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# 6 Health and Welfare of Women in the United Kingdom, 1785–1920

Paul Johnson and Stephen Nicholas

## 6.1 Introduction

Women's status within the family and economy was transformed by industrialization. Whether the change worsened or improved the living standards and position of women remains one of the most important and contentious issues in economic history. This paper uses new data on the heights of women and men born in Britain and Ireland between the 1780s and the 1850s, and information on mortality, to assess the changing fortune of women's welfare during early and late industrialization.

It is well established in biomedical studies that changes in average height within a population reflect changes in net nutritional status, and this finding has been widely applied in anthropometric history to draw inferences from heights to living standards and other measures of welfare. Two significant problems have been identified with this procedure, one methodological and the other inferential. First, the use of military records in the majority of historical studies of height can be problematic because of minimum height standards for recruits, which erode the left-hand side of the military height distributions, biasing the average height estimates. There has been debate over how best to adjust for such biases (Floud, Wachter, and Gregory 1990, 1993; Komlos 1993). Second, the exact nature of the relationship between height and other measures of living standards, such as real income per capita, is unclear. This means that it has not been possible to map directly from heights to economic indicators of welfare.

Our data on heights are derived solely from convict and criminal records and no minimum or maximum height restrictions apply, which avoids the truncation problem that infects the military recruitment data. We partially circumvent the second problem of mapping from heights to alternative measures of living standards by comparing the height movements of women relative to men. Changes in the height gap between men and women is a powerful test of the relative changes in female and male living standards during industrialization.

The paper begins with a survey of the historical literature on industrialization and female living standards. Section 6.3 discusses the three separate sources of data on female criminal heights that we use in this paper, and section 6.4 reviews the existing literature on the relationship between height and industrialization in a number of countries. Section 6.5 presents our analysis and interpretation of female heights and living standards in the United Kingdom during early and late industrialization, and this is followed by a more detailed analysis of occupational and regional influences on heights. The final section compares the height data with information on the female mortality experience in Victorian Britain.

## 6.2   Historiography

The issue of whether industrialization worsened or improved the living standards and socioeconomic position of women has a long history. Marx and Engels (1977; Marx 1977) forecast the disintegration of oppressive family obligations, and John Stuart Mill (1988) argued that industrialization opened up more economic opportunities for women than it did for men. In contrast, Mary Wollstonecraft (1792) and William Thompson (1983) believed that an unequal sharing of unpaid family responsibilities prevented women from competing equally with men, intensifying female oppression in an era of individual competition.

Arguments by historians have split along similar lines. Alice Clark (1919) dated the rise of capitalism, and the demise of women, from the seventeenth century. Prior to capitalism, production in its numerous forms (textile, mining, agriculture) had been based on the family labor system. Employment contracts either explicitly or implicitly entailed that the male worker worked with his wife and children. Wages reflected this, being payment sufficient to cover the entire family; this conferred some, but not equitable, power to women. Patriarchy determined the degree of power that men exercised over the resources of the household, including the labor power of women within the family and the labor market. Within the preindustrial and protoindustrial household, men were the controlling members of the family labor system who employed various strategies, including access to intrahousehold resources and the organization of work, to maintain their unequal authority over women. However, the family labor and wage system, in operating subject to mutual rights and obliga-

tions between men and women and children, explicitly recognized the contribution of women to household income, which meant that the family wage was recognized as joint income (Seccombe 1986, 66).

The family wage system was not always inconsistent with capitalism. Many factory industries duplicated the household workshop where males dominated the labor power of women by subcontracting the labor of their wives. For example, in cotton textiles and coal mining, the patriarchal control over women's labor in the household was extended to the factory, where men determined the sexual division of labor in the workplace by allocating work tasks and dictating the process of work (Mark-Lawson and Witz 1988).

But, increasingly, emerging capitalist production became inconsistent with the family labor system. In many industries, such as hosiery and silk, there were not sufficient male workers in factories populated by unskilled female and child labor to operate a system of family subcontracting (Rose 1986; Lown 1990), and protective legislation, in mining for example, prohibited underground work by women, which destroyed the family subcontract system (Mark-Lawson and Witz 1988). More generally, men restricted women's work to unskilled and low-paid labor or forced women out of employment altogether, leaving them at home with the children. Concomitant with the shift from the family labor system to the individual worker, the family wage was converted to an individual wage. But the individual wage was higher for the "breadwinning" man, even if he was unmarried, since men were deemed to have a family to support while women workers only supported themselves. Working-class living standards suffered, but within the working class the onus of the suffering was deeply gendered.

Subsequent historians have challenged Clark's periodization, bringing the date of the rapid change from family to breadwinner wage to the early to mid-nineteenth century. Work has progressed from the study of waged employment in industry to include wage work in agriculture, the changing forms of the family, and increasingly, the continuing economic roles of women in the household or "nonmarket" sector. The parts played in the declining status of women by economic necessity, biology, ideology, and labor aristocrats have all been considered, as have the differences across industries, geographical area, and class, with a continuing debate over the relative significance of each (Tilly and Scott 1978; Berg 1985; McBride 1976; Davidoff and Hall 1987).

While Clark's tale was pessimistic, Pinchbeck (1930) had a positive story to tell. Pinchbeck focused on the opportunities that industrialization opened up for single urban women. Factories provided jobs with cash payment and a degree of freedom unknown to domestic and farm servants and girls used to working under the close scrutiny of parents. Optimistically, Pinchbeck declared that factories "meant higher wages, better food and clothing and an improved standard of living. This was especially so in the case of women" (Pinchbeck 1930, 311). The perils for women working in the factory were no more than "the experience of cottage and workshop industry writ large for all to see"

(McKendrick 1974, 161). Married women, too, benefited. Like Clark, Pinchbeck identified the changing wage form as highly significant for women, but her appraisal was favorable. The gradual movement toward a male breadwinner wage for the whole family meant financial recognition for women's reproductive labors, which freed women from the burden of paid work while acknowledging that "in the rearing of children and in home-making, the married woman makes an adequate economic contribution" (Pinchbeck 1930, 313).

Subsequent optimists have advanced a somewhat modified argument. Rather than liberating women from the burden of paid work, the benefit of industrialization was the opening up of the labor market to women. In the preindustrial past, production was heavily dependent on strength, which disadvantaged women. This, plus domestic responsibilities, fostered a strong division of labor in which women did "women's work" and men did "men's work." Popular culture, religion, and the legal system provided evidence of the low status of women (Shorter 1976b, 1982; Thomas 1988, 537). Industrialization wrought change, to the advantage of women. Machinery reduced the need for physical strength, and medical advances reduced the number of pregnancies women needed to bear (Goode 1963; Fox-Genovese 1982, 21–22; Shorter 1982). Compared with agriculture and domestic service, industry offered women and children more jobs, and they were better paid (McKendrick 1974, 185). The logic of capitalism reduced inequalities. The demand for labor, particularly skilled labor, broke down gender barriers. Facing a more equitable labor market, women increased their bargaining power and status within the family; work and responsibilities were shared more equitably.

Williamson and Lindert (1983, 17) have used the ratio of women's hourly wage rates to those of unskilled men to argue that women's earning power relative to unskilled men did not decline between 1820 and 1850; it may have stayed the same or even advanced slightly. Critics of Williamson and Lindert argue that women's wages cannot be accurately measured, and one recent antagonist has suggested that a resolution to the Clark-Pinchbeck debate is impossible, given the lack of adequate data on female wages (Thomas 1988, 545). Further, critics have argued that declining participation rates for women in the formal labor market point to involuntary unemployment and falling living standards. Williamson and Lindert (1983, 19) thought such an argument "hard to sustain" because there was no institution that compelled employers to hire men in preference to women. But the patriarchal system of male headship in family households was exactly such an institution, forcing women involuntarily out of the paid workforce.

There is increasing qualitative evidence from parliamentary papers, the evidence of witnesses, detailed studies of household accounts, and newspapers that labor market segmentation increased and women's position in the paid labor market deteriorated, with the proportion of working-age females in the labor market falling rapidly between the 1820s and the 1890s (Humphries

1987, 1990; Richards 1974; Snell 1981). These changes held true for women in agriculture, handicraft, and the modern sector and are consistent with a patriarchal interpretation of job segmentation. This position has received support from Horrell and Humphries's (1992, 1995) statistical work on household budget data, which showed increased institutional and ideological obstacles to women working. There emerged both the patriarchal family where wives did not work and a sustaining ideology that women need not work. As need became a criterion in determining pay rates, the wage structure based on the individual earner bifurcated along gender lines, with a male breadwinning wage norm granted to men irrespective of conjugal status (Holley 1981; Land 1980; Seccombe 1986). Although the pattern was not uniform or continuous across occupational categories, by the mid-nineteenth century women's financial dependence on men had increased. Recently, Horrell and Humphries (1995) found an overall decline in the participation of married women in the labor force and a declining relative contribution of women's earnings to those of their husbands in family income between 1795 and the mid-nineteenth century.

Using data on female height, combined with information on mortality and life expectancy, we provide an evaluation of women's standard of living in the United Kingdom since 1780 that supplements and extends the existing literature.

## 6.3    The Data

Our data are derived from three separate sources, all of which relate to women either accused of or found guilty of criminal offences between 1817 and 1876. The sources are the indents of 2,926 English-born and 3,370 Irish-born female convicts transported between 1826 and 1840 from the United Kingdom to the penal colony of New South Wales ("convict data"), registers of 20,519 female prisoners admitted to Newgate prison in London between 1817 and 1860 ("Newgate prisoner data"), and a register containing details of 3,552 female habitual criminals compiled by Scotland Yard in 1877 ("criminal data"). These three sources contain information on the height of over 30,000 women; and this provides for women equivalent data sources to the Description Books of the army and Royal Marine recruits used by Floud et al. (1990) to assess the trend in male heights. It is unlikely that any other extant data set of this size is available for the study of the long-term trend in the height of women in Britain.

Detailed tests of the representativeness of our data are presented in the data appendix. Here we will outline the key points and identify important differences in the quality of data derived from the three sources. The minimum requirement for inclusion in our sample was that data exist on the age, height, and date of measurement of the female. The convict indents provide the richest

set of data, with details of name, age, education, religion, marital status, number of children, place of birth, up to four occupations, crime, place of trial, date, sentence, and prior convictions, as well as height. The Newgate registers report information on name, age, height, place of birth, and marital status, together with crime and sentence, but do not give occupational information for females. The register of habitual criminals contains details of crime and sentence, place of imprisonment (but not place of birth), age, occupation, height, color of hair and eyes, complexion, and distinguishing features such as scars and tattoos.

All three sources displayed height distributions that were normally distributed and free of truncation bias, a problem that typically infects army records due to minimum height standards for recruits. All three sources were dominated by women aged 30 or below. This, however, allows us to estimate terminal height, since adult height was attained between 21 and 23 years of age. To avoid biases due to shrinkage in height of older women, all women older than 49 years were excluded from our analysis.

For the convict data, a comparison of occupational structure was made with the 1841 census, which showed that 78 percent of English female convicts and 83 percent of English women workers were in the skilled and semiskilled categories. The literacy of these English and Irish female convicts was very similar to that of the home populations. No occupations were recorded for female Newgate prisoners, but among the habitual criminals there appears to have been a bias toward unskilled occupations, with 60 percent of male habitual criminals and 80 percent of females recorded as semiskilled or unskilled, compared with 41 percent of males in the 1841 census. This suggests that female habitual criminals were drawn from the lower half of the occupational distribution.

There is no evidence, however, that the women in any of these three data sets represented a distinct "criminal class." Among the habitual criminals, only 8.7 percent of the women had more than two previous convictions, and the majority were for petty theft, resulting in prison sentences of just a few months. The majority of Newgate female prisoners were also awaiting trial for alleged crimes of petty theft, but over 40 percent had their cases dismissed or were found not guilty. Among the convicts, over 60 percent of females were first offenders, and their crimes were almost entirely against property, involving theft of money or items for immediate consumption—clothes, cloth, household goods (e.g., pots, candles, and pans), bedding, and foodstuffs accounted for nearly three-fifths of the items stolen.

The case for the convicts, prisoners, and criminals as ordinary working-class men and women also gains support from recent work by historians of British crime who reject the idea of a separate nineteenth-century criminal or dangerous class, born and bred to a life of crime and operating as organized gangs (Beattie 1975; Emsley 1987; Jones 1982; Philips 1977; Rudé 1985). While not

"honest men and women," British and Irish criminals were mainly working people who supplemented their incomes by theft. We are confident, therefore, that there are no obvious selection biases that would make the heights of females included in our three data sets unrepresentative of the heights of the working-class female population in Britain and Ireland.

### 6.4    Height, Living Standards, and Industrialization

Height-by-age, change in height between successive ages (velocity or rate of growth), age at which final height is reached, and final adult height are reliable indexes of a country's health and nutrition (Eveleth and Tanner 1976, 1; Fogel et al. 1983). Anthropologists, biologists, and nutritionists have found each of these measures of stature to be sensitive indicators of nutritional inputs and environmental impacts during the growing years. The health and the average nutritional status of a country's citizens are a good guide to its standard of living. In a sample of developed and underdeveloped countries, average height was found to be highly correlated with the logarithm of per capita income, which suggests that factors correlated with poverty such as poor diet, hard work, and poor medical care are major sources of nutritional deprivation and slow growth (Steckel 1986, 1–7).

Height data, used in conjunction with information on wages, mortality, and morbidity, offer a new way of assessing U.K. living standards. Poor nutrition, revealed during wartime shortages, may slow growth, and disease may also retard growth by impeding the absorption of nutrients and diverting nutrition to combat infection. Malnutrition and illness may interact to produce an effect on height larger than the separate effects of each in isolation (Scrimshaw 1975, 22). Catch-up growth (where velocity exceeds the average rate for a given chronological age) may follow brief periods of malnutrition, but if environmental conditions are unsatisfactory, growth may resume at no more than the normal rate. Prolonged but moderate malnutrition tends to delay and diminish the adolescent growth spurt and postpone the age at which adult height is attained. Malnutrition that is severe and chronic may substantially erode the typical growth pattern and result in permanent stunting (Steckel 1986, 1992).

Height provides a net rather than a gross measure of nutrition and depends on the nutrition available for physical growth after claims made by body maintenance. Clearly, the economic historian must investigate work intensity, the disease environment, and the state of public health, as well as nutritional inputs, if the growth spurt and average heights are going to be used to proxy changes in female living standards in the past. This paper deals with the height of birth cohorts because access to food, environmental disadvantages, and work intensities affected women during their growing years from birth to attained final height at age 21. Unfortunately, it is not possible to determine precisely when, during their growing years, women were affected by changes in

their living standards, but environmental factors predominate. While genes are important determinants of individual height, studies of genetically similar and dissimilar populations under various environmental conditions show that differences in average heights across most populations are due to environmental, not genetic, factors (Steckel 1992, 16).

In this paper, Ireland is treated as a control economy, largely unaffected by the industrial transformation taking place in England. Of course, Ireland was not simply England without an industrial revolution. There were strong interdependencies between the eastern counties of Ireland and Britain, and Belfast's industrialization was as "dramatic and thoroughgoing as anything happening in Preston or Middlesborough" (Ó Gráda 1988, 25–27). Yet the differences between the two economies overshadow the similarities, leading Mokyr and Ó Gráda (1988, 216) to declare that Ireland experienced nothing like an industrial revolution. The distribution of resources in the preindustrial Irish family resulted in an unusually tall population. From a sample of Irish recruits into the East India Company army, Mokyr and Ó Gráda (1988, 227–28; 1990, 11) discovered that Irish recruits born around 1810 were taller than their counterparts in England, although England was a much richer economy.

The height advantage of the poor preindustrial Irish over the richer industrializing English is confirmed by data on the height of army recruits in other preindustrial economies. Komlos (1989, 1993) was the first to argue that the positive correlation between height and per capita income for market economies was not always true for preindustrial economies. He found that the populations of Lower Austria and Bohemia, the most economically developed regions of the Habsburg empire, were generally the shortest, while those of Hungary and Galicia, the least developed provinces, were taller (Komlos 1989, 96–97). In the American Civil War, Union troops from less developed Kentucky and Tennessee were the tallest (177.0 cm) followed by the other slave states and the Midwest (at approximately 174.5 cm), while troops from the more developed New England (173.5 cm) and the Middle Atlantic states (172.7 cm) were shortest (Gould 1869, 123). Among Southern whites who signed amnesty oaths during the 1860s, those from the interior states of Kentucky, Tennessee, Missouri, and Arkansas tended to be 0.75–1.8 cm taller than residents from the more densely settled lower coastal states. A similar but less pronounced regional pattern existed among ex-slave recruits (Margo and Steckel 1992). In Sweden in the mid-nineteenth century, soldiers from the less densely settled regions (north and east) were 3.0–5.0 cm taller than those from the more densely settled western areas (Sandberg and Steckel 1988). Japanese soldiers of the late nineteenth century born in the outlying prefectures such as Tottori and Iwate were 3.0–4.0 cm taller than recruits from the wealthier, more central and developed regions (Shay 1986). It is exactly in this connection between heights in preindustrial economies and heights in economies undergoing industrialization that our Irish-English height comparisons are particularly useful in measuring the changing living standards of women.
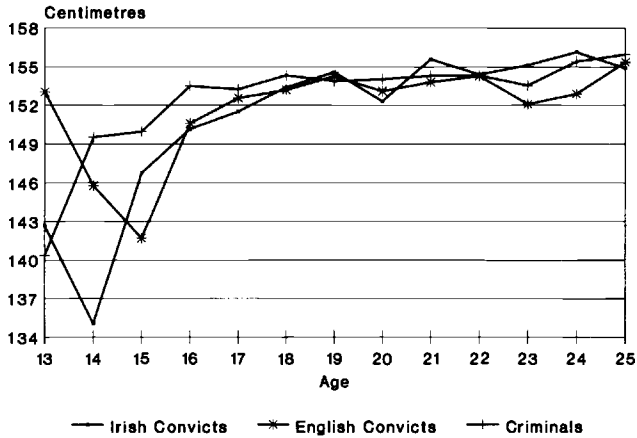
**Fig. 6.1    Female convict and criminal growth spurts**
*Sources: Convict Indents* and *Alphabetical Register of Habitual Criminals.*

## 6.5    Female Heights and Living Standards in Early and Late Industrialization

### 6.5.1    Growth Spurts of Early Industrial Revolution Women

Average height-by-age and the timing and extent of the adolescent growth spurt are sensitive both to nutritional factors and to the external environment, providing a good indicator of living standards experienced by women. While sample sizes were small before age 15, figures 6.1 and 6.2 indicate that English and Irish convict women, Newgate women, and English criminal women experienced a growth spurt that began around age 14 and lasted until age 16.5 or 17.5. The growth spurt for girls living through the industrial revolution period began later, and continued about four years longer, than that for well-nourished girls today, whose spurt begins about age 10.5 and continues until age 13 (Tanner 1962, 1). The delayed and much longer spurt experienced by the females was also typical of the Irish and English males, who spurted between ages 14 and 15 (one year later than well-nourished children today) and continued to grow until about age 23, nearly three years longer than boys born today. The later and longer spurt suggests that an "insult" due to insufficient food intake or increased work effort or adverse environmental conditions or some combination of all three was general, affecting males and females and Irish and English alike and extending over the whole 1785–1857 period.

Recently, Jackson (1996) has criticized Nicholas and Oxley's (1993) estimates of the growth profile of rural-born convict women, arguing that women continued to grow into their late 20s, not reaching their terminal height until age 26–30 years. Jackson's criticism misinterprets the evidence on the growth
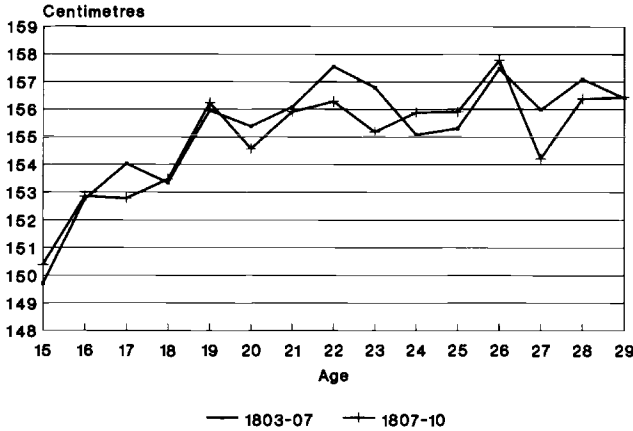
**Fig. 6.2    Newgate female prisoner growth spurts, born 1803–7 and 1807–10**
*Source: Newgate Prison Registers.*

spurt, confusing period effect and age effect (Nicholas and Oxley 1996). Unlike the military recruitment data, where soldiers were measured each year, 21-year-old women born in 1815 were measured in 1836 and 22-year-old women born in 1815 were measured in 1837. The organization of the female height data means that older women are overrepresented in the earlier periods and younger women are overrepresented in later years. Inclusion of women who were still growing would provide a downward bias to the average height, creating an artificial decline in heights. To overcome this problem, we estimate the height-by-age profiles for women born within a few years of each other to minimize any period effects. The shorter the time period in years, the less the period effect, but the fewer the number of observations. Figure 6.2 presents height-by-age profiles for urban and rural women born in the years 1803–7 and 1807–10 and shows that terminal height was attained by age 21, and certainly by age 23. The number of observations are usually more than 50 for each age, and over 80 observations for each age up to 23. A number of unreported height-by-age profiles for different time periods were constructed, all pointing to a terminal height attained by age 21–23.

### 6.5.2    Convict Women's Living Standards during Early Industrialization, 1790–1815

The delayed growth spurt affected women and men, English and Irish alike, but the effect was not equal. English-born women were shorter than Irish-born women, resulting in a statistically significant difference in terminal heights shown in table 6.1. Urban-born English females were over 1 cm shorter than rural-born English girls during their growth spurt and were over 2 cm shorter by age 23. There was, however, no significant difference in the heights of urban- and rural-born Irish women during their growth spurt or in their termi-

**Table 6.1**          **Terminal Height and *t*-Test Differences in Terminal Heights of English and Irish Workers**

| Worker Type | English Rural | English Urban | Irish Rural | Irish Urban |
|---|---|---|---|---|
| Females | | | | |
| Height (cm) | 156.6 | 154.3 | 155.7 | 155.3 |
| English rural | | 10.71* | 5.71* | 4.18* |
| English urban | | | 8.44* | 3.68* |
| Irish rural | | | | 0.73 |
| Males | | | | |
| Height (cm) | 167.5 | 166.2 | 167.9 | 167.2 |
| English rural | | 7.12* | 1.94 | 1.39 |
| English urban | | | 8.16* | 3.57* |
| Irish rural | | | | 1.09 |

*Source: Convict Indents.*
*Significant at the 5 percent level.

nal heights reported in table 6.1. All these women, however, were very short compared to modern "Western" standards—between the 6th and the 12th percentiles of a modern height standard (Steckel 1995, 10).

What are the causes of these height differentials between English rural-born and urban-born women? The English female urban-born height disadvantage also applies to English males in table 6.1. The English urban-rural height differential, and its absence in Ireland, is partly explained by environmental factors. Being born in a town implied different conditions depending on whether a woman or man was born in England or Ireland. Shielded from the full force of the urban transformation occurring in England, those born in Irish towns, except Dublin, escaped many of the worst features of overcrowding, poor housing, and inadequate public health typical of the burgeoning towns in industrializing England. The smaller size of Irish towns and their closer links to the countryside also meant that the urban Irish had better access to food supplies than women workers in London or Manchester.

But not all the urban-rural height differences in England are due to environmental factors. First, as shown below, female heights fall relative to male heights, and rural-born female heights fall relative to urban-born female heights. Second, the English urban-rural female height differential (2.3 cm) in table 6.1 was nearly twice that of the urban-rural male differential. These data focus attention on the access to food and nutrients by women in England.

Our evidence shows that the average height of rural-born English women fell further, and more rapidly, than the average height of urban-born women in the 25 years after 1795. Figure 6.3 shows that from a peak of 157.0 cm in 1800, the height of birth cohorts born in rural locations fell to just under 155 cm by 1815. Urban-born English women experienced a similar, if less dramatic, decline in height of about 1.3 cm over this same period. By contrast, the height
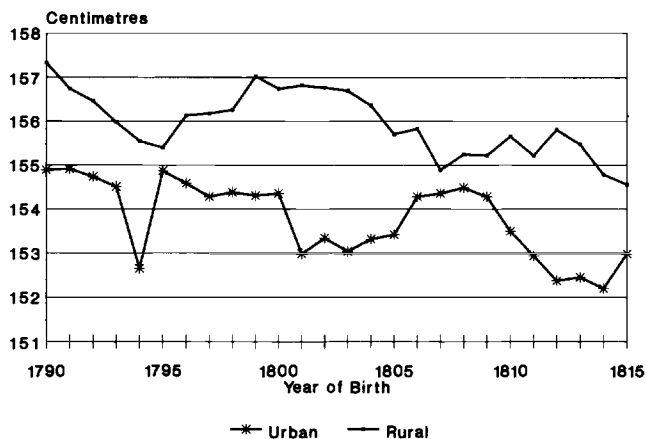
**Fig. 6.3    English female convict heights, born 1790–1815, five-year moving averages**
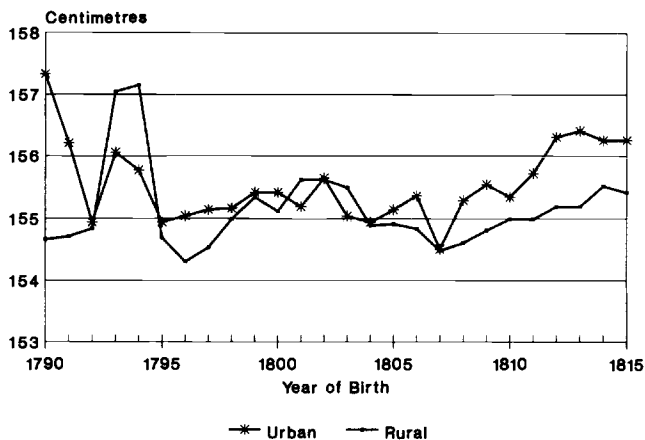*Source: Convict Indents.*



**Fig. 6.4    Irish female convict heights, born 1790–1815, five-year moving averages**
*Source: Convict Indents.*

of rural-born male cohorts fell by only 0.6 cm in the same period (Nicholas and Oxley 1993).

The deteriorating living standards of English women contrasted with the increasing heights of Irish women in figure 6.4. From the late 1790s the average height of Irish women increased, with the height of urban Irish women rising 1.3 cm, about twice the rate of that of rural Irish women. The English deterioration is evident in figure 6.5, which shows a widening gap between English rural-born women and Irish rural-born women.
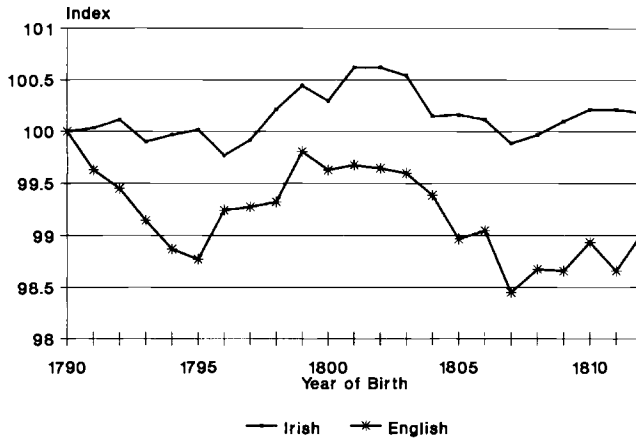
**Fig. 6.5    English and Irish rural female heights, index based on five-year moving average: 1790 = 100**
*Source: Convict Indents.*

### 6.5.3    The Family Economy

The family is an economic and social unit in which controlling family members determine the allocation of household resources vital to their children's future standard of living. Food and schooling are two resources allocated within families that are fundamental to the physical and human capital development of children. Well-fed men and women earn higher incomes than poorly fed workers since they can work longer hours at harder tasks and can better resist diseases that reduce work capacity. Parents allocate scarce nutrients and education between competing family members in order to maximize total household economic returns in the long run. The allocation of intrahousehold resources between children will, therefore, depend on gender differences in expected labor market outcomes.

Substantial empirical evidence from today's developing countries exists to support this model of intrahousehold resource allocation. Gender-specific differences in food allocation are linked to different labor market outcomes for women and men. We know that labor market returns to men and women diverge as developing economies shift from subsistence to market-based production. The higher economic value that families place on males vis-à-vis females is related to the greater ability of men to support parents in their old age, the higher labor force participation of boys and men, and the greater earning power of men (Sen and Sengupta 1983). This gender-based differential in expected labor market returns has led to a promale distribution of nutrients and education within the family in many developing countries (Behrman 1988).

The promale bias has been revealed in weight-by-age and height-by-age data, which show a systematic sex bias in malnutrition, with a higher nutrient deprivation for girls than boys (Sen and Sengupta 1983, 863). Survey and

econometric estimation found that household members claimed extra food when their occupations required high levels of calories and paid work took place outside the home. During industrialization it was males who increasingly found outside work and males who were hired for labor-intensive tasks (Sen 1990, 62–64; Pitt, Rosenzweig, and Hassan 1990, 1139–41). Those households that enhanced the health endowment of males had higher incomes (Pitt et al. 1990, 1153). The promale discrimination in the allocation of food was greatest in a sample of Indian and Pakistani villages with the best overall nutritional record. It was in these better fed villages that market forces and land reform had proceeded furthest and that employment opportunities for women had declined most (Sen and Sengupta 1983, 863). This contemporary evidence confirms that height data provides a reliable measure of the changing status and living standards of women during industrialization.

### 6.5.4   Access to Intrahousehold Resources

There is considerable evidence of a promale allocation of food within industrial revolution families. Oddy (1976, 220) reported that women and children ate less meat than men, and that women acquiesced because "the husband wins the bread and must have the best food." In the nineteenth century, Charles Booth noted the same fact and Shorter (1976a, 54–55; 1982, 21) and Humphries (1981) argued that women got smaller proportions of everything because men worked harder. Oren (1974) reviewed later nineteenth-century sources to conclude that wives restricted their own and their children's nutrition in periods of economic want in order to maintain their husbands' standard of living. These decisions about the care and feeding of the family and the preferential allocation of food remained the wife's responsibility regardless of the degree of involvement or detachment of the husband (Ittmann 1995, 227). Ross (1993, 30–39) further suggested that this "breadwinner effect" in the distribution of food—especially meat—came to be a cultural norm that sanctioned an unequal distribution of resources to male heads of household and to fully employed elder sons even in households with adequate incomes. This allocative asymmetry did not apply just to food. In a systematic analysis of family budgets since the 1840s, Wall (1994, 328–30) showed that average expenditure on clothing for the male head of household exceeded that for his wife by between 12 and 15 percent, a bias that has been dramatically reversed since the mid-twentieth century.

Different work requirements and unequal access to food underpin the economic model of the maximizing family household where "parents controlled resources vital to their children's future standard of living" (Anderson 1980, 51; Pahl 1985, 20–21). Allocation of nutrients was determined by expected differential labor market returns on parental investments in boys and girls. It was control over their children's inheritance and their immediate employment opportunities that consolidated parents' power over intrahousehold resources. Such power meant that working children frequently turned over their wages to

parents who determined how the family used this additional income. Even where parents did not directly control employment, by distributing food inputs within the household they influenced their children's job prospects since strength determined opportunities for manual work (Anderson 1971).

Girls were likely to have been affected by discrimination in food allocation at the critical periods in their growth profile. A Bangladesh study showed a large and statistically significant difference in the average calories allocated to boys over age 12 and under age 6 compared to girls, while girls and boys between ages 7 and 12 received similar allocations of calories (Pitt et al. 1990, 1140). We hypothesize that a similar age effect operated in industrializing England. Children in the middle age group took on a multitude of largely home-based tasks, which offered employment to girls as much as to boys. After about age 12 or 13 boys took on different work than girls, increasingly participating in high-energy intensive activities outside the household. The timing of the unequal allocation of calories occurred during the two most sensitive growth periods for the human body, resulting in maximum negative impact on women's height and health.

All the historical evidence points to declining labor market opportunities for English girls in the older age group, reinforcing our household model of intergender resource allocation that disadvantaged women (see Richards 1974; Thomas 1988; Berg 1988; Rose 1986). In preindustrial and agricultural economies, gender inequalities were less pronounced than in modernizing societies (Ehrenreich and English 1979, 7; Smock 1977, 418; Sen 1990, 62–63). Women were partners with men, both at home (as managers of children and household financial resources) and in outside work and paid employment. Protoindustrialization and industrialization worsened the economic and social position of women and children, limiting their employment opportunities, restricting the range of jobs open to them, and segmenting them into unskilled work with low pay. These gender divisions occurred mainly in the agricultural sector, but also to a lesser extent in manufacturing, transforming the traditional role of women and children in the labor market and the household.

There is considerable qualitative evidence that work relations between men and women were changing during early industrialization in England. In agriculture, shifts from livestock to grain production intensified the gender specialization of agricultural work, restricting the participation of women in the agricultural workforce; they went into low-paid and unskilled summer and spring work, such as picking stones and clearing ground (Snell 1985, 51–62; 1981, 411–23). The shift to heavier technology associated with grain harvesting further restricted women to nonharvest work (Roberts 1979). The sexual division of labor in agriculture was partly a consequence of the expansion of grain production and new technology, but also a result of discrimination as male agricultural workers opposed the employment of females (Snell 1985, 61; 1981, 433). From 1780, at least in the east, restricted job opportunities for women and children saw female wage rates decline (Snell 1985, 59; Pahl 1984,

37). The gender division of labor had important implications for household income: while males may have experienced more stable employment in well-paid harvest work, the loss of female earnings impacted negatively on family income. At the same time, enclosures and the loss of common rights led to a change in the economic role of women and children, the primary exploiters of the commons. The elimination of sources of family income not deriving from wages, such as gleaning, gathering and scavenging, and tending pigs and cows, all traditionally "women's work," increased the household's dependency on wages and wage earners (Snell 1985, 62; Humphries 1990, 39–41). The loss of paid employment opportunities meant that women went into low-paid "female jobs" that devalued and undervalued the unpaid household work undertaken by them. Anderson argued that the newly emerging definition of men as the family wage earners legitimized the irregular employment and below subsistence wages for female agricultural workers (Anderson 1980, 83).

Loss of common rights made women and children more available for domestic, protoindustrial, and industrial work, but even here the range of opportunity for women was reduced, and they were obliged to take the lowest paid and worst of jobs in the "sweated" trades (Humphries 1990, 41). The textile factory, which did increase the job opportunities for women and children, was not the "typical" form of female employment (McKendrick 1974, 153). Most women worked as domestic servants, laundry workers, charwomen, and agricultural laborers, and those women and children employed in producing textiles, clothing, boots and shoes, nails, and metal goods usually worked in their own homes or in small workshops. Slop or sweated workers were disadvantaged by the industrial revolution, and those urban trades employing women involved irregular employment, long hours, and poor pay. Women now rarely entered into the "mysteries" of the trade and were only infrequently employed in trades that required formal apprenticeship. The industrial revolution limited the employment chances of women and children, creating a secondary labor market segmented by gender both in agriculture and in manufacture. This qualitative evidence on market exclusion, segmentation, and discrimination against women suggests that families adopted the promale allocation of household nutrients in an attempt to maximize long-run income.

Might not families have invested in their daughters' potential as marriage partners, offsetting or attenuating the labor market effects that discriminated against women? It is not clear that tall and healthy girls found marriage partners more easily than other women since selection depended mainly on other qualitative factors. Even if healthier and more productive girls found marriage partners more easily, the gains from having a healthier and stronger female worker were captured by the husband or the husband's family, at least in the absence of a dowry paid by the prospective husband to the woman's family. Dowries were not normally paid in the British working classes.

Did the distribution of other intrahousehold resources also discriminate against English women and girls? Education is an investment in human capital,
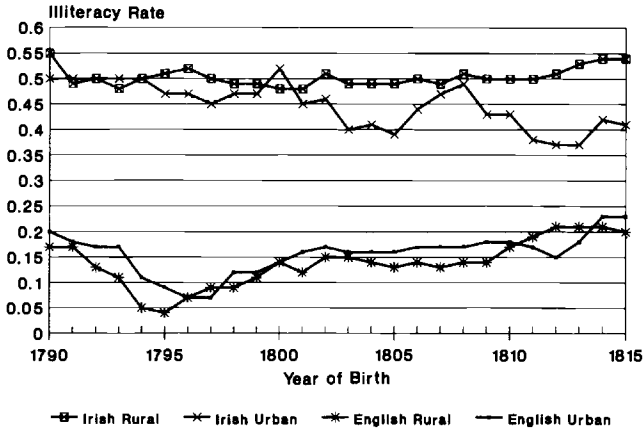
**Fig. 6.6    Female education**
*Source: Convict Indents.*

budgeted by households between family members, and relative to other inputs such as food, clothing, and housing. According to Burnett (1966, 22), what the English laboring family spent on bacon, beer, and white bread was spent by its Scottish counterpart on the education of its children. From a listing of the inhabitants of Cardington (Bedfordshire) in 1792, Schofield (1970, 265–66) found that boys typically attended school until age 11 while girls had only a one in three chance of schooling (Nicholas and Nicholas 1992; Mokyr and Ó Gráda 1988, 222–27). Illiterate societies are likely to be poor and slow growing, less able to adjust to structural change than literate ones. Literacy, of course, is valued in its own right: it releases people from ignorance and prejudice and also enhances their ability to find work and attain occupational and social advancement.

The convict indents contained information on whether each transportee could read and write, read only, or neither read nor write, allowing us to define literate individuals as those claiming the ability to read or to read and write. In figure 6.6, both rural- and urban-born English females experienced rising illiteracy from 1797 to 1814, while urban-born Irish females had declining illiteracy and rural Irish women experienced no significant change. This pattern of rising illiteracy among English female convicts is consistent with Schofield's parish register data. Although he discovered a declining trend in illiteracy for the whole period 1750–1840, for women born between 1803 and 1813 and marrying between 1828 and 1838, illiteracy rates, based on ability to sign parish marriage registers, rose (Schofield 1973, 445). The tendency for height and literacy to move together suggests that when households reduced their expenditure on food intake they also invested less in expensive schooling. Male illiteracy also rose after 1800, which provides additional evidence that declin-

ing English male and female stature may have been caused by financial stress on families, which also registered in lower investments in schooling.

### 6.5.5   Newgate Women's Living Standards during Early Industrialization, 1785–1815

The heights of Newgate women provide an alternative data source to the convict records for assessing women's living standards during the 1785–1815 period. Since 61 percent of the Newgate women were born in Middlesex (effectively that part of London north of the River Thames) and given the urban-rural height differential for convict women, the Newgate sample was divided into urban-born and rural-born women using Hunt's (1973) classification of urban and rural counties. There was an urban-rural height differential among 21–49-year-old Newgate prisoners, with urban-born prisoners (155.8 cm) 1.6 cm shorter than rural-born prisoners. This urban-rural height differential persisted when a higher terminal age (23 years) was used (155.9 vs. 157.3 cm) and when a subperiod (1803–13) was selected (156.2 vs. 157.0 cm). These urban-rural height differentials are consistent with the convict data above. However, the prisoners from the Newgate sample were taller than the convict women, particularly the urban born. Using Hunt's urban-rural classification, urban-born convict women were only 154.5 cm tall, over 1.3 cm shorter than Newgate prisoners. The height differential between rural convict (156.6 cm) and Newgate women (157.4 cm) was less than for urban born, 0.8 cm. The differences between the convict and Newgate women are probably due to different sample characteristics of the women, but the absence of information on occupations for the Newgate women precludes a direct test of this speculation. Nevertheless, compared with the convict men in table 6.1, Newgate women were about 10 cm shorter than their male counterparts.

The five-year moving average height profiles of the Newgate prisoners in figure 6.7 show that rural heights fell over 1 cm from about 157.7 cm in the 1785–97 period to a low point of 156.5 cm in 1810 before recovering in the last years of the Napoleonic Wars. This is unambiguous evidence of declining living standards during the early industrial revolution. Urban heights followed a different path. Falling between 1785 and 1797, urban heights rose about 1.4 cm from about 155 cm in 1797 to a peak of 156.4 cm in 1802 before stabilizing near their late 1780s level. The fall in the average height of women was confirmed by simple regression results of height against year of birth. Table 6.2 reports these results and shows that all the coefficients on the time variable are statistically significant. These Newgate height profiles confirm the convict evidence that rural living standards fell before 1815, providing additional support for women's unequal access to intrahousehold food resources.

The differences between the timing in the profiles of the urban-born convicts (fig. 6.3) and Newgate women (fig. 6.7) are principally due to the different definitions of urban and rural birthplace and the high proportion of Newgate prisoners from Middlesex. Figure 6.8 displays the profile of the Newgate
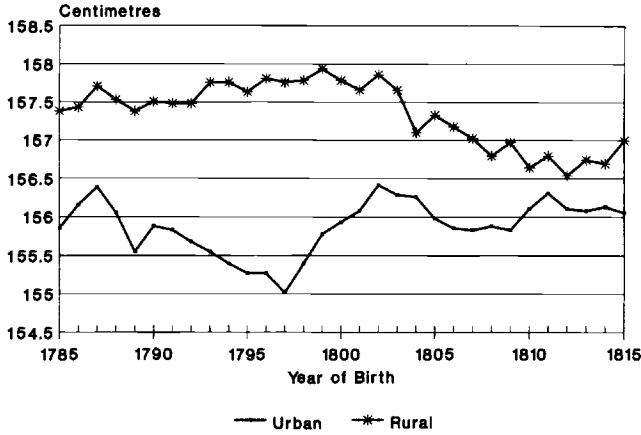
**Fig. 6.7    Urban and rural Newgate female prisoner heights, 1785–1815, ages 23–49**
*Source: Newgate Prison Registers.*

Table 6.2    **Regression Results on Heights of Rural-Born Newgate Female Prisoners, 1788–1815**

| Variable | Age 21–49 | Age 23–49 | Age 26–49 |
|---|---|---|---|
| Constant | 88.17 | 91.73 | 87.86 |
| | (7.30)* | (6.24)* | (13.71)* |
| Birth year | −0.02 | −0.02 | −0.01 |
| | (−2.17)* | (−2.03)* | (−1.89)* |
| Adjusted $R^2$ | 0.0024 | 0.0022 | 0.0020 |
| N | 1,567 | 1,394 | 1,270 |

*Source: Newgate Prison Registers.*
*Note:* Numbers in parentheses are *t*-statistics.
*Significant at the 5 percent level.

women born in Middlesex, whose height fell until 1797 (154.2 cm), before rising to a peak of 155.9 cm in 1812. Also in figure 6.8 is the profile of urban-born Newgate women, excluding those born in Middlesex, which shows a different five-year moving average. After an improvement in height before 1803, women's heights fell over 2 cm from a peak of 158.7 cm in 1802 to a low of 156.6 cm in 1812. Non-Middlesex urban-born Newgate women suffered declining living standards after 1802, which is consistent with the experience of rural-born women.

### 6.5.6    Women's Living Standards 1815–57

Height data from the habitual criminal records and the Newgate prison records were joined to create a new data series on female heights in the 1815–57
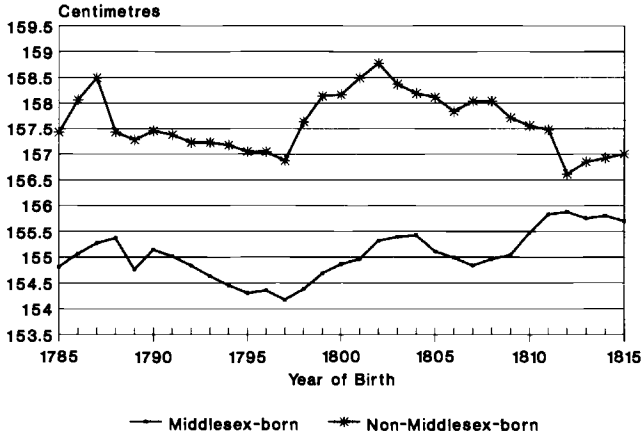
**Fig. 6.8   Middlesex-born and urban non-Middlesex-born Newgate female prisoner heights, ages 23–49**
*Source: Newgate Prison Registers.*

period. Since the criminal data only contain information on place of imprisonment, we have had to assume that county of imprisonment was county of birth in order to determine location for the pooled data. In the convict data, in which both place of birth and place of trial were recorded, 66 percent of convicts were tried in their county of birth (Nicholas and Shergold 1987a, 1987b), and in the Newgate data, 62 percent of female prisoners were born in and around London. We have no reason to believe that female habitual criminals exhibited a significantly different level of intercounty mobility. In figure 6.9, rural-born female heights rose in the immediate post–Napoleonic War period to a peak of 158.1 cm in 1823 before falling to a trough of 153.9 cm in 1853, with brief comebacks in 1832–35 and 1843–48. Urban-born heights followed a different profile, with heights stable at about 156 cm before declining in the 1840s. These profiles were repeated for women reaching terminal height at age 21. Most of the improvement in the rural heights of women in the 1820s in figure 6.9 was due to the Newgate women, whose height rose from 156.8 cm in 1816 to 158.8 cm in 1825.

Given the high proportion of women from London and the Home Counties (the counties closest to London, being Middlesex, Surrey, Sussex, Kent, and Essex) in the Newgate sample, we present profiles for women born in the Home Counties and the rest of England in figure 6.10. For Home County women, heights rose from a low of 155.6 cm in 1820 to a peak of 157.9 cm in 1838 then declined to their 1820s level by the early 1840s before falling rapidly after 1848. For women born outside the Home Counties, heights rose from 156.8 cm to 157.6 cm in the years before 1824, before these women experi-

**Centimetres**
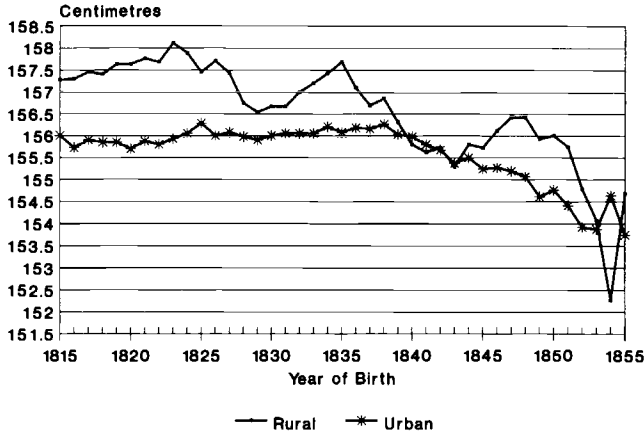
Fig. 6.9    **Urban and rural female heights, 1815–55, ages 23–49**
*Sources: Newgate Prison Registers* and *Alphabetical Register of Habitual Criminals.*

**Centimetres**
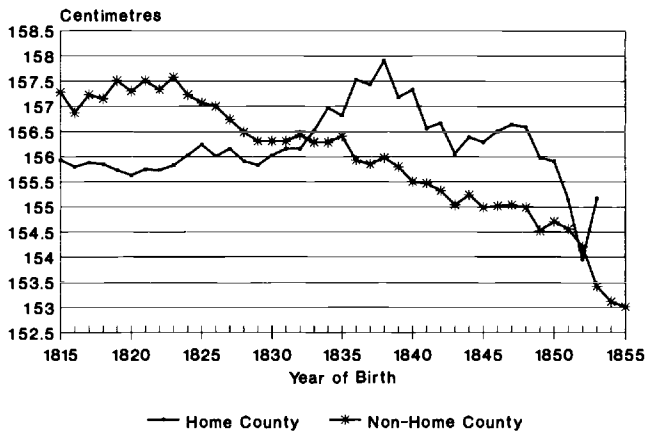
Fig. 6.10    **Female heights, Home and non-Home County, ages 23–49**
*Sources: Newgate Prison Registers* and *Alphabetical Register of Habitual Criminals.*

enced a continuous fall in living standards, with their heights falling to 155 cm in the late 1840s.

However, the locational information in this pooled data may contain biases because, as noted above, we suspect that in around one-third of the habitual criminal cases the county of birth does not correspond with the county of incarceration. Therefore, the criminal data are presented on their own in figure 6.11, simply in terms of male and female profiles. Between 1825 and 1835 female and male heights both rose, before falling together over the period 1834–55.

**Fig. 6.11   Rural and urban male and female criminal heights, ages 19–49**
*Source: Alphabetical Register of Habitual Criminals.*

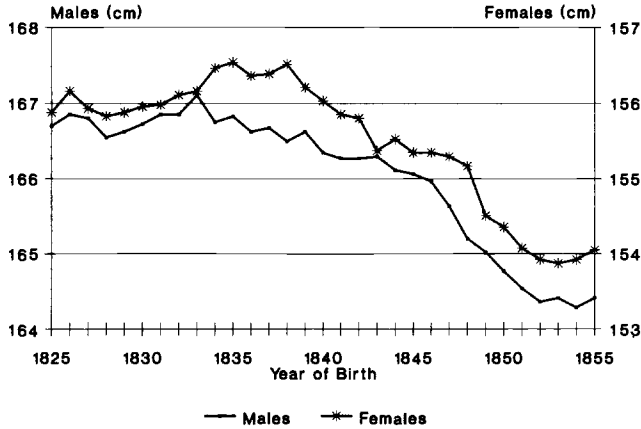From 1834 female heights declined 2.5 cm to a low point of 153.9 cm in 1853, with male heights falling almost 3 cm from 167.1 cm in 1833 to only 164.3 cm in 1856. There is no evidence that women's living standards suffered more than those of men in the post-1825 period. This is confirmed by an analysis of female and male criminal data grouped by urban and rural place of incarceration; in both cases the declining height trajectories for females closely follow those for males.

The evidence that female heights moved roughly in unison with male heights produces a very different reading of the course of women's living standards from that suggested in the early industrial revolution period. After 1825 working-class women experienced a substantial deterioration in nutritional status, although the fall began earlier and was greater for rural-born than for urban-born women. It is, however, a deterioration that is almost exactly matched by that found in the male criminal data. This decline begins roughly at the same time as that identified in the military recruit data by Floud et al. (1990). We now consider the occupational and regional composition of our samples.

## 6.6   Heights and Occupations

Heights may vary by occupation. This happens when women are apprenticed or encouraged to work in the same trades as their mothers and when strength is important for the job, channeling tall women into certain occupations. To the extent that intergenerational correlations exist for occupations of mother and daughters, then income, wealth, housing, and work conditions of parents impact directly on the height of children.

**Table 6.3**    **Regression Model for Composition Effects by Occupation for English Female Convicts**

| Variable | Rural Age 21+ Years | Urban Age 21+ Years |
|---|---|---|
| Unskilled rural | 0.63 | 0.62 |
| | (1.81) | (1.00) |
| Manufacturing and transport | −0.16 | 0.24 |
| | (−6.43) | (0.79) |
| Domestic service | 0.16 | 0.04 |
| | (0.58) | (0.19) |
| Birth 1795–99 | −0.17 | 0.03 |
| | (−0.51) | (0.08) |
| Birth 1800–1804 | −0.004 | −0.10 |
| | (−0.14) | (−0.34) |
| Birth 1805–9 | 0.10 | 0.07 |
| | (0.36) | (0.24) |
| Birth 1810–14 | −0.47 | −0.30 |
| | (−1.83) | (−1.08) |
| Birth 1815+ | 0.17 | −0.25 |
| | (0.53) | (−0.75) |
| Constant | 61.55 | 60.69 |
| | (200.33) | (219.59) |
| $R^2$ | 0.02 | 0.01 |
| D-W | 2.04 | 1.89 |
| $N$ | 767 | 747 |

*Source: Convict Indents.*
*Note:* Numbers in parentheses are *t*-statistics.

To test this hypothesis, regressions were run on height allowing for occupation and birth by quinquennia. For convict women occupational dummy variables were constructed for four broad occupational groups: rural unskilled, manufacturing and transport, domestic service, and the excluded category of all other occupations (unskilled urban, professional and dealing, construction and building, and public service). To test for period effects, we created dummy variables for quinquennia, excluding the pre-1795 period. Since the height profiles in figures 6.3 and 6.4 showed different trends for the same quinquennium in the heights of rural and urban women, separate regressions were run for the rural and urban born. The regressions in tables 6.3 and 6.4 show that composition effects by occupations were important only for rural Irish women. Irish females who worked in rural unskilled and domestic service jobs were 0.8 cm (0.32 inches) taller than the excluded group. These jobs required extra strength and endurance, and there is evidence of some self-selection in terms of stature by Irish rural women who sought unskilled and domestic employment. Since employment in domestic service (especially as general servant, chambermaid, laundress, and kitchenhand) and rural unskilled jobs (dairyhand and farm servant) accounted for the overwhelming number of opportunities open to rural Irish females, there is little evidence that there were significant shifts across

**Table 6.4          Regression Model for Composition Effects by Occupation for Irish Female Convicts**

| Variable | Rural Age 21+ Years | Urban Age 21+ Years |
|---|---|---|
| Unskilled rural | 0.32 | 0.03 |
| | (2.24) | (0.06) |
| Manufacturing and transport | −0.07 | −0.69 |
| | (−0.34) | (−1.11) |
| Domestic service | 0.31 | −0.21 |
| | (2.53) | (−0.50) |
| Birth 1795−99 | −0.004 | 0.48 |
| | (−0.28) | (0.89) |
| Birth 1800–1804 | −0.14 | 0.49 |
| | (−0.94) | (0.95) |
| Birth 1805–9 | 0.05 | 0.59 |
| | (0.03) | (1.18) |
| Birth 1810–14 | 0.11 | 1.02 |
| | (0.74) | (2.22) |
| Birth 1815+ | −0.17 | 0.24 |
| | (−1.05) | (0.51) |
| Constant | 61.02 | 60.73 |
| | (425.13) | (113.22) |
| $R^2$ | 0.002 | 0.03 |
| D-W | 1.88 | 1.99 |
| N | 2,528 | 249 |

*Source: Convict Indents.*
*Note:* Numbers in parentheses are *t*-statistics.

occupational categories. Therefore, the height profiles of Irish rural females in figure 6.4 were not artifacts of changes in the occupational structure of the convict sample.

The regressions in table 6.3 also display the period effects that are evident in the quinquennial moving averages in figure 6.3. The fall in the average height of English cohorts after 1800 is clearly evident in the negative coefficients on the 1800–1804 and 1815+ dummies for urban-born women and the negative coefficients for the 1795–99, 1800–1804, and 1810–14 birth periods for rural English females. For example, English women born in rural locations in 1810–14 were 1.2 cm (0.47 inches) shorter than rural cohorts born before 1795. Further, the results in table 6.3 for each quinquennium are consistent with the movements in heights in figure 6.3. These regression results confirm falling heights and living standards for women born in England. The Irish quinquennial dummies in table 6.4 reflect the increasing heights of Irish females, both rural and urban born, which are also evident in figure 6.4.

For the criminal data, there exists information only on place of trial, but one partial test for urban-rural effects is to regress height on county of trial using Hunt's (1973) wage data to classify counties as rural or urban. Regression analysis in table 6.5 shows that urban conditions affected women tried in urban counties, who were shorter than those tried in rural counties, but not signifi-

**Table 6.5**       **Regression Model for Composition Effects by Location and Occupation for Female Habitual Criminals**

| Variable | Coefficient |
| --- | --- |
| Semiskilled | 0.033 |
| | (0.16) |
| Unskilled | −0.389 |
| | (−2.66) |
| Manufacturing | −0.653 |
| | (−4.71) |
| Dealing | −0.290 |
| | (−1.60) |
| Domestic service | −0.195 |
| | (−1.41) |
| Location (1 = urban; 0 = rural) | −0.126 |
| | (−1.24) |
| Born 1825–29 | −0.252 |
| | (−1.21) |
| Born 1830–34 | −0.192 |
| | (−1.01) |
| Born 1835–39 | −0.070 |
| | (−0.38) |
| Born 1840–44 | −0.302 |
| | (−1.71) |
| Born 1845–49 | −0.511 |
| | (−2.85) |
| Born 1850+ | −0.918 |
| | (−4.70) |
| Constant | 62.27 |
| | (274.73) |
| $R^2$ | 0.026 |
| D-W | 1.95 |
| $N$ | 2,723 |

*Source: Alphabetical Register of Habitual Criminals.*
*Note:* Numbers in parentheses are *t*-statistics.

cantly so. The occupational dummies in table 6.5 show that unskilled workers and women working in manufacturing are significantly shorter than our reference group of skilled women born before 1825 working in all other industries except manufacturing, dealing, and domestic service. The year-of-birth dummies are negative for each five-year period, although significant only for the 1845–49 and 1850–55 birth periods. There is conclusive evidence that the height and well-being of women born after 1825 declined.

## 6.7   Heights and Regions

Historians agree that living standards varied by region, and that English and Irish diets differed in their nutritional input by geographical area. Regressing the final attained height by county, region, and urban-rural location provides a
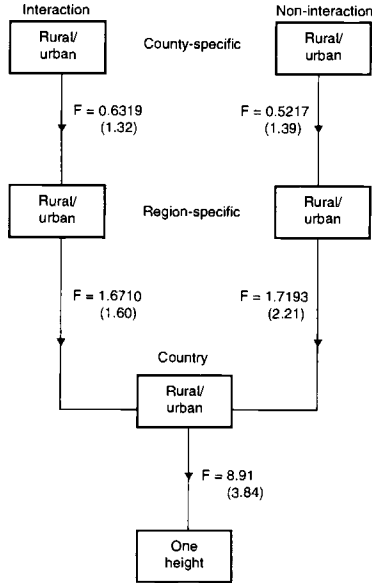
```
        Interaction                                Non-interaction
    ┌──────────┐                                  ┌──────────┐
    │  Rural/  │        County-specific           │  Rural/  │
    │  urban   │                                  │  urban   │
    └──────────┘                                  └──────────┘
         │  F = 0.6319            F = 0.5217            │
         │    (1.32)               (1.39)              │
         ▼                                             ▼
    ┌──────────┐                                  ┌──────────┐
    │  Rural/  │        Region-specific           │  Rural/  │
    │  urban   │                                  │  urban   │
    └──────────┘                                  └──────────┘
         │  F = 1.6710           F = 1.7193             │
         │    (1.60)              (2.21)                │
         ▼                                             ▼
                          Country
                     ┌──────────┐
                     │  Rural/  │
                     │  urban   │
                     └──────────┘
                          │  F = 8.91
                          │    (3.84)
                          ▼
                     ┌──────────┐
                     │   One    │
                     │  height  │
                     └──────────┘
```

**Fig. 6.12    Regional regression model of English female convicts**
*Source: Convict Indents.*
*Note:* The critical value of the $F_{0.5}$ test is given in parentheses. When the $F$-value is less than the critical value the model is rejected. See text for further explanation and for a breakdown of the regions. Number of observations: English = 1,522.

powerful new test for uncovering regional patterns in female living standards. Figures 6.12 and 6.13 present a set of nested hypotheses regarding attained height and location. In the most general model, at the top of figure 6.12, final attained height depends on whether a woman was born in an urban or rural part of a specific English county, while the model at the bottom predicts one height for all of England. Formally, the figure tests whether the coefficients on the additional variables in the more general models (but excluded from the less general models directly below) are significantly different from zero. If the coefficients in the more general model are not significant (i.e., the $F$-value is less than the critical value in brackets immediately beneath), the reader should proceed to the next, less general, model. When the $F$-value is greater than the critical value in brackets immediately beneath, the coefficients in the more general model are significant and should be accepted. The most general interaction model on the left in figure 6.12, which predicts that female English heights depended on whether a woman was born in a rural or urban part of a particular English county, should be rejected. Similarly, the noninteraction model, which tests whether height depended on the county of birth and the urban-rural location of birth, can also be rejected. This is also true of the Irish models in figure 6.13. The absence of significant differences in height by indi-
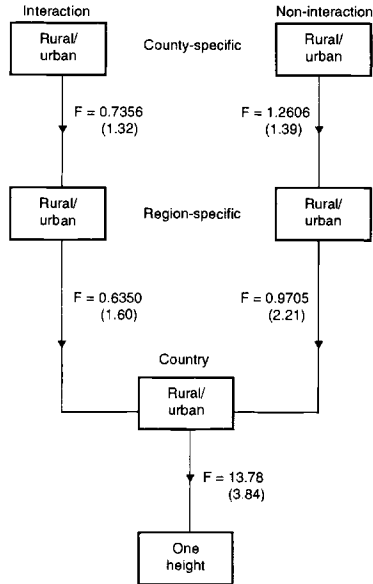
**Fig. 6.13  Regional regression model of Irish female convicts**
*Source: Convict Indents.*
*Note:* See note to fig. 6.12. Number of observations: Irish = 2,790.

vidual counties is not surprising since employment, industrial, and wage and cost regimes spanned county boundaries.

Counties were grouped together into specific regions based on Hunt's agricultural wage areas of England: London and the Home Counties, the south, midlands, the north and the fringe (including Cornwall, Devon, Cumberland, Westmoreland, and Northumberland), and regions used by Mokyr and Ó Gráda for Ireland (Dublin and east Ulster; west Ulster; Connacht, Kerry, and Clare; Munster excluding Kerry and Clare; and Leinster excluding Dublin; Hunt 1973; Mokyr and Ó Gráda 1990, 28). The preferred model for England (fig. 6.12) is the noninteraction regional model, where height depended on whether a woman was born in a particular region and whether the location was rural or urban. For Ireland (fig. 6.13), the regional models were not significant. Irish female heights depended on whether a woman was born in a rural or urban location.

The regression models uncovered regional patterns in English women's living standards. Rural-born women in the north and south were the tallest in our sample, while those born in the Home Counties were the shortest. The urban pattern was slightly different. Those born in the south, midlands, and fringe were the tallest, with the towns and cities of the north and London producing the shortest women. This general pattern, particularly the disadvantageous po-

sition of Londoners, is similar to that found by Floud et al. (1990, 200–202) for male military recruits. These data support the view that urban disamenities (poor housing and disease environment), together with regional differences in diet and workloads in the industrializing and urbanizing regions, reduced the living standards and quality of life for women. The absence of regional height differences for Irish women is consistent with Mokyr's dual economy hypothesis that the cash and the subsistence economy were intertwined and mutually dependent rather than being two geographically separate sectors (Mokyr 1983, 20). If the subsistence and cash economies were continuous, living alongside each other, then urban-rural differences, not regional differences, would have had the most important effect on Irish women's stature.

## 6.8   Heights and Mortality

The substantial decline in both female and male heights in the 1840s revealed by the criminal data indicates that workers in this period were subjected to a substantial nutritional insult. This finding is consistent with a similar decline in the military height data of Floud et al. (1990) and with historical interpretations of the "hungry forties." This decade saw a surge in working-class political organization in the Chartist movement, which was in part a response to economic distress. Yet the most recent assessment of trends in real wages indicates that this was a period of increasing prosperity. Crafts and Mills (1994) estimated a trend rate of growth in real wages of 1.2 percent per annum between 1813 and 1903 and found that the cost-of-living real wage rose over the decade of the 1840s as a whole, with only 1847 exhibiting substantial real wage reductions as a result of short-run price changes.

One way to resolve or reconcile these different findings is to examine a further indicator of well-being—mortality experience. Mortality data is available in detail only from 1841 (vital registration in England and Wales began in 1837), so it is not possible to compare mortality and height trends for the early nineteenth century. For the period from 1841, however, the mortality data are instructive. Floud et al. (1990, 314) argued from the heights of male recruits that "the fall in mortality in late nineteenth century England and Wales follows almost exactly the pattern that we would expect from the evidence of nutritional status."

Figure 6.14 presents mortality rates for age ranges up to 19 years for males and females separately. Three points should be noted. First, the rise and decline in mortality rates for all three age groups (5–9, 10–14, and 15–19) and for both males and females over the period 1841–55 corresponds with the decline and slight recovery in both male and female criminal heights for individuals born in this period. The coincidence of the mortality peak in 1846–50 for all three age groups together with the negative and significant coefficients for females born in 1845–49 shown in table 6.5 suggests that the dominant influence is a period rather than a cohort effect. However, the absence of mortality data for
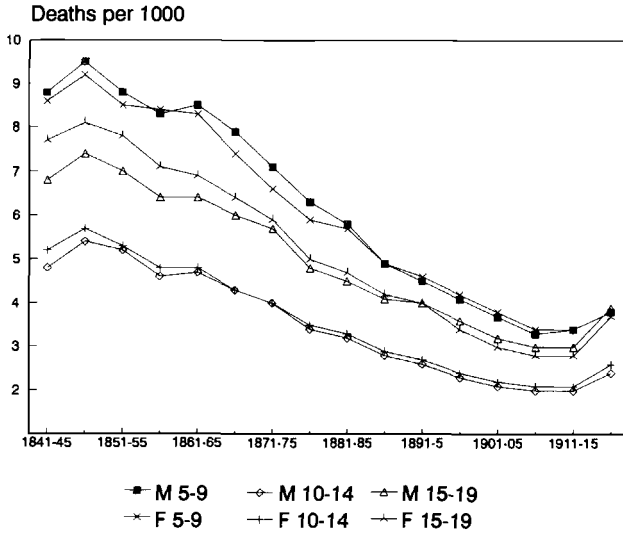
Deaths per 1000



**Fig. 6.14    Child and juvenile death rates, England 1841–1920**
*Source:* Case et al. (1962).

the pre-1841 period means that we cannot determine whether the child mortality peak in 1845–49 is a short-run deviation from a downward trend or a significant break in trend.

Second, this decline in child mortality is quite different from the pattern of infant mortality, which remained high to the end of the century. This divergence between infant and child mortality rates is important and may give an insight into the determinants of nineteenth-century height profiles. Szreter (1988) has challenged McKeown's (1976) argument that the major reason for the pre-1901 mortality decline is the reduction in incidence of airborne disease, and that the only generic explanation for this must be a general rise in resistance to infection due to improved nutrition and living standards.

Szreter suggests that the decline in death rates from the major food- and water-borne disease categories (typhoid/typhus and cholera/diarrhea) "would between them be responsible for at least half as much again, and perhaps almost twice the absolute quantity of mortality reduction during the nineteenth century as that attributable to the airborne combination of t.b. and the bronchitis group." Infants were particularly susceptible to food-borne diarrheal diseases, while children were proportionately more at risk from water-borne enteric diseases. An improvement in the urban environment from midcentury, and particularly the construction of water supply and sewerage systems during the "sanitary revival" from the mid-1860s, would have reduced the incidence of enteric diseases among children. A decline in infant diseases, on the other hand, required a more specific improvement in the working-class domestic en-

vironment, which itself required a reduction in overcrowding brought about by family limitation and by the implementation of minimum housing regulations from the 1890s.

If Szreter's interpretation of the mortality data is correct (and it has not gone unchallenged—see Guha 1994), it suggests that a deterioration and subsequent improvement in environmental conditions, rather than a deterioration and then improvement in nutrition, is the primary explanation for the nineteenth-century child mortality trends. Since we know that repeated infections retard growth, we would expect this environmental pattern to produce lower final adult heights in the population that experienced the worst childhood environmental conditions, and we would expect males and females to be affected equally. If, on the other hand, the decline in criminal heights was a result of an economically determined reduction in nutritional intake (i.e., reduced real wage), then we would expect to see a bias against females because of their lower earning potential. The lower adult heights achieved by both male and female criminals born in the 1840s and early 1850s is consistent with the environmental interpretation of the mortality decline.

There is, however, a third point of interest in these mortality data. Although the male and female age-specific mortality rates in figure 6.14 track each other fairly closely, there is an important change over time in the male-female mortality gap. Females aged 10–14 have slightly higher age-specific death rates than males over the period 1841–65, and females aged 15–19 have substantially higher death rates than males aged 15–19 in the period 1841–65, an excess mortality that is not eliminated until 1891–95. This is of some significance since in modern developed societies females are found to have a "natural" mortality advantage over males in each and every age group. However, this "natural" advantage is not universal; in some developing countries where women have limited autonomy and restricted access to economic opportunity, they also experience excess mortality, at least up to their mid-30s (Johansson 1991).

The proximate cause of the excess mortality of young females in early Victorian Britain was tuberculosis, and this was to a large degree a disease of poverty (Johansson 1977). The elimination of the female excess mortality gap from the 1860s does, therefore, suggest that females enjoyed greater benefits from increases in real incomes and economic opportunity in the mid-Victorian period, while the similar downward trend for both males and females indicates that they benefited equally from environmental improvements.

Humphries (1991) further investigated excess female mortality by both county and town in England in the 1840s and concluded that it was affected by the economic environment, but in a complex way. She found that predominantly agricultural counties were hostile to female life chances, as were many towns that were organized around centralized factory production, but the underlying economic rationale was different. In rural areas it was the absence of productive opportunities for women in increasingly capitalist agriculture that adversely affected their life chances, whereas in the factory towns it was the

excessive physical demands and harsh environment of the workplace that took its toll. This analysis of excess female mortality is fully consistent with the height data reported in section 6.5, which sees a decline in rural female heights relative to urban heights up to 1840 (figs. 6.7 and 6.9), and a decline in non–Home County heights (which include northern industrial birthplaces) relative to Home County heights (fig. 6.10).

## 6.9   Conclusion

This analysis of convict and criminal height data for birthdates 1790 to 1857, and of mortality data from 1841 to 1920, has allowed a detailed examination of female living standards in England. We have been able to look at three separate elements of the height data—the *gap* between male and female heights, the *level* of female heights for women born in different places, and the *trend* in female heights over time. The gap between male and female heights in Britain appears to widen over the period up to the end of the Napoleonic Wars, but thereafter the height trajectories move in parallel (fig. 6.11). This suggests that up to 1815 female height profiles are strongly influenced by factors endogenous to the household economy. The very low overall level of household income made it essential to distribute resources in a way that maximized household utility, and this implied a bias against female infants and children.

There are important intrasample variations in the level of female height that are related to location and occupation. Rural-born women in England are consistently taller than urban-born women up to 1840 (figs. 6.3, 6.7, and 6.9), and the absence of this urban-rural height gap in Ireland (fig. 6.4) is broadly indicative of urban disamenities in England. Within the urban- and rural-born groups, there were significant regional effects, with rural-born women in the Home Counties and urban-born women in London and in northern industrial towns being the shortest groups. Employment in manufacturing had a significant negative impact on the height of English women, but not on Irish women (tables 6.3–6.5).

These locational and occupational differences change over the medium to long term. Female rural heights decline relative to urban up to 1840, and non–Home County heights decline whereas Middlesex/Home County heights rise from 1797 to 1835 (figs. 6.8 and 6.10). All heights fall in the 1840s, and by 1850 regional differences have largely disappeared. These differences in levels and trends indicate that rural-born women experienced declining relative living standards in the first half of the nineteenth century, but that Middlesex/Home County women enjoyed improvements in relative welfare despite living in a crowded urban environment. When supplemented by evidence on excess female mortality, these findings are indicative of declining economic opportunities for women in English agriculture after the Napoleonic War enclosures, and of increasing economic opportunities in urban areas, particularly in the metropolitan economy, which had very little large-scale factory employment.

However, the similarity between male and female height trends and the greater uniformity of the male-female height gap in the post-1825 period (fig. 6.11), even for people living in rural areas, is consistent with an increase in real wages from the second decade of the nineteenth century that permitted a more equitable distribution of resources between male and female children. Aggregate male and female height profiles come to follow similar trajectories, with the rate of deterioration in the 1840s and 1850s determined largely by environmental factors exogenous to the domestic economy.

# Data Appendix

This appendix presents information on the content and representativeness of the three separate sources of data on female heights used in this paper.

## Convict Data

Convict Women

Our first set of data, on the heights of women born between 1790 and 1815, is derived from the indents of 2,926 English-born and 3,370 Irish-born females transported from the United Kingdom to the penal colony of New South Wales between 1826 and 1840 (State Archives of New South Wales, *Convict Indents of Transported Prisoners,* 4/4003–4019; *Convict Indents of Transported Irish Prisoners,* 4/7076–7078).[1] The distributions of the heights of the female convicts were free of truncation bias. The absence of truncation in the lower tail and of overloading in the upper tail of the female height distributions indicates the absence of any twisting or distortion of the distributions. Jarque-Bera tests reported in table 6A.1 found that the female distributions were normal, or Gaussian, when measured to the half-inch or full inch. The Jarque-Bera (Jarque and Bera 1980) statistic tests whether the first four moments of the sample distribution are consistent with the normal distribution. There was evidence of heaping, the concentration of measurements at the whole or half-inch for the English females and rural Irish women. The height of females was measured to the quarter-inch, and the heaping was largely symmetrical around the half-inch. Heaping affects many studies of height, including modern ones, and while not a desirable quality is not uncommon (Fogel et al. 1983). Simulations suggest that heaping on the half-inch is a relatively minor adverse effect in the estimation of mean heights because the biases tend to cancel out one another (Steckel 1992).

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1. This section on convict women draws from joint work with D. Oxley. See Nicholas and Oxley (1993, 1994, 1996).

Table 6A.1    **Jarque-Bera Tests for Normality of Convict Height
              (critical value at 95 percent confidence is 5.99)**

|  | Convict Type | Statistic |
|---|---|---|
|  | English urban females | 5.87[a] |
|  | English rural females | 2.37[b] |
|  | Irish urban females | 3.82[c] |
|  | Irish rural females | 1.38[a] |
|  | English males | 3.48[c] |
|  | English urban males | 2.21[c] |
|  | English rural males | 2.24[c] |
|  | Irish males | 2.01[c] |
|  | Irish urban males | 1.88[c] |
|  | Irish rural males | 1.99[c] |

*Source: Convict Indents.*
[a]Half-inch.
[b]Full inch.
[c]Quarter-inch.

The convict indents that accompanied each shipload of transportees docu-
mented name, age, education, religion, marital status, number of children,
place of birth, up to four occupations, crime, place of trial, date, sentence, and
prior convictions, as well as height, for each individual. These data allow the
representativeness of the convicts to be assessed. The occupational structure of
the female convict sample was compared with the female occupations in the
1841 English and Irish censuses. Employing Armstrong's social skill classifi-
cation as a common "yardstick," 78 percent of English female convicts and 83
percent of English women workers were in the skilled and semiskilled catego-
ries (Armstrong 1972). Similarly, almost three-quarters both of Irish women
workers in the census and of convict women transported from Ireland were
skilled or semiskilled.

The predominance of skilled and semiskilled women among the convicts is
not surprising since most women convicts were employed in domestic service,
classified mainly as a skilled or semiskilled occupation according to the Arm-
strong scheme. Unfortunately, the aggregation of the skilled and semiskilled
occupations disguises the complex distribution of female skills and trades. The
problem lies with the 1841 English and Irish censuses, which lump together
one-half of all working women into one amorphous "domestic servant" cate-
gory. In contrast, the convict indents provide a fine detail of women's occupa-
tions, including over 160 distinct jobs. In order to make comparisons with the
1841 census, we were forced to collapse most of these carefully listed trades
of the English and Irish convict women into one aggregate "domestic servant"
category, which combined skilled and semiskilled jobs. While this aggregation
showed that the convict data were broadly coincident with the 1841 census,

**Table 6A.2**            **Occupations of Female Convicts, 1817–40**

| Occupation | Sample[a] (%) | Stock of Skills[b] (%) |
|---|---|---|
| Housemaid | 28.4 | 20.2 |
| Allworker[c] | 25.4 | 18.1 |
| Kitchenhand | 11.0 | 7.8 |
| Nursemaid | 9.7 | 6.9 |
| Cook | 8.7 | 6.2 |
| Laundress | 8.3 | 5.9 |
| Dairyhand | 7.5 | 5.4 |
| Needlewoman | 6.9 | 4.9 |
| Country servant | 5.6 | 4.0 |
| Laundrymaid | 3.9 | 2.8 |
| Washerwoman | 3.3 | 2.3 |
| Children's maid | 2.9 | 2.0 |
| Country allworker[c] | 2.2 | 1.6 |
| Dressmaker | 1.8 | 1.3 |
| Nurse | 1.3 | 0.9 |
| General house servant | 1.0 | 0.7 |
| Barmaid | 1.0 | 0.7 |
| Farm laborer | 0.8 | 0.6 |
| Housekeeper | 0.5 | 0.4 |
| Thorough servant[c] | 0.5 | 0.4 |
| Other | 10.5 | 6.9 |

*Source: Convict Indents.*

[a]Percentage of sample engaged in given occupation. Due to the listing of multiple occupations, the total exceeds 100 percent.

[b]Percentage of stock of skills (combined multiple job listings) accounted for by given occupation.

[c]Allworkers, also known as maids of all work, and thorough servants were workers who, because they were employed in single-servant households, had to perform all of the duties divided among specialist servants in larger households.

the occupational variety of female convict employment was investigated, in order to assess further the representativeness of our data.

For many women in our sample, two or more skills, such as housemaid and kitchenhand or country allworker and dairyhand, were listed in the indents. As table 6A.2 shows, Irish and English female convict employment fell into roughly a dozen major categories. Two-thirds of the convict women had held jobs as housemaid, allworkers, or kitchenhands, and 86 percent were employed in the first 12 occupations in table 6A.2. In table 6A.3 the skill composition of English female convicts was similar to that for the male convicts, and the male convict skill distribution was broadly in line with that for the working-class population in the 1841 census. The overrepresentation of domestic servants arose from the age distribution of the convict women, who were disproportionately young (with 75 percent of the English and 79 percent of the Irish convict women below 31 years of age) and single (59 percent of the English and 65

percent of the Irish). Our data show that the number of women employed in domestic service declined from 82.4 percent for English convict women under age 20 to 68 percent of women over age 20. Employment in resident domestic service required women to be single, and the high percentage of single women among the transportees also explains the high percentage of domestic servants in our sample. The underrepresentation of textile workers probably reflects some overrepresentation of southern and London workers.

Details of Irish female convict occupations in the 1841 census and the convict sample were grouped into laborers, textile workers, farmers, other artisans, white-collar workers, and others as used by Mokyr and Ó Gráda (1982, 379). There were many more women in the farm servant category and far fewer in the textile worker categories in the indents than in the 1841 census. These differences can be explained by the fact that female textile workers identified* in the census worked at home as domestic workers with many classified as female farm servants (laborers) in the Mokyr and Ó Gráda scheme.

Our data on occupations suggest that women were representative of the English and Irish working classes, although they were not representative of the age distribution of the population. Our sample contains sufficient observations to estimate accurately terminal height in each year. The concentration of female convicts in the under 31 age group is not a problem since terminal height was attained at the time by women at age 21, which marked the end of their growing years. Height did not change between ages 21 and 49, at which time shrinkage occurred, which led us to exclude all women older than age 49 from our analysis.

Convict Men

For comparative purposes, the heights of 12,528 English-born and 7,358 Irish-born males transported between 1817 and 1840 are also analyzed. Male height was typically recorded to the nearest inch, and the frequency distribution shows little sign of heaping. The Jarque-Bera tests shown in table 6A.1 indicated that the distribution of male English and Irish height is normal, or Gaussian.

One test of the accuracy of the data was to compare the indents with the court records. In a survey of Old Bailey court records of 593 male convicts sentenced between 1816 and 1834, all the occupations listed in the court records agreed with those in the convict sample, although only 3.5 percent of the court records reported occupations. Table 6A.3 shows that the male convict sample was representative of the men in the English working classes using Armstrong's classification scheme. The major difference between the 1841 English census and the male sample of convicts was that over three times as many English men as convicts were in Armstrong's professional and middling categories. However, the proportions of skilled and semiskilled convicts corresponded very closely to those in the English population. A Spearman's rank correlation between 83 occupations with over 50,000 workers in the 1841 cen-

**Table 6A.3**     **Skill Classification of English Workforce (1841) and Convicts (1817–40)**

| Armstrong Classification | Convict Females (%) | Convict Males (%) | English 1841 Census Males (%) |
|---|---|---|---|
| Professional | 0 | 0.3 | 1.7 |
| Intermediate | 0.3 | 3.1 | 9.2 |
| Skilled | 49.8 | 45.6 | 45.2 |
| Semiskilled | 27.9 | 26.3 | 25.7 |
| Unskilled | 22.0 | 24.7 | 15.5 |

*Sources: Convict Indents* and *Census of Great Britain* (PP 1841, xiv).

sus and the convict indents was 0.714, suggesting a close match between the sample occupations and those of the English workforce. These tests give us confidence that the male convicts were representative of the English working class.

For the Irish male convicts, the indents and the census differed in terms of laborers (71 percent in the indents and 55 percent in the census) and farmers (1.1 percent in the indents and 20.7 percent in the census). A similar discrepancy was found by Mokyr and Ó Gráda in their comparison of occupations in the census with those in the shipping lists for Irish emigrants to the United States. The differences are not as great as they might first appear. In preindustrial Ireland, the border line between farmer, cottier, and farm laborer was not well defined (Mokyr 1983). Combining laborers and farmers, 72 percent of the Irish convicts and 76 percent of the 1841 Irish male population fell into this aggregate group, giving us confidence that the Irish convicts were broadly representative of the Irish working class at home.

Convict Literacy

The representativeness of our convict data can be assessed further by utilizing the indent information on literacy. The convicts in the indents and the population at home had similar levels of literacy. While less than half of women marrying between 1825 and 1840 could sign the marriage register, 45 percent of convict women tried in England could read and a further 34.6 percent could write also (Laquer 1974, 98). Of course, the tests are not identical, since the indent information is questionnaire data while the marriage registers provide a test of practical literacy. But other questionnaire-style data exist for paupers and migrants. Compared with the literacy rate of only 50 percent for adult paupers in 1838, 80 percent of the female convicts were literate (*Report from the Select Committee on Education of the Poorer Classes in England and Wales* [PP 1838, vii: 42]). Only 11 percent of paupers could read and write, while one-third of the convict women could do both. English convict literacy (80 percent could read, write, or both) was also very similar to the literacy rate of free female migrants to Australia in 1838 (79 percent; Penglase 1983, 43–49)

England's convict women seem less like paupers, and more like workers generally.

Male English convict literacy was 74 percent, significantly higher than the registrar-general's average of 58 percent able to sign the marriage registers, and Schofield's average of a little over 60 percent able to sign the registers in a random sample of 274 English parish registers between 1790 and 1820 (Schofield 1970, 445). In a sample of politically conscious prisoners involved in a rising in the manufacturing districts of Lancashire, Cheshire, and Staffordshire, Webb (1950, 335) found that 73 percent were literate, virtually the same rate (74 percent) as that for English male transportees for these counties. A rank correlation of 0.92 between Sanderson's (1983) sample of occupations by literacy for Lancashire in the 1830s and the convict sample provides additional evidence for the robustness and representativeness of our data. From the 1841 Irish census, where literacy was measured in the same way as in the indents, 54 percent of the Irish male population was literate while 67 percent of the male transportees could read, write, or both. Irish female convicts and Irish women were much alike with less than half of both groups literate: 48 percent of convicts compared with 45 percent of adult Irish women could read, write, or both. The Irish transportees were at least as literate as the Irish left at home.

### The Criminal Class

There has been considerable debate among Australian historians on the class origins of the convicts. Wood's (1922) nationalist interpretation of the convicts as "innocent and manly" unfortunates fighting for freedom and social justice was attacked by Clark (1956) for "grossly distorting Australia's past." Clark argued that the transportees were persistent thieves engaged in a life of crime; they were by choice and training members of a professional criminal class. This view of the convicts as a criminal class, separate and distinct from the working class, dominated Australian convict historiography until the 1980s. Using the information on occupations presented above, Nicholas (1988) and Oxley (1988) showed that the transportees to New South Wales were not members of a criminal class, but were working-class men and women who stole. While this new interpretation is not without its critics, it has attracted considerable support (Shlomowitz 1990; Nicholas 1991; Garton 1991).

The majority of transportees had no previous convictions (over 60 percent of the women were first offenders), all reported workplace skills, and most stole to satisfy immediate consumption needs. Overwhelmingly, female convicts committed crimes against property—96.2 percent of all reported crimes. In order to assess whether the female criminals were professional criminals or casual pilferers, Oxley (1988) categorized the crimes of women transportees into 11 basic categories. Most women stole clothes (33 percent) or money (22 percent) or cloth and yarn (10 percent), which were used for basic consumption. Theft of clothes, cloth and household goods (e.g., pots, candles, and pans), bedding, and foodstuffs accounted for nearly three-fifths of the items

stolen. Valuable items, jewelry (6 percent), and metals (0.9 percent), which were not for immediate consumption, required resale, and were more likely to be targeted by a professional criminal, accounted for less than 10 percent of the crimes.

An attempt was made to assess whether crime was work related. For men in each occupational category with more than 30 observations, work-related crimes were defined as stealing tools, stealing goods, and stealing from an employer. Theft of tools included tools that were specific to the job, for example, a sawyer stealing a saw, and all thefts that were listed as "tools" on the indents. Theft of goods involved stealing movable property and foodstuffs related to the job, such as iron by a blacksmith, sheep by a butcher, or livestock and small farm animals by farm servants and farm laborers. Stealing from one's master included all thefts where the indents specified master, mistress, or employer and all thefts by nursemaids, general servants, housemaids, and kitchenhands that were listed as theft from inside the house. On this basis about 10 percent of the thefts were work related, ranging from 0.7 percent for general servants to 40 percent for butchers and farm servants.

These are lower bound estimates because most thefts were listed in the indents simply as stealing money or stealing clothing without any indication of whether they were work related. While some work-related thefts were easily identified, such as horses or saddles stolen by grooms, the indents rarely tell one if the money, clothes, trunks, spoons, watches, food, and handkerchiefs were taken from employers. Upper bound estimates were then calculated. Upper bound estimates of work-related theft for each occupation assumed that all theft that could be work related was work related. If the lower bound underestimates work-related crime, then our upper limit percentages, which show about 95 percent of thefts as work related, are overestimates. What is clear from our calculation of lower and upper bounds on work-related crime is that a significant proportion of crime was related to male workers' employment. Convicts were working-class men and women who normally held jobs, frequently stealing from their employers for immediate consumption needs.

The case for the transportees as ordinary working-class men and women also gains support from recent work by historians of British crime. For Black Country criminals, Philips (1977, 287) found that the great majority of crimes were committed by ordinary men and women, who worked at jobs normally, but also stole on occasion. Beattie (1975, 102–3), Emsley (1987), and others (Gatrell and Hadden 1972, 382; Jones 1982, 13) have related the late-eighteenth- and early-nineteenth-century crime rates to economic distress, arguing that most criminals were people in employment pushed into crime by hard economic times. There can be little doubt that the transportees were typical of such British criminals. Compared with offenders in the Black Country, transported convict workers had a similar occupational breakdown: 59 and 53 percent, respectively, were unskilled and semiskilled, 38 and 44 percent skilled, and 3 percent middle and upper class. They had committed the same

types of offenses, less than 3 percent against persons and the rest property offenses, mainly larceny (Philips 1977). The rank correlations between the occupations of the transported male convicts and the male prisoners held in Pentonville Gaol was 0.908. (Unfortunately, similar comparative statistics were not available for women or the Irish, but no one has suggested a criminal class consisting of women and the Irish.) On the basis of all these tests, it seems fair to argue that the female and male convicts transported to Australia were broadly coincident with the skill composition of the English and Irish working classes.

### Newgate Prisoner Data

Our second, and largest, data set is drawn from 24 manuscript registers of prisoners admitted to Newgate Prison in London between 1817 and 1860 (Public Records Office [PRO], *Newgate Prison Registers*, PCOM2/191–214). This source provides information on 20,519 female prisoners (16,325 English, 3,199 Irish, 248 Welsh, 27 Scottish, and 720 foreign-born) and, using the lower and upper age thresholds of 21 and 49, provides us with height data for women born between 1768 and 1839. (The registers also contain information on approximately 100,000 male prisoners, but these male data have not been collected.) In this period Newgate served primarily as a prison for accused persons awaiting trial at the Old Bailey. The Old Bailey served both as a City of London court and as the assize court for the county of Middlesex, and it was from Middlesex that most of the prisoners came. The magistracy in Middlesex, unlike that in the rest of the kingdom, did not hear cases of grand larceny at the quarter sessions, but instead always forwarded these for trial at the Old Bailey. Since the monetary threshold between simple larceny and grand larceny in the early nineteenth century was just one shilling, the majority of Old Bailey cases related to what were effectively alleged crimes of petty theft (Select Committee on the State of Gaols [PP 1819, vii: 283]).

In 1819 the governor of Newgate reckoned that almost 2,000 of the 2,396 prisoners admitted in the previous year had been Middlesex assize cases (Select Committee on the State of Gaols [PP 1819, vii: 263]). By 1835 the remit of the Old Bailey (and so the catchment area for Newgate) had been extended to cover Kent, Surrey, and Essex as well as Middlesex (Select Committee of the House of Lords on Gaols and Houses of Correction [PP 1835, xi: 77]). The great majority of Newgate prisoners, therefore, were people from London and surrounding districts who were accused of low-value theft. When female prisoners were found guilty of theft, they typically received short sentences of between one and six months in a House of Correction. There is little indication that Newgate inmates were dominated by professional criminals.

Information on the crime, sentence, occupation, age, place of birth, and height was also recorded. Data on the place of birth of prisoners listed in the registers confirm the very heavy London and southeast bias of the female pris-

oners—62 percent were born in the south, with an underrepresentation of women from the north, shown in table 6A.4. The Newgate registers gave information about each prisoner's height, usually measured to the full inch though sometimes to the half or quarter. Jarque-Bera tests for normality indicate that English and Welsh (0.910) and English (0.901) women's heights measured to the half-inch were normally distributed, with no signs of truncation or other distortions to the distributions.

There was little information collected on female occupations, in contrast to male prisoners, where occupation was nearly always stated. In place of occupation, women's marital status—single/spinster, married, or widowed—was given in 99.5 percent of the cases. Table 6A.5 shows the marital and age status of the Newgate prisoners. The women were predominantly young, displaying an age distribution similar to that of the female convicts. Young women under age 21 were predominantly single, with the proportion of single women falling from 93 percent of the sample for those under age 21 years to 57 percent aged 21–30 years, 22 percent aged 31–40 years, and 10 percent aged 41–50 years. Generally, the age distribution fits the young female offender category—a woman who stole articles of small value for immediate use. The gross underrecording of female occupations means that we cannot construct any statistical tests of the socioeconomic representativeness of these female prisoners, but the unexceptional nature of their crimes suggests that they were not significantly different from either female convicts or female habitual criminals.

### Criminal Data

Habitual Criminals

Our final set of data on heights of women born between 1812 and 1857 is taken from a register of habitual criminals compiled by Scotland Yard and circulated in printed form in 1877 to local police forces (PRO, *Alphabetical Register of Habitual Criminals,* PCOM2/404). The register contains information on 8,612 males and 3,552 females who had been designated "habitual criminals" under the Habitual Criminals Act of 1869 and the Prevention of Crimes Act of 1871. These were people who had been convicted on indictment of a crime and against whom a previous conviction could be proved. The purpose of the register was to enable police forces to identify and take action against repeat offenders. In addition to details of crime and sentence, the register recorded age, occupation, height (measured to the half-inch), color of hair and eyes, complexion, and distinguishing features such as scars and tattoos. As an instrument of criminal identification the central criminal register proved to be inadequate and haphazard, but it was the best that could be done before the development of Bertillon's system of body measurement and Galton's "finger mark" system (Radzinowicz and Hood 1986, 263).

Habitual criminals will not be representative of the entire population if there

**Table 6A.4        County Distribution of Newgate Female Prisoners**

| County | Newgate Prisoners | | Non-Middlesex Percent | Female Percentage of Population |
| | Number | Percent | | |
|---|---|---|---|---|
| Bedfordshire | 61 | 0.3 | 1.0 | 0.7 |
| Berkshire | 234 | 1.4 | 3.8 | 1.2 |
| Buckinghamshire | 127 | 0.8 | 2.1 | 1.2 |
| Cambridgeshire | 131 | 0.8 | 2.1 | 1.1 |
| Cheshire | 39 | 0.2 | 0.6 | 2.4 |
| Cornwall | 69 | 0.4 | 1.1 | 2.3 |
| Cumberland | 19 | 0.1 | 0.3 | 1.4 |
| Derbyshire | 43 | 0.3 | 0.7 | 1.9 |
| Devonshire | 280 | 1.7 | 4.6 | 3.9 |
| Dorsetshire | 67 | 0.4 | 1.1 | 1.3 |
| Durham | 80 | 0.5 | 1.3 | 1.7 |
| Essex | 421 | 2.6 | 6.8 | 2.6 |
| Gloucester | 363 | 2.2 | 5.9 | 3.0 |
| Hampshire | 305 | 1.9 | 5.0 | 2.5 |
| Herefordshire | 81 | 0.5 | 1.3 | 0.9 |
| Hertfordshire | 224 | 1.4 | 3.6 | 1.2 |
| Huntingdonshire | 21 | 0.1 | 0.3 | 0.4 |
| Kent | 527 | 3.2 | 8.6 | 3.1 |
| Lancashire | 354 | 2.2 | 5.8 | 9.3 |
| Leicestershire | 49 | 0.3 | 0.8 | 1.5 |
| Lincolnshire | 89 | 0.5 | 1.4 | 2.5 |
| Middlesex | 10,175 | 62.3 | – | 13.1 |
| Norfolk | 195 | 1.2 | 3.2 | 3.0 |
| Northampton | 44 | 0.3 | 0.7 | 1.4 |
| Northumberland | 113 | 0.7 | 1.8 | 1.9 |
| Nottinghamshire | 49 | 0.3 | 0.8 | 1.7 |
| Oxfordshire | 178 | 1.1 | 2.9 | 1.2 |
| Rutland | 2 | 0.0 | 0.0 | 0.2 |
| Shropshire | 127 | 0.8 | 2.1 | 1.8 |
| Somerset | 240 | 1.5 | 3.9 | 3.2 |
| Staffordshire | 98 | 0.6 | 1.6 | 3.1 |
| Suffolk | 203 | 1.2 | 3.3 | 2.4 |
| Surrey | 370 | 2.3 | 6.0 | 1.2 |
| Sussex | 206 | 1.3 | 3.4 | 2.1 |
| Warwickshire | 196 | 1.2 | 3.2 | 2.4 |
| Westmorland | 3 | 0.0 | 0.0 | 0.5 |
| Wiltshire | 188 | 1.2 | 3.1 | 1.9 |
| Worcester | 102 | 0.6 | 1.7 | 1.7 |
| Yorkshire | 252 | 1.5 | 4.1 | 10.4 |
| Total | 16,573 | 100.0 | | |

*Source: Newgate Prison Registers.*

**Table 6A.5**          **Age and Marital Status of Newgate Female Prisoners**

| Age Category | Single | Married | Widow | Total |
|---|---|---|---|---|
| Up to 20 | 5,185 | 337 | 30 | 5,552 |
| (%) | (93.4) | (6.1) | (0.5) | (100.0) |
| 21–30 | 3,465 | 2,227 | 384 | 6,076 |
| (%) | (57.0) | (36.7) | (6.3) | (100.0) |
| 31–40 | 559 | 1,439 | 558 | 2,556 |
| (%) | (21.9) | (56.3) | (21.8) | (100.0) |
| 41–50 | 141 | 793 | 515 | 1,449 |
| (%) | (9.7) | (54.7) | (35.5) | (100.0) |
| 51–60 | 40 | 259 | 272 | 571 |
| (%) | (7.0) | (45.4) | (47.6) | (100.0) |
| 61–70 | 12 | 55 | 115 | 182 |
| (%) | (6.6) | (30.2) | (63.2) | (100.0) |
| 71+ | 1 | 1 | 18 | 20 |
| (%) | (5.0) | (5.0) | (90.0) | (100.0) |

*Source: Newgate Prisoner Registers.*

are regional and occupational biases in the data. Analysis of the working of the Habitual Criminals Act over the period 1869–90 by Stevenson (1986) demonstrated that registration was pursued more vigorously north of a line from the Severn to the Wash than elsewhere, and in towns with populations between 20,000 and 100,000. He found no clear relationship between the registration rate for habitual criminals and other indicators of crime and concluded that local variation in the density of policing and the sentencing policies of magistrates and judges were the most important determining factors. We find little general evidence of regional overrepresentation in our sample, with the correlation between county shares of habitual criminals and population in 1871 standing at 0.94. The only significant outlier is Lancashire, which accounted for 12.4 percent of the population of England and Wales in 1871 but 21.8 percent of habitual criminals.

However, we do find evidence of occupational bias in our sample of criminals. The occupations were coded using Armstrong's occupational-social class scheme. As shown in table 6A.6, the major difference between the female and male criminals and the 1841 English census was the small proportion of criminals that came from Armstrong's first two occupational-social classes, repeating the same pattern found in the convict data. There were also fewer skilled workers among the criminals than in the population as a whole, with an overrepresentation of unskilled workers.

We ran several tests on the internal accuracy of the data using 1,046 individuals who were identified in the records more than once. In 58 percent of the cases the occupations of criminals who appear twice in the records were exactly the same. This is a lower bound estimate since the computer match of

**Table 6A.6**          **Skill Classification of English Workforce and English Habitual Criminals**

| Armstrong Classification | Criminal Total (%) | Criminal Males (%) | Criminal Females (%) | English 1841 Census (%) | English 1841 Census Males (%) |
|---|---|---|---|---|---|
| Professional | <1 | <1 | 0 | 1.2 | 1.7 |
| Intermediate | 1.6 | 2.1 | <1 | 8.7 | 9.2 |
| Skilled | 32.9 | 38.5 | 19.5 | 53.1 | 47.9 |
| Semiskilled | 14.6 | 13.5 | 17.3 | 21.2 | 25.7 |
| Unskilled | 50.8 | 45.8 | 63.0 | 15.9 | 15.5 |

*Sources: Alphabetical Register of Habitual Criminals* and *Census of Great Britain* (PP 1841, xiv).

occupations did not allow for slight variations in occupations, so bootmaker and shoemaker were treated as a mismatch, although the two occupations were the same. In 70 percent of the repeat cases the same place of trial was listed, and in 90 percent of the cases the ages agreed (allowing for a higher age when the two occurrences in the records were separated by a number of years). The heights of the criminals who occurred more than once in the records agreed to the nearest 0.5 inch in 70 percent of cases, which rose to 75 percent for criminals over age 23, who had reached their terminal height. These various tests give us confidence in the accuracy of the criminal data.

In the crucial variable of height we find that the female and male height distributions were free of truncation bias, and the Jarque-Bera tests found that the female (5.23) and male (5.51) distributions were normal, or Gaussian. Female height was measured at the half-inch since there was some evidence of heaping on the quarter-inch.

## Crimes and the Working-Class Victorian Criminal

How representative were these criminals of the population as a whole? The concept of a "habitual criminal," which was given legal standing in 1869, derived from a deep-seated Victorian belief in the existence of a "criminal class," but it had more proximate origins. The virtual cessation of transportation to Australia in 1853 removed the option of expulsion, which had hitherto been the lot of many repeat offenders, and an outbreak of garrotting in London in 1862 created a moral panic that saw an increase in the number of violent crimes reported and a call for tougher policing and tougher sentencing (Davis 1980). The Habitual Criminals Act introduced a system of police supervision for repeat offenders after their release from prison and allowed them to be summarily imprisoned if they were found to be acting suspiciously.

This does not mean, however, that these repeat offenders were social outcasts who gained a living through crime. Summary statistics presented in the register, and reproduced in tables 6A.7 and 6A.8, show that the majority of

**Table 6A.7**          **Marital and Occupational Status of Female Habitual Criminals by Age Group**

| Age | Married | Single | Stated Occupation | Prostitute | No Occupation |
|---|---|---|---|---|---|
| Up to 20 | 40 | 604 | 478 | 31 | 135 |
| 21–30 | 559 | 590 | 689 | 77 | 383 |
| 31–40 | 722 | 169 | 561 | 19 | 311 |
| 41–50 | 473 | 62 | 338 | 11 | 186 |
| 51–60 | 228 | 18 | 155 | 1 | 90 |
| 61–70 | 62 | 9 | 45 | – | 26 |
| 71+ | 16 | – | 11 | – | 5 |
| Total | 2,100 | 1,452 | 2,277 | 139 | 1,136 |

*Source: Alphabetical Register of Habitual Criminals.*

**Table 6A.8**          **Marital and Occupational Status of Male Habitual Criminals by Age Group**

| Age | Married | Single | Professional, Trades, etc. | Artisans | Unskilled |
|---|---|---|---|---|---|
| Up to 20 | 19 | 2,079 | 46 | 641 | 1,411 |
| 21–30 | 829 | 2,490 | 160 | 1,051 | 2,108 |
| 31–40 | 900 | 769 | 128 | 518 | 1,023 |
| 41–50 | 549 | 275 | 52 | 253 | 519 |
| 51–60 | 349 | 129 | 40 | 142 | 296 |
| 61–70 | 151 | 40 | 19 | 57 | 115 |
| 71+ | 27 | 6 | 4 | 8 | 21 |
| Total | 2,824 | 5,788 | 449 | 2,670 | 5,493 |

*Source: Alphabetical Register of Habitual Criminals.*

habitual criminals were unmarried young adults, predominantly from unskilled occupations, although one-third of the males were listed as artisans or as having a trade or profession. These were clearly not just the economically inferior residuum assumed in contemporary discussion of the habitual criminal class. Nor were they the physically defective, a description that was applied (according to unknown criteria) to only 7.4 percent of males and 4.3 percent of females on the register. Only 616 males (7.2 percent) and 310 females (8.7 percent) had more than two previous convictions, and the majority of convictions were for petty theft (larceny simple), resulting in prison sentences of 3 to 12 months. The majority of these repeat offenders were not, therefore, hardened professional criminals. Their appearance on the register fits with mainstream historical interpretation, which sees the great majority of crime as being committed by ordinary people who worked at jobs and lived in generally law-abiding communities, but who stole on occasion (Rudé 1985; Jones 1982; Philips 1977).

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