that genes don't matter, in the following sense. Obviously an *individual's* height depends in part on his parents, but:

The mean heights of well-fed West Europeans, North American Whites, and North American Blacks are nearly identical. There are, of course, some ethnic groups in which mean final heights of well-fed persons today differ significantly from the West European or North American standard. In these cases the deviation from the European standard appears to be due to genetic factors. But such ethnic groups have represented a minuscule proportion of the U.S., West European and West Indian populations. Consequently they are irrelevant to an explanation of the observed trends in mean final heights in the United States and in the various European nations since 1750 (Fogel, 1989: 138).

In the last century Europeans were very small and stunted by modern standards. Fogel instances the Dutch case, where today less than two percent of young adult males are less than 66" (168 cm.) but in the mid-nineteenth century about two-thirds were below that. The Dutch gene pool has not changed much in the interim; so changes in nutrition, health, and environment are responsible. Nor can the increase in male final heights in Europe over the last two centuries or so - 7 to 12 cm. - be attributed to some darwinian natural selection process, because that takes much longer to work out (Fogel, 1993). The connection between physical measures such as birth-weight or height and nutritional status, nowadays invoked by international agencies as a measure of health and nutritional status in less developed countries, was noted by Malthus in the *Essay on Population*:

¹I am grateful to David Fitzpatrick, Joel Mokyr, Rodney Thom, and Brendan Walsh for comments on an earlier version of this paper.

The sons and daughters of peasants will not be found such rosy cherubs in real life as they are described to be in romances. It cannot fail to be remarked by those who live much in the country that the sons of labourers are very apt to be stunted in their growth, and are a long while arriving at maturity. Boys that you would guess to be 14 or 15 are, upon inquiry, frequently found to be 18 or 19. And the lads who drive plough, which must certainly be a healthy exercise, are very rarely seen with any appearance of calves to their legs: a circumstance which can only be attributed to a want either of proper or of sufficient nourishment.

A few decades earlier essayist Samuel Johnson had been moved by his observations in the inner Hebrides to note that "in regions of barrenness and scarcity, the human race is hindered in its growth by the same causes as other animals".

This paper offers a critical review of recent research into the link noted by Malthus and Johnson, with particular attention to work on Ireland. Military records are a rich source of historical heights data. Armies have long relied on a minimum height requirement as a method of quality control and of helping identify deserters. Inferring the height of a population from a sample based on such data presents its own computational and interpretational difficulties, however. The frequency distributions of the heights of large randomly-selected groups of people like those of, say, a series of observations on annual rainfall or crop yields, are bell-shaped or 'normal'. The heights of military recruits typically are not so distributed: smaller men are rejected, or are less likely to present themselves to the recruiting agent. The computational challenge has been met by the development of specially-devised algorithms - one of the rare instances where economic historians have prompted the development of new statistical techniques. The Quantile Bend Estimator (QBE) generates a measure of the mean height of a population or sub-population from samples (such as our soldiers) subject to shortfall and truncation. Prison and convict indents records are another fruitful source. Thirdly there are data on slaves in the United States, the West Indies, and Brazil, and in the United States on runaway indentured servants. Finally, hospital records provide data on birth-weights.

REVIEW OF FINDINGS:

So far, the analysis of historical heights data has yielded several surprising and some puzzling findings. Komlos (1986) has identified a malthusian crisis in parts of the eighteenth-century Austro-Hungarian empire from the heights of its soldiers. Sokoloff and Villafior's study of U.S. Revolutionary

Army muster rolls (1982) revealed that white native-born Americans were almost as tall in the eighteenth century as today. Height-based inferences have prompted debate about economic welfare in eighteenth-century Sweden and twentieth-century Netherlands (Sandberg and Steckel, 1987; Brinkman *et al.*, 1988). They have produced a contribution from France by LeRoy Ladurie (1973), and have been invoked by Fogel to corroborate claims that slaves in the U.S. South were better treated than those in the West Indies (Fogel, 1989: 138-47).

The anthropometric approach is premised on the role of changes in nutritional status, i.e. the intake of food relative to work done. And for the eighteenth and nineteenth centuries energy-accounting - a kind of political arithmetic that 'allocates' the available food across the whole population, allowing for age, sex, and income distribution - corroborates the implications of the height estimates: lack of food prevented large numbers from doing what would today be considered a decent day's work. * According to Fogel, lack of energy prevented the bottom twenty percent of English population from doing more than six hours of light work daily in the early nineteenth century; he claims that in France ten percent lacked the energy for any work, another ten percent for no more than three hours daily. * Similar studies exist for nineteenth-century Belgium and pre-Famine Ireland (Fogel, 1994; Bekaert, 1991; Ó Gráda, 1994, ch. 4).

What does the approach offer Ireland? The satirical seventeenth-century saga Pairlimint Chloinne Tomáis provides an early Irish reference to the connection between diet and height at issue here. According to the story the men of Meath, Fingal and Kildare, bred on a diet of peas and oatmeal pottage, were "*fearaibh gearra, bolgmhóra, tollreamhra, tábhachtachta* (short, pot-bellied, fat-arsed and important men)". The men of Munster, even then potato-eaters, stood at a distance from them, "*mar do bhádar 'na bhfearaibh boga arda* (being soft, tall men)". No firm Irish heights data for the seventeenth century survive to verify this claim, but, as in the case of many other European countries, a good deal survives from the following centuries.

Mokyr and I have based three studies on the heights of soldiers recruited by the East India Company (EIC) army between the 1770s and the 1850s (Mokyr and Ó Gráda, 1989, 1994a, 1994b). The first used data on men enlisted by one Robert Brooke in the 1770s and men similarly enlisted in England around the same time. Applying the QBE algorithm (on which more later) to the reported

* heights of the Irish and English recruits showed that the former were considerably taller - 166.9 cm. versus 164.6 cm. - for men aged 22 years and over. Since armies typically enlisted poor men, the QBE's reflect the height of the poor. By modern standards, the implied height of men in both Ireland and England was very small indeed. More surprising was the inference that young Irishmen of humble backgrounds were nearly 2.5 cm. taller than their English counterparts. Though the comparison is complicated by the operation of selection biases in recruitment - on which more below - the calculated difference in Irish and English heights seems too big to be purely the result of such bias. The results are tantalizing at least in their implications for the relative health and nutritional status - though hardly the economic welfare more broadly defined - of men born around the mid-eighteenth century. An analysis by Sokoloff and Villaflor (1982) of a sample of men recruited by the American Revolutionary forces (1775-83) offers some corroborative evidence. Though they find that foreign-born men were shorter than American-born, the gap between American- and Irish-born men was 1.5 cm. less than that between American-born and English-born.

The EIC's army, like the French Legion, offered a haven for hardened men, down on their luck or in trouble with the law (Bhatia, 1977; Heathcote, 1977; Mason, 1974). The Company tended to take on such men with no questions asked. However, comparing the occupational breakdown of EIC men and H.M.'s forces suggests that this had little bearing on the social background of recruits.² Over five thousand Irishmen joined the EIC army between 1802 and 1814. In terms of regional origin and occupational background, they were more representative than Brooke's men. The Company's enlistment registers for the period include every county in Ireland and the Irish recruits extended over 150 different occupations. Most numerous were labourers, servants, weavers, shoemakers, carpenters, tailors, masons and smiths, but the lists also include gentlemen, miners, combers, dyers, miners from Kilkenny and Wicklow, Dublin stucco plasterers and dyers, a 21 year-old Kerry student, several tobacconists spread over ten counties, a fiddler and a letter-carrier from Fermanagh, and many more. The small number of farmers reflects the youth of the recruits: farmers' sons were likely to be returned as labourers. The number of workers in occupations requiring literacy (6.5 percent of the total), the over-representation of Dublin and the rest of Leinster, and the under-representation of East Ulster, hub

²On the importance of Irish recruitment generally see Chart, 1917; Karsten, 1983.

of Ireland's Industrial Revolution, are noteworthy features.

An analysis of the heights of this much larger number of men again indicates that the Irish were drawn from a taller population, though the QBE-derived gap between Irish and English is now smaller (somewhat over 0.8 cm.). In these years, the Company faced a serious shortage of recruits, and was forced to relax greatly its minimum height and age requirements. Our results (not reported here) refer to adult men only. Evidently rurality and being a labourer had little influence on height in the Irish case, though country people were a little taller. Within Ireland, Munster and rural Leinster produced the tallest men, and Dubliners were about 1.3 cm. smaller than the national average. Weavers were typically short, while men declaring 'literate' occupations before joining the ranks were almost 2.5 cm. above the mean. The comparison also suggests some reduction in Irish heights between the 1770s and the 1800s, and a rise in the English. these last results support the possibility that the growth of Irish population in these years was a disequilibrium phenomenon. Though interesting, they must not be pressed too far, for reasons explained below. The low estimated heights in this period reflect the poverty of the reference sub-populations in both Ireland and Britain; at other times, when the Company could pick and choose its men, mean height rose significantly.

A third study with Mokyr deals with the period between 1815 and the quelling of the Great Sepoy Revolt of 1857-8, when almost 70,000 Europeans embarked on the journey from the Company's barracks on the Isle of Wight to India as private soldiers in the Company's army. The EIC army was probably then the world's largest. First, the place of the EIC Army recruits in the economy and the labour force that produced them in this period. The European recruits continued to face a tough life characterized by poor pay, disease, and a diet dominated by meat and massive drinking. The pace and quality of enlistment in the Company's regiments varied with military requirements in India and labour market conditions back in the United Kingdom. In 1800-1815 the EIC had been forced to rely heavily on adolescents, in effect indentured laborers, and very small adult men, although mean age was clearly increasing over time, possibly because of the ineffectiveness of teenagers as soldiers. Many of the teenagers would become victims of "the climate and their own imprudence" before seeing military action. In the depressed labor markets of the late 1810s and the 1820s, the ^{EIC} Company could have its pick of prime-aged men. Much later, in the wake of the Mutiny of the 1850s, it again raised the bounty

offered to recruits and reduced its minimum height requirement in a desperate - and successful - attempt to attract men. At times during the interim, by way of contrast, the Company could afford to raise the minimum height requirement to 66" (or 167.6 cm.).

As in all studies using data from volunteer armies the question of selection bias must be paramount. How typical were these EIC men of the population whence they sprung? The previous occupations and birth places of those recruited suggest a broad cross-section of the male labour force in these years. The recruits were by no means an undifferentiated mass of the very poorest unskilled labourers. The Company's enlistment registers contain some 1200 occupations between 1802-60, underlying the heterogeneity both of its intake and of the labour force during the Industrial Revolution. Though 'labourer' was the most common designation in the registers - accounting for about one-third of British and over 1/2 of Irish recruits - other occupations accounted for a majority of all job descriptions given. In this regard at least the representativeness seems confirmed: slightly over fifty percent of Irish adults were identified as "labourers" in the 1841 census.

It is also striking that casualties of the Industrial Revolution such as handloom weavers and framework knitters were numerous; the framework knitters largely in the 1800s and the 1810s, the weavers throughout. Occupations requiring a modicum of literacy such as 'clerk' or 'printer' also featured prominently. Movements in the proportion of recruits declaring employments that required literacy are a reasonably good proxy for fluctuations in the quality of the recruits. Thus former clerks, printers, teachers, and the like accounted for only five percent of the total in the 1800s, when recruits were scarce, but they accounted for about one-fifth of the total in 1836, in 1843-4, and in 1848, years when the labour market was a buyer's market. Again, their share dropped from over ten percent in 1854-6 to seven percent in 1857-9. Curiously, perhaps, literate workers accounted for a higher share of Irish than British recruits before 1820, and Ireland's share continued to be high relative to its economic status, although a gap opened up between the two Kingdoms in the late 1820s and gradually widened over the next three decades. However, the shares of occupations requiring literacy in Ireland and Great Britain moved very closely in line at least until the disruptions of the 1840s. Thus, if we believe that the occupational structure of the recruits reflects market conditions, this suggests a high degree of economic integration between the two islands.

Why not calculate mean heights on, say, a five-yearly basis between the Union and the Famine (1800-1845) in order to track the trend in diet and health? There are several precedents for this procedure. New interpretations of eighteenth-century Austro-Hungarian economic history and of the trends in Swedish and British living standards are based on it. Floud and his associates have also tracked the heights differential over time between Ireland, rural England, and Scotland. Their QBE estimates reveal a long-standing Irish advantage over the English; however, the gap narrowed between the 1790s and the 1820s, only to rise sharply thereafter. According to the authors, their estimates "are sufficiently sensitive to track a strong negative impact of the Irish famine.. [I]t is also interesting how strong a rebound is evident among Irish families who survived and stayed" (FWG, 1990: 205). These are not implausible findings, though Komlos's reworking of the Floud-Wachter-Gregory data offers an a somewhat different synoptic view. Komlos, like them, finds that the Irish were taller than the English for most of the period between 1740 and 1850, but with the gap in his index being eroded in the early nineteenth century, and increasing again before the Famine. This closing of the gap after 1820 supports the finding of Irish immiseration at the lower end of the socio-economic scale before the Famine.

Our own estimates of the trend (reduced sample maximum likelihood estimates correcting for changing truncation points and compositional effects) failed to reveal any sustained improvement in observed height from the end of the Napoleonic Wars (birth cohorts of about 1790-1800) to the end of the 1850s (birth cohort of about 1835-1840). Of course, this 'pessimist' finding about trends in the United Kingdom as a whole must be weighed against more 'optimistic' claims based on estimates of the trends in real wages (compare Lindert and Williamson, 1982; Hunt, 1986). The outcomes are not conclusive, for the following reason: the comparison ignores the potentially serious selection biases associated with volunteer army data such as that of the EIC or the United Kingdom. These pose particularly awkward problems for time-series inferences, as the quality of recruits is sensitive to trends in unemployment and poverty, and to shifts in military requirements and in the relative status of soldiering. Thus a change in estimated mean height might reflect either a genuine improvement in health - or merely a loosening in labour market conditions. Floud-Wachter-Gregory recognise this problem, but dwell on the difficulty of measuring their soldiers' relative income, and give up: "it seems

unlikely that the dispute can ever be resolved" (1990: 39).

The EIC data contain several warnings against the dangers of incautious time-series inferences. For instance, the rise in the quality of the EIC's intake in 1815-6 and the equally remarkable fall during the Sepoy Revolt of 1858 (when the minimum height requirement was reduced to 62" or 157.5 cm.) were due to short-term shifts in labour supply and demand. Even at the best of times the Company accepted men with ailments such as defective teeth, stammers, or varicose veins. But among recruits deemed unfit for service in 1858 was one Archibald Smith, who had been "at drill for eight weeks and although willing.. from extreme awkwardness and apparent imbecility of mind totally incapable of learning his drill". Cavalry recruit Martin Donohue proved no better; the Company's inspector at Warley barracks "instantly remarked his imbecile expression of countenance, he has since evinced extreme silliness, and I am of opinion that this is his natural state of mind and that he will be worthless as a soldier". Smith, Donohue and some others like them were weeded out before embarkation for India, but their prior selection by recruiting sergeants desperate for men is symptomatic. A cross-tab of mean height by age of the contrasting intakes in 1856-7, on the eve of the Sepoy Revolt, and in 1857-8 corroborates. On the eve of the Rebellion the Company was accepting only men considerably above the population mean, but the news from India produced a dramatic drop in recruit quality. Comparing the mean heights of 20 and 21 year olds in 1858-60 also suggests that the frenzied recruitment campaign that ensued also produced teenagers who exaggerated their ages a little.

Throughout these years Ireland was a fertile recruiting ground for the Company's recruiting sergeants: between 1800 and the army's demise, Irishmen were nearly always more than twice as likely to enlist as Englishmen or Scotsmen. The Irish presence in the regular army was more in tune with population size (Karsten, 1983). The ratio of Irish to English recruits in both armies also fluctuated in the short run, though movements in occupational distributions suggest that variations in recruit quality in both islands moved in tandem. In Ireland, Dubliners were more likely to join the Company's army than men from any other region; London played a similar, though less important role, in England. Such over-representation of metropolitans is a common feature of volunteer armies.

The QBE algorithm was devised in part to correct for changes in the height requirements imposed by the authorities. To some extent the effect of the various biases may be reduced by

controlling for the previous occupation and regional origin of recruits. One might focus, for instance, on Irish weavers or London labourers. Nevertheless, the sharp shifts in the occupational distribution of recruits over time is itself worrying, since it raises the possibility that those calling themselves 'labourers' at a time of labour shortage may have differed from 'labourers' recruited when the labour market is slack. Far-reaching inferences about trends in general health and welfare are therefore not warranted, and other evidence should also be checked out.

{ Further analysis of the EIC data-base illustrates the strengths and drawbacks of the anthropometric approach. Irishmen declaring 'white collar' jobs - clerks, printers, teachers, etc. - accounted for one-eighth of the Irish intake in the 1830s and 1840s, but only half that during the 1850s. Second, there was a rise in the urban share of enlisted men. In 1802-15 fewer than 1 in 7 of Irish recruits came from a big town or city background, and less than one-third of British; in the 1850s the proportions were nearly two-fifths and three-fifths, respectively. Poor conditions of pay and service in India were probably responsible: nominal wages in the ranks had hardly changed since the 1790s, and in the 1840s and 1850s soldiers were still earning less than 9 rupees (about £0.9) per month after stoppages for clothes and rations.

Floud-Wachter-Gregory and Komlos focus mainly on whether the Irish were taller than the English. But what lay behind the differences in average height? Obviously, unconditional estimates of mean heights over the period as a whole are important, but the role of factors such as age, occupation, and urban-rural background may also be of interest in their own right. Besides, in so far as the skill and urban-rural composition of the recruits is partly due to the state of the labour market, controlling for such factors should reduce the bias in estimates of the nationality gap. To this end Mokyr and I subjected the intake in subperiods during which the minimum height standard remained constant to regression analysis. For each subperiod, we regressed height on age, age squared, and a list of occupational and regional dummies (Mokyr and Ó Gráda, 1994b). The Irish height advantage usually turned out positive, but small: over the period as a whole they average 0.25 cm. The results imply some whittling away of the Irish height advantage after 1815, followed by a mild recovery, and the outcome is consistent with the relative worsening in Irish diets in the pre-famine decades. The height advantage of the Scots over both Irish and English, noted by Floud-Wachter-Gregory, is confirmed.

Rurality consistently produced taller men early on, though this premium had nearly vanished by the 1840s. A weaving background produced smaller men - a finding consistent with the historiography of the Industrial Revolution. The socioeconomic background of men previously employed in jobs requiring literacy made them taller throughout; that advantage was accentuated in 1857-60 when the quality of unskilled recruits fell dramatically.

The data also invite a look at inter-regional comparisons. Dividing Ireland first into six regions - an industrial east Ulster (comprising counties Antrim, Armagh, and Down), a less-developed west Ulster, a 'peripheral' western region comprising Connacht and the Munster counties of Clare and Kerry, Dublin, the rest of Leinster, and a four-county east Munster - the Irish soldiers were subjected to separate regression analysis (see Table A.1). The outcome indicated once more the robustness of the findings regarding the status of literate workers and weavers. The greater height of Leinstermen reflects the east-west gradient previously mentioned. The small stature of Dubliners also stands out. East Munstermen were usually smaller than average also, and the men of east Ulster taller. No strong trends over time are discernible, however.

A few analogous studies covering the pre-famine decades have recently been published. In general they show that the Irish advantage persisted but grew narrower. The Irish advantage was not due to higher living standards in the conventional sense of greater purchasing power; nevertheless these results indicated that Irish poverty was mitigated by a nutritious diet. That the Irish remained small by modern standards is a reminder of the stunting effect of childhood and adolescent diseases in an era of primitive medical technology. Had cures for childhood ailments such as diphtheria, measles, scarlet fever, tooth-aches, and so on, been discovered by mid-nineteenth century, it may be safely assumed that the British would have converted easier access to them into a height advantage over the Irish.

(ii) *IRISH PRISONERS:*

Surviving prison register data provide an alternative snapshot of the heights of the Irish just before the Great Famine. Here I report the results of analyzing two such registers. The first concerns men and women recorded in the register for Clonmel jail between 1845 and 1850 (Ó Gráda, 1992). These people lived in the garrison and market town and its rural hinterland in south Tipperary and Waterford;

they were accused of a panoply of crimes ranging from "rolling a car on a footpath" through "entering the house of John Dalton and killing three hens and cocks his property", being "wandering strangers", "trespass by pulling carrots", to grievous crimes such as rape and murder. The records reflect both the 'disturbed' state of the countryside and, through the large number of women charged with prostitution, Clonmel's status as garrison town. The socio-economic 'representativeness' of the sample is unclear, though probably it reflects a broader spread than the soldiers. That most of those listed in the register seemed to be first-time or once-off offenders - with the notable exception of the prostitutes - suggests that they should not be seen as belonging to some criminal lumpenproletariat.

The mean height of adult men (aged 22-39 years) was 168.7 cm. (Table 1), impressive when compared to the estimates yielded by the QBE technique for other countries in mid-nineteenth century. Women were about 12.5 cm. shorter. The spread of ages in Table 1 permits some tentative time-series inference. Allowing for the likelihood that the older men included there had 'shed' some height, men born c. 1820 still seem to have been as tall as those born two or three decades earlier. In Clonmel literacy added an impressive 2.5 cm. or so to mean male height, and 1.2 cm. to female.

[Tables 1 and 2 about here]

Table 2 summarises the results of an analysis of a related source, the heights of transported convicts in the K'ham prison register. These are based on records of 1400 men transported to van Diemen's Land in the 1840s. The regional spread is good (40 percent from Leinster, 29 percent from Munster, 20 percent from Ulster, and the rest from Connacht). The literacy information contained in the data also matches priors, though it indicates that Ulster convicts hailed from a relatively poorer background than those from other provinces. The outcome tallies well with the Clonmel data. The mean height of men aged 23 years and over was 168.4 cm. Literacy 'mattered', though less than in Clonmel. So did religion: the 552 Catholics aged 23 and over averaged 168.7 cm., the 111 Protestants 169.9 cm. Munstermen were tallest, Ulstermen and Connachtmen smallest.

(iii) *CONVICT INDENTS:*



The Irish advantage is confirmed by analysis of the heights of convicts transported from Britain and Ireland to New South Wales in this period. Studies by Nicholas with associates Steckel and Oxley on male and female convicts show those transported from Ireland between the 1780s and the 1810s to have been taller than their British peers. The urban-rural and skilled-unskilled differentials described earlier also hold in the case of the convicts. A convict-based study of female heights finds a modest increase in the heights of Irishwomen born between 1790 and 1820; and while rural Irish women convicts born at the beginning of the period were shorter than the English, those born towards its end were taller. Since the convict population was subject to different selection biases than the military, inferences based on convict data usefully supplement those based on soldiers or sailors.

The great strength of the convict indent data invoked by Nicholas is that they don't suffer from the sample selection biases just described. Nicholas has argued repeatedly that the convicts were neither the agrarian redressers of traditional historiography nor the habitual, hardened criminals of Australian revisionist writing, but 'ordinary British and Irish working-class men and women who stole'. It was not that simple. Firstly, though in rural Ireland transportation may have been used primarily as a deterrent against petty theft by first-time offenders, that was not so in Dublin. So convinced was one thieving Dublin prostitute of this that she "did not care a damn as it was her first offence and she could not be transported". Secondly, for much of the period under review parts of rural Ireland lacked an effective police force; being a first-time offender was consistent with having spent a considerable time in criminal activity. Thirdly, certain parts of Ireland and, in particular, urban areas were greatly over-represented among the convicts. Nearly half the women sent out between 1791 and 1828 had stood trial in Dublin, while Connacht, which contained about one Irishwoman in six, supplied only one female convict in twenty. Scotland was radically under-represented; though they accounted for ten percent of the United Kingdom's population in 1821, Scots supplied only 2.9 percent of the convict samples. Fourthly, those selected for and surviving the voyage to Australia were likely to be healthier than the average convict (Robinson, 1993; Nicholas, 1988: 210-1).

The literacy levels implied by the convict sample raise some further questions about the representativeness and accuracy of the indent data. Nicholas and Oxley claim that 'the Irish transportees were at least as literate as the Irish left at home', but there is very little correspondence

between the illiteracy of female their Irish convicts born between 1790 and 1825 and the age-cohort data in the 1841 Irish Census. For most of the period surveyed by Nicholas *et al.*, the rural illiteracy rates of the convicts are 'too low' and urban 'too high'. In particular, the convict indents imply (i) that illiteracy in Irish urban areas was rising for years of birth from 1810 on, and flat before then, and (ii) that before 1810 female illiteracy was higher in Irish urban areas than in rural. Neither of these implausible claims is supported by the evidence on literacy in the 1841 census. Indeed, the convict samples are another reminder of the atypicality of the urban convicts, and their urban sample for 1816-25 is much more illiterate (over 40 percent) than those in Ireland (28.5 percent).

The convict indent data suffer from other shortcomings. They are subject to heaping, and they bring the story up to the cohorts born in 1810s only. Moreover, as seen in Table 3, movements in the signs and sizes of the coefficients on their birth-cohort dummies are very erratic, and the accompanying t-statistics too weak to reject a broad range of hypotheses about time trends. In certain cases, besides, the series of positive or negative signs on the coefficients seem to be artifacts of the control group born before 1780 (English urban males), 1790 (Irish urban males), or 1795 (Irish urban females).

[Table 3 about here]

Given the inconclusive statistical outcome and likely selection biases in the raw data, we believe that the trends over time before then are too weak to bear the burden placed on them by Nicholas and his co-workers. Claims that the convict data have demonstrated 'definitively' a decline in English living standards in the pre-1820 period 'particularly among the urban population', but 'slowly improved nutritional standards in Ireland' thus seem premature.

POST-FAMINE:

Post-famine data on heights are plentiful. Here I summarize the results of an analysis of four data-sets, two taken from the records of Castlebar and Kilmainham prisons in the early 1880s, a third from Kilmainham in the late 1900s, and a fourth from Castlebar in the 1910s. The Castlebar prisoners were mainly Mayo-born and nearly all Catholics. A majority were charged for crimes such as

drunkenness, assault, and begging. But 82 year-old John Hopkins, an illiterate weaver, was charged with "causing the death of Pat Jordan by bleeding him not being a qualified surgeon", and the charges ranged from debt to sedition. Several of the younger females, especially those charged more than once, were probably prostitutes. The mean height of adult men was about 168.9 cm. Crosstabs show mean height falling off after age 30 or so, but this probably springs from adverse selection in the kind of men included: alcoholics and vagrants were particularly numerous among the older prisoners. My analysis of 859 Mayo prisoners in the 1880s showed men being about 12.5 cm. taller than women. Literacy added about 2 cm. to height, and not being a Catholic 1 cm. The last result means little, however, since it derives largely from the heights of wayward English-born soldiers and sailors.

The Kilmainham prisoners of the 1880s, all male, hailing from a much wider range of birth-places, and including a far higher proportion of non-Catholics, are the basis for the regression results in Table 4. They show that literacy was a much weaker predictor of height in Dublin in the 1880s than in the west, but perhaps the most striking result is how much smaller, after controlling for age, literacy, and religion, were Dubliners. Cross-tabulations reveal that the adult westerners in the Kilmainham sample were as tall as the Mayomen measured in Castlebar around the same time. Little had changed in Kilmainham by the late 1900s: the mean heights of adult non-Dubliners was 168.9 cm., that of Dubliners almost 2.5 cm. less. The mean height of first-time prime-age male Castlebar prisoners charged between 1910 and 1918 - excluding men charged in connection with the 1916 Rising, who were taller - was 170 cm., that of women charged over the same period 157.5 cm..

[Table 4 about here]

Comparing results on prisoners in the 1840s and 1900s reveals little change in the mean height of Dubliners, but a modest improvement in that of rural men. The difference is probably an indication that conditions improved more in post-famine rural Ireland than in the city.

Small sample size rules out hard generalizations, but both 1880s data sets indicate that the male adolescent growth spurt occurred early, before the age of sixteen years. For the Dublin teenagers the pattern was very like that recently reported for Christ's Hospital school, London, in the 1870s (FWG,

1990: 182-3).

<i>Age:</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>	<i>18</i>	<i>19</i>
Height:	146.6(18)	153.4(20)	159.9(19)	164.1(56)	165.6(71)	166.3(68)
Growth (%):	+ 4.6	+ 4.2	+ 2.6	+ 1.0	+ 0.4	

Note: number of observations in parentheses, height in cm.

The Kilmainham records also report the weights of prisoners from 1884 on. These are the basis for the estimates given below of the Body Mass Index (BMI) - defined as $\text{Weight}/\text{Height}^2$. This alternative anthropometric index - a favourite of Fogel's - reflects 'the balance between intakes and the claims on those intakes'. While the mean height of a population is the product of dietary intake during childhood and adolescence, BMI reflects the balance between food and energy requirements at the time of measurement. In Fogel's parlance, people who are short relative to modern North American or West European standards are deemed 'stunted', while people with low BMI are 'wasted'. The 'ideal' BMI level varies with height; Fogel puts it at about 26 (measuring height in meters and weight in kilograms) for men under 66" (167.6 cm.). The results of modern clinical research invoked by Fogel suggest that Kilmainham BMI - about 23 - on the low side. The outcome by age is as follows:

<i>Age-group</i>	<i>Dublin</i>	<i>Rest-of-Ireland</i>	<i>All Ireland</i>
20-4	22.9 (107)	22.6 (44)	22.8 (151)
25-9	23.2 (86)	23.3 (37)	23.2 (123)
30-4	23.0 (41)	23.4 (25)	23.1 (66)
35-9	22.8 (31)	23.3 (19)	23.0 (50)
40-4	23.6 (20)	23.8 (26)	23.7 (46)

Analysis of a group of Kilmainham prisoners charged in 1908 reveals little change: for men over 20, BMI was 22.9 for non-Dubliners and 23.1 for Dubliners. In Mayo in the 1910s BMI was also 23. The most plausible explanation for low BMI is that the data include men who, though they may have been reasonably fed while growing up, tended to neglect their health in adulthood; that many of the prisoners

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