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**Human Capital Formation from Occupations:
The 'Deskilling Hypothesis' Revisited**

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Human Capital Formation from Occupations: The 'Deskilling Hypothesis' Revisited¹

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Abstract

We use HISCLASS to code the occupational titles of over 30,000 English male workers according to the skill-content of their work. We then track the evolution of the sampled working skills across three centuries of English history, from 1550 to 1850. We observe a modest rise in the share of 'high-quality workmen' deemed necessary by Mokyr and others to facilitate the Industrial Revolution, including machine erectors and operators. But we also find remarkable growth in the share of unskilled workers, rising from 20% in the late sixteenth century to nearly 40% in the early nineteenth century, caused mainly by falling shares of semi-skilled, blue-collar workers. Close inspection of the occupational structures within the main sectors of production suggest that deskilling occurred in agriculture and industry alike, prompted by land concentration in agriculture and workshop-to-factory changes in industry.

Keywords: Deskilling, HISCLASS, Human Capital, Industrial Revolution, Occupations

JEL Codes: J24, N34, O10

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I Introduction

Economic historians have long debated whether early modern England's technical and structural changes were largely skill saving or skill demanding. One view holds that the transition from artisan workshops to factory production reduced the need for skilled workers (Goldin and Katz 1998), a notion that has received support from four sides: with Humphries (2010, 2013) and Kirby (2005) showing that mass production raised the demand for female and child labour; with Mitch (1999, 2004) and Nicholas and Nicholas (1992) observing a pause in the rise of male literacy rates during the late eighteenth century; with Nuvolari (2002) noting that early industrialisation witnessed a considerable number of machine-breaking riots conducted by workers who feared that machines would render their skills redundant; and with Clark (2005), Van Zanden (2009), and Allen (2009) arguing that the skill premium remained surprisingly flat until the mid-nineteenth century. Another side contrastingly stresses the importance of knowledge and working skills to facilitate the innovations and mechanising that made industrialisation possible in the first place (Mokyr 2009; Mokyr and Voth 2009; Meisenzahl and Mokyr 2012). This view has received support from the work of van der Beek (2012) documenting a rising number of apprentice contracts within 'high-quality' trades, such as joiners, turners, and wrights, in eighteenth-century England, and from Squicciarini and Voigtländer (2014) linking the French Industrial Revolution to a small and highly knowledgeable elite.

Previous work attempting to quantify the evolution of average working skills in England during the Industrial Revolution has mainly focused on literacy rates, either inferred from signatures or self-reported. Though meticulously documented (e.g. Nicholas and Nicholas 1992), literacy skills measure only very basic competencies. For

example, the literacy rate assigns the same skills to a literate farm worker and a literate university professor, with no distinction being made between the enormous variation in ability required of these two very different roles. It is also questionable whether the rising standards in literacy in the centuries leading up to the Industrial Revolution increased the workers' ability to perform work of economic value, i.e. they could have resulted from the rise and spread of Protestantism rather than from a demand for this ability by employers (Clark 2007). Last but not least, the fact that any skills obtained were not necessarily used productively, such as a farm worker's ability to read and write, makes the potential discrepancy between the *acquisition* of skills and the *application* of skills in productive activities a relevant matter, and one which is difficult to address using the existing measure.

In this paper we propose to use a far more substantial source of data to explore the formation of human capital in the past: occupational titles. We employ the so-called HISCLASS system, developed by Van Leeuwen and Maas (2011), to code the occupations of over 30,000 English male workers according to the skill-content of their work. The occupational titles come from historical marriage registers covering three centuries of English history, from 1550 to 1850. Our methodology enables us to quantify the evolution in average working skills used in productive activities across a sample of 26 different parishes scattered across England. These data, collected and provided by the *Cambridge Group for the History of Population and Social Structure*, allow us to investigate trends in the share of unskilled workers among different social groups (blue-collar versus white-collar workers) and within the main sectors of production (primary, secondary, and tertiary). We are also able to study the prevalence of the 'density in the upper tail' of professional knowledge by focusing on a set of occupations that Mokyr

deemed necessary to facilitate the Industrial Revolution, such as joiners, turners, and wrights (Mokyr 2005).

We find that our sampled workforce was remarkably well trained during the sixteenth century, with 20% on average of all sampled workers coded as ‘unskilled’ according to the HISCLASS scheme. But we also find a dramatic rise in the share of unskilled workers after 1700: by the nineteenth century the share of unskilled workers had almost doubled, comprising 39% of our sampled workforce. These estimates chime with those derivable from (sporadic) social tables and census data, which cover a much larger share of the English workforce than our data. The deskilling observed is robust to a large variety of regression model specifications, including our controls for compositional effects and the restriction that at least 95% per year of the sampled males were recorded with an occupational title.

By splitting our sampled workforce into blue-collar (manual) and white-collar (non-manual) workers, it becomes clear that the deskilling we observe was chiefly a blue-collar phenomenon. On average, the shares of lower- and medium-skilled blue-collar workers declined substantially over the period of observation, while the share of unskilled blue-collar workers grew from 24% to 42%. The skill structures among white-collar workers, however, remain largely constant during the period of observation. We also establish that some degree of skill formation takes place among our sampled workforce and can be attributed to upward social mobility across the life-cycle (notably in agriculture), and that some of the loss of skill we observe is associated with having an immigrant background (notably in parishes mainly engaged in non-agricultural activities).

By studying the most populous parishes in the sample individually, it becomes clear that deskilling was rather widespread, both geographically and across the main sectors of production. That is, the loss of skill can be observed in agriculture and industry alike, and sometimes also in services. This is true regardless of how the large group of uncategorised, unskilled 'labourers' is allocated between the main sectors of production. In two of the most densely populated parishes in the sample, Banbury and Gainsborough, we also observe that the share of 'high-quality' professions, including machine erectors and operators, displayed modest growth. This skill-formation was, however, not enough to counterbalance the vast decline in the shares of lower- and medium-skilled weavers, tanners, and smiths in manufacturing. In Gainsborough, the concentration of land, which is linked to the disappearance of lower-skilled husbandmen and cottagers and the rise in the share of medium-skilled farmers and unskilled farm workers, also contributed to the loss of skill. The sampled parishes cover only a tiny fraction of the entire country. But the deskilling that we observe indicates that the loss of skills among English workers could have been much more widespread than hitherto assumed, and also that it started much earlier than the classical years of the Industrial Revolution.

II Data

The key source of the data used in our analysis is the Cambridge Group's *Family Reconstitution Data*. This dataset was built around information derived from ecclesiastical events recorded in 26 English parishes (Wrigley et al. 1997).² The full data set covers more than three centuries of English demographic history, from the first emergence of parish registration, in 1541, until population censuses became common, in

² These parishes are: Alcester, Aldenham, Ash, Austrey, Banbury, Birstall, Bottesford, Bridford, Colyton, Dawlish, Earsdon, Grainsbro, Gedling, Great Oakley, Hartland, Ipplepen, Lowestoft, March, Methley, Morchard Bishop, Odiham, Reigate, Shepshed, Southill, Terling, and Willingham.

1871. The parishes represent a variety of locations in England, ranging from large market towns to remote rural villages, including proto-industrial, retail-handicraft, and agricultural communities.

The sampled occupational titles were recorded on the occasion of three ecclesiastical events: marriage, burial, or baptism (or burial) of offspring. Some individuals were recorded several times, others only once. Multiple entries, notably in the context of baptising offspring, introduce a potential bias in the data since individuals who baptise many children appear in the data more often. Previous research has shown that the rich were not only more skilled than the poor but they also had more children (Clark and Hamilton 2006; Boberg-Fazlic et al. 2011). That raises the risk that the rich will be over-represented in the sample, and hence that we thus overestimate the skill acquisitions of the sampled population. We eliminate the bias by including each individual only once, at the time of their earliest recorded occupation. Among our sampled males, 27% had their first occupation recorded at the time of their marriage; 53% when baptizing a child; and 20% at the time of their burial. In our later regression analysis we control for potential composition effects arising from the fact that some were recorded early in life and others later.

Four occupational recordings – ‘Gentleman’, ‘Esquire’, ‘Pauper’, and ‘Widower’ – were excluded from the original dataset. These titles, which make up 4% of the sampled population, do not refer to an actual profession, and hence cannot be coded using the HISCLASS scheme (see the description below). Our findings are robust to the inclusion of three of those titles on the assumption that paupers are unskilled and gentry and esquires are (highly) skilled.

The 26 sampled parishes were originally selected for the demographic quality of their registers rather than for the quality of their occupational information. This raises two concerns regarding their suitability for the purpose at hand. The first concern is the fact that occupational status was not systematically recorded in the past. Fortunately, there are ways of dealing with this problem, as we explain below. The second concern is that the occupational structure of the sampled parishes might not provide a representative sample of national occupations over time. Wrigley et al. (1997) faced the same problem and have discussed this issue at length (*ibid.*, pp. 41ff). By comparing the occupational structure of the sampled parishes to that obtainable from the 1831 national census, Wrigley et al. concluded that ‘the proportional distribution of occupations in the 26 parishes as a whole compares with the national picture and with England without the metropolis’. They further noted that ‘the discrepancy between the occupational structures [...] reflects the influence of the presence of a single parish, Birstall’ (*ibid.*, p. 43). Our sensitivity analysis handles this issue in the same way as Wrigley et al., namely by either removing Birstall entirely from the sample or changing its weight.³ As we will demonstrate further below, it makes no difference to our conclusion whether we include or exclude Birstall in our analysis.

Still, we cannot be certain that the sampled parishes represent the occupational distribution in England equally well as we move back in time from 1831, a problem that Wrigley et al. also confronted. Nonetheless, we are encouraged by how well the shares of unskilled workers in our sample match the scattered data points derived from social

³ Birstall had on average 100 occupations per fifty years, except for the period of 1750-99 when it had a staggering 2,200 observations making up more than one-fourth of all the sampled occupations (of all the parishes) in that period. The inclusion of Birstall would thus heavily distort the skill-structure in 1750-99. Including Birstall without the 1750-99 period does not alter our conclusions below. Wrigley et al. also changed the weight of the parish of Shepshed (*ibid.*, p. 45). This change does also not alter our conclusions (see below).

tables dating back to 1688, as Figure 3 below will illustrate. In any case, until more historical parish registers have been transcribed and analysed, the sample of 26 parishes serves as an important and unique starting point for understanding the long-term evolution of working skills in early modern England.

The other issue mentioned above – that of unsystematic occupational recording – is clearly visible in Table 1. Although on average two out of five of the sampled males were tagged with an occupational title, the propensity to report the occupational status varied greatly from year to year between no one, someone, and everyone. What is more, the share of males recorded with an occupation grew gradually over time, from 13% in the first sub-period (1550-99) to 69% in the final sub-period (1800-49). This presents a problem for the study of skill formation across time: if the parish ministers initially recorded only high-status occupations, but later included everyone, then it would appear as though the workforce becomes less skilled over time. But, in reality, the deskilling would simply emerge from a higher proportion of lower status males (especially ‘labourers’) being tagged with an occupational title. Fortunately, there is an easy solution to this problem. Namely by using only those individuals years where 95% or more of the sampled males attracted an occupational descriptor (Shaw-Taylor 2012). Our later regression analysis shows that our findings are robust to controlling in this way for any systematic under-recording of occupational titles.

Table 1: The Share of Males with an Occupational Descriptor, by Period and Parish

Parish	1550-49		1600-49		1650-99		1700-49		1750-99		1800-50		1550-1850	
	Obs	Share	Obs	Share	Obs	Share	Obs	Share	Obs	Share	Obs	Share	Obs	Share
Alcester	392	0%	617	1%	614	6%	531	5%	546	1%	764	82%	3464	20%
Aldenham	338	6%	425	11%	386	11%	359	9%	377	15%	365	29%	2250	14%
Ash	.	.	3	33%	493	8%	706	27%	719	34%	1255	52%	3176	36%
Austrey	103	96%	123	55%	129	48%	154	84%	169	48%	182	87%	860	70%
Banbury	734	8%	1140	26%	813	41%	1055	87%	1580	96%	1886	88%	7208	66%
Birstall	148	2%	1350	5%	1498	5%	2149	5%	4836	46%	22	55%	10003	25%
Bottesford	153	3%	382	55%	377	29%	308	26%	342	66%	411	91%	1973	51%
Bridford	77	0%	114	3%	97	29%	100	19%	101	41%	96	94%	585	31%
Colyton	545	4%	934	17%	655	11%	484	9%	588	44%	698	86%	3904	30%
Dawlish	.	.	5	20%	263	1%	267	4%	338	54%	438	69%	1311	38%
Earsdon	5	40%	82	63%	210	30%	301	71%	785	85%	767	87%	2150	78%
Gainsborough	583	14%	1193	62%	1362	74%	1365	52%	2317	92%	719	86%	7539	70%
Gedling	206	3%	333	7%	293	5%	319	5%	454	5%	984	9%	2589	6%
Great Oakley	195	13%	179	13%	161	32%	299	72%	332	7%	312	77%	1478	39%
Hartland	432	0%	475	0%	402	0%	384	0%	440	0%	329	0%	2462	0%
Ipplepen	.	.	.	.	87	56%	148	9%	209	55%	178	84%	622	52%
Lowestoft	759	31%	838	28%	875	29%	565	48%	20	100%	.	.	3057	33%
March	480	1%	630	2%	1119	5%	1140	12%	14	7%	.	.	3383	6%
Methley	289	0%	377	0%	353	0%	315	0%	495	0%	176	0%	2005	0%
Morchurch Bishop	.	.	.	.	334	13%	495	10%	480	4%	757	66%	2066	30%
Odiham	625	12%	636	23%	473	39%	544	35%	697	44%	1095	76%	4070	43%
Reigate	436	69%	760	55%	742	48%	828	42%	161	22%	2	.	2929	50%
Shepshed	229	13%	272	60%	250	36%	355	57%	751	28%	1365	84%	3222	57%
Southill	519	3%	714	39%	637	43%	738	84%	776	70%	882	85%	4266	58%
Terling	260	0%	336	3%	285	1%	283	0%	289	4%	298	37%	1751	8%
Willingham	329	7%	401	2%	381	2%	277	6%	325	22%	108	18%	1821	8%
Total	7837	13%	12319	24%	13289	25%	14469	32%	18141	50%	14089	69%	80144	38%

Notes: The number of observations reports all sampled males except paupers and gentry. The shares concern those males that have an occupational descriptor. *Source:* CAMPOP Data.

With these caveats in mind, our goal in the following is to construct an index of the share of unskilled workers among the sampled population based on their occupational titles. Next, we use the index to study the evolution of working skills across time. We are not only interested in the classic years of the Industrial Revolution (1750-1850) but also in the two centuries preceding the Industrial Revolution (looking back as far as 1550). That enables us to study skill formation during a time when structural and technical change in England has recently been said to have emerged (Broadberry et al. 2015). To this end, we code the sampled occupational titles using the so-called HISCO-/HISCLASS schemes. The HISCO (Historical International Standard Classification of Occupations), developed by Van Leeuwen et al. (2002, 2004), comprises 1,675 distinct job categories. In a follow-up book, entitled *HISCLASS: A historical international social class scheme*, Van Leeuwen and Maas (2011), building on the expertise provided by Bouchard (1996) and a team of labour historians (to avoid issues of anachronism), applied the principles of the Dictionary of Occupational Titles (DOT) to extract information about the working skills of incumbents of historical occupations coded in the HISCO system. The DOT was developed in the 1930s by the US Employment Service in response to a rising demand for standardised occupational information to assist job-placement activities (US Department of Labor, 1939). In order to efficiently match jobs and workers, the public employment service system required that a uniform occupational language be used in all of its local job service offices. Through an extensive occupational research programme, occupational analysts collected and provided data to job-market interviewers, to help them match the specifications given in job openings to the qualifications of job applicants. Based on the data collected by occupational analysts, the first edition of the DOT was published in 1939, containing some 17,500 job

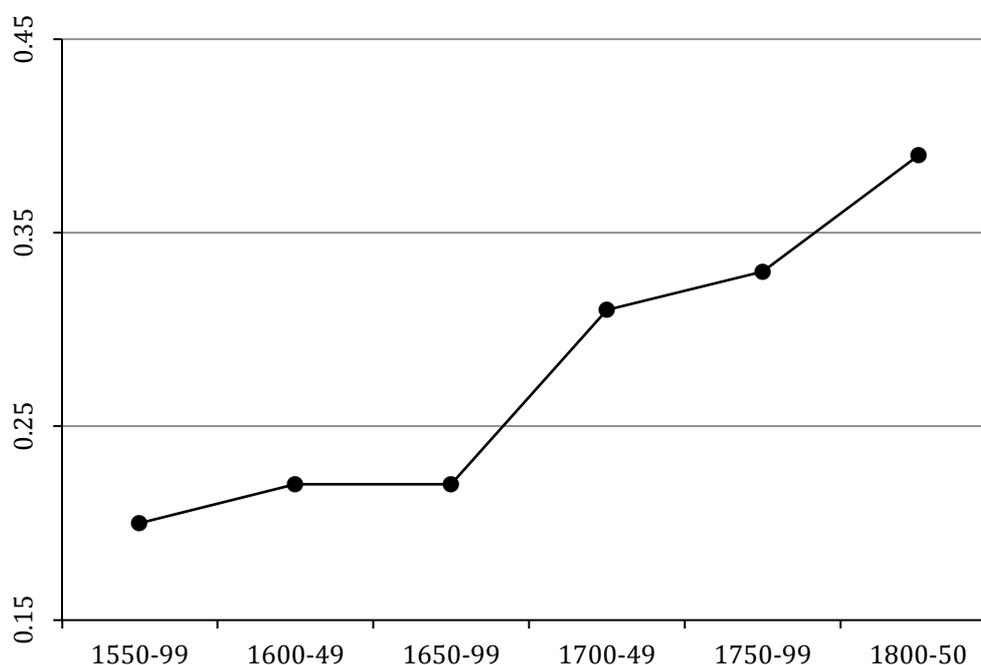
definitions, presented alphabetically, by title, with a coding arrangement for occupational classification.

The transformation of occupational titles into working skills in the HISCLASS scheme builds on two main scores used in the DOT: the *General Educational Development* score and the *Specific Vocational Training* score. The score concerning general educational development captures three key features regarding the intellectual competencies necessary to fulfil the tasks and duties of an occupation: the incumbent's reasoning abilities; his or her ability to follow instructions; and the acquisition of language and mathematical skills needed to conduct the work. The score concerning specific vocational training captures the time investments needed in three main areas: the time required by the worker to learn the techniques necessary for the job; the time needed to acquire the relevant information to conduct the work; and the time necessary to develop the competencies required for an average performance in a job-specific working situation. These abilities implicitly capture any formal (or, as was often the case, informal) training needed to carry out the work.

Van Leeuwen and Maas used the two DOT scores to code the occupational titles categorised in HISCO according to the skill-content of the work, as part of a procedure to create the HISCLASS scheme. In the HISCLASS scheme, occupational titles were grouped into four categories: *unskilled*, *lower-skilled*, *medium-skilled*, or *higher-skilled*. Our sampled workforce contained 284 different occupational titles identified by the HISCO and hence 'codeable' in the HISCLASS scheme. Table A1 in the Appendix lists the most common professions and shows how they are coded in the HISCLASS scheme.

Figure 1

The Share of Unskilled Male Workers, 1550-1850



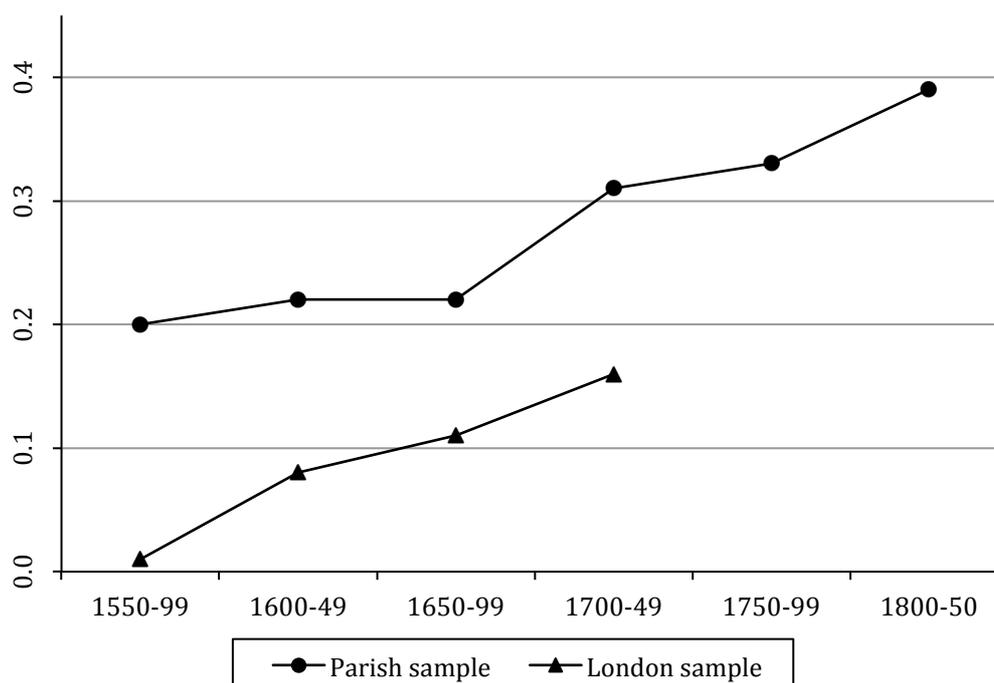
Note: Unskilled workers are workers whose occupational title is labelled 'unskilled' in the HISCLASS scheme (see van Leeuwen and Maas 2011). *Source:* CAMPOP data (see text).

We split our sampled observations into fifty-year intervals covering the period from 1550 to 1850. Figure 1 shows the share of workers in the sampled workforce whose professions were deemed 'unskilled' in the HISCLASS scheme. Table A2 in the Appendix reports the exact shares. Figure 1 speaks a very clear language: up until 1700, the sampled workforce was rather well educated, with only one in five workers coded as unskilled. But between 1700 and 1850 a profound process of deskilling took place, with the share of unskilled workers increasing to two in five workers in the first half of the nineteenth century. In light of the inherent problems discussed above regarding compositional effects and occupational under-recording, there is good reason to believe that the loss of skills observed in Figure 1 is based on a misreading of the data. The remainder of this paper is thus devoted to studying how robust the deskilling result is to controlling for these and other issues.

An obvious explanation for the loss of skills among the sampled workforce is that the sampled parishes are located in the provinces. Thus, it may be that what we observe is that skilled workers simply left the provinces to pursue jobs in urban or industrial centres. Although the sampled parishes include anything from large market towns to rural villages, no large urban centres appear in the sample. Fortunately, work by Newton (2007) and Newton and Baker (2007) allow us to gain a better idea about the evolution of working skills among male workers captured in seven parishes in London. The sampled London parishes combine the very wealthy Cheapside parishes and the much poorer suburb of Clerkenwell. The predominantly merchant and artisanal population of Cheapside remained fairly static over the period in which the parishes can be observed, while that of Clerkenwell, inhabited mainly by migrants, grew substantially to eventually dominate the London sample (exclusively so after 1710). The fact that many of these migrants held low-status occupations already informs us that large numbers of unskilled workers migrated to London during this period. This is confirmed by Figure 2 showing the share of unskilled workers in the London sample compared to that in the provincial parishes. Although the London data only runs up until 1750, it nevertheless informs us that (as expected) the sampled Londoners were even more highly trained than their provincial counterparts before 1600, with barely any unskilled workers among them. However, the share of unskilled workers in London grew remarkably over the period of observation: from 8% in 1600-49 to 16% in 1700-49 (Table A3 in the Appendix). Hence, no immediate support is provided for the possibility of a 'brain drain' from the provinces to the city.

Figure 2

The Share of Unskilled Workers in London and the Provinces, 1550-1850



Note: Unskilled workers are workers whose occupational title is labelled ‘unskilled’ in the HISCLASS scheme (see van Leeuwen and Maas 2011). *Sources:* Province data (Wrigley et al 1997). London data: Newton (2007) and Newton and Baker (2007).

If skilled workers left the provinces, but not for London, did they go, then, to one of England’s industrial centres? Lancashire and Cheshire are known as the birthplaces of the Industrial Revolution, but are not represented by the provincial parishes. The Cambridge Group’s occupational data for Lancashire and Cheshire covering two periods, c. 1725 and c. 1812, can help shed light on this.⁴ Table 2 shows that Cheshire was subject to considerable deskilling: its share of unskilled workers increased from 17% to 34% between 1725 and 1812, fed by declining shares of lower-, medium-, and highly-skilled workers. In Lancashire, despite considerable growth in the size of the workforce, the skill shares were largely constant. As expected, a great deal of the lower-skilled workers in Lancashire consisted of weavers and spinners (23% in 1725 rising to 34% in 1812).

⁴ These data were kindly made available to us by the Cambridge Group, courtesy of Leigh Shaw-Taylor.

There was a modest drop in the share of unskilled workers, from 11% down to 10%, but a comparatively larger growth in the share of lower-skilled workers. The share of medium-skilled workers declined from 40% to 38%, and the share of highly-skilled workers remained constant. Again, no immediate support is provided to the idea that skilled workers moved from the sampled parishes (or elsewhere in England) to the centres of the Industrial Revolution.

Table 2: The Share of Workers by Skill Status

	Un- skilled	Low- skilled	Medium- skilled	High- skilled	<i>N</i>
Lancashire					
c. 1725	0.11	0.48	0.40	0.01	15,486
c. 1812	0.10	0.51	0.38	0.01	79,233
Cheshire					
c. 1725	0.17	0.30	0.51	0.02	7,691
c. 1812	0.34	0.19	0.45	0.01	15,254

Source: Cambridge Data (see text)

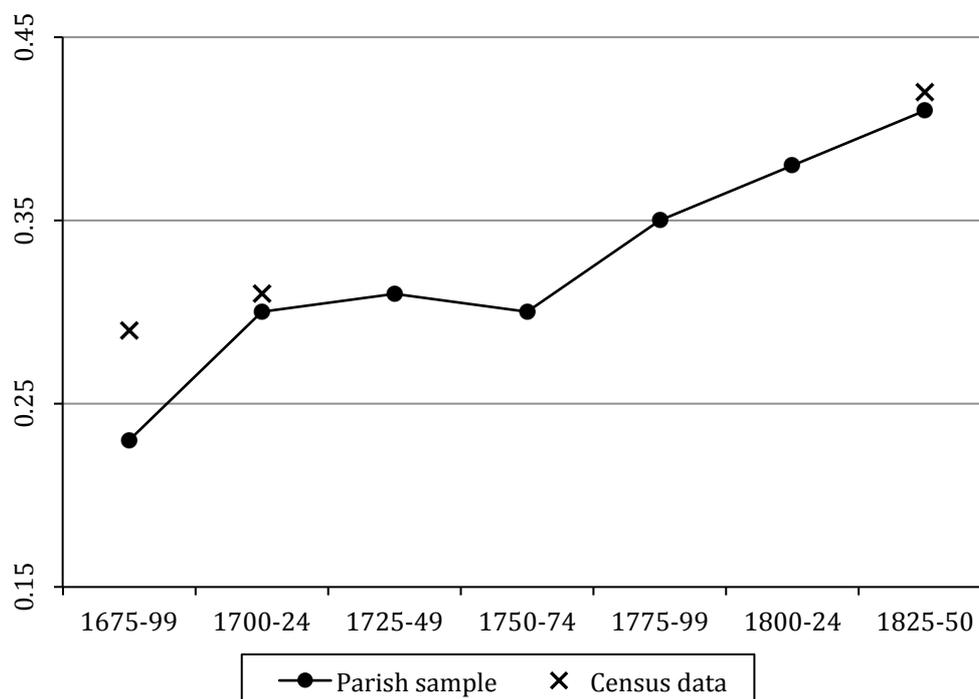
A more general assessment of the representation of the sampled parishes can be made by comparing our sampled workforce with England more broadly. To this end, we undertake three spot checks using occupational information from pre-existing census data and social tables. The English social table of 1688, revised and reported in Lindert and Williamson (1982), can be used to calculate the share of unskilled workers for that year. This social table includes some 1.39 million male workers, of which 29% are classified as ‘unskilled’ in the HISCLASS scheme. Furthermore, the account of Shaw-Taylor et al. (2010) of adult male employment in England and Wales c. 1710 leaves us with 1.48 million workers (after removing ‘gentry’, ‘paupers’ and those of ‘no occupation’). Among these, 31% were coded as ‘unskilled’ workers in the HISCLASS

scheme. Finally, Booth's grouping of the occupational titles included in the 1841 census of the English population provides a share of unskilled workers equal to 42% (Booth 1886). Booth's census data is particularly interesting since it covers the entire English male workforce at the time: 6.63 million men. Figure 3 plots the three independent shares of unskilled workers against our sampled workforce (see the exact numbers in Table A3 in the Appendix). Not only do the independent data compare rather well to ours in terms of shares of unskilled workers; they also follow the same trend, displaying the same episode of deskilling that is captured in Figure 1. Interestingly, our sampled workforce slightly underestimates the shares of unskilled workers in the general population.

The increase in the share of unskilled workers does not tell us whether deskilling was a general phenomenon, or whether it was confined to certain groups of workers. To shed some light on these matters, we now use the HISCLASS scheme to decompose the sampled population into blue-collar and white-collar workers to study the evolution of skills within each group. White-collar work includes semi-professional office, administrative, and sales-coordination jobs, such as 'Clerk', 'Salesman', and 'Manager'. In contrast, blue-collar work refers to jobs requiring manual labour and includes professions in fields such as construction, mining, and farming. Blue-collar workers make up 87% of the sampled population in 1550-99, growing to 91% in 1800-50.

Figure 3

Comparison between the Provinces and Social Tables and Census Data, 1675-1850

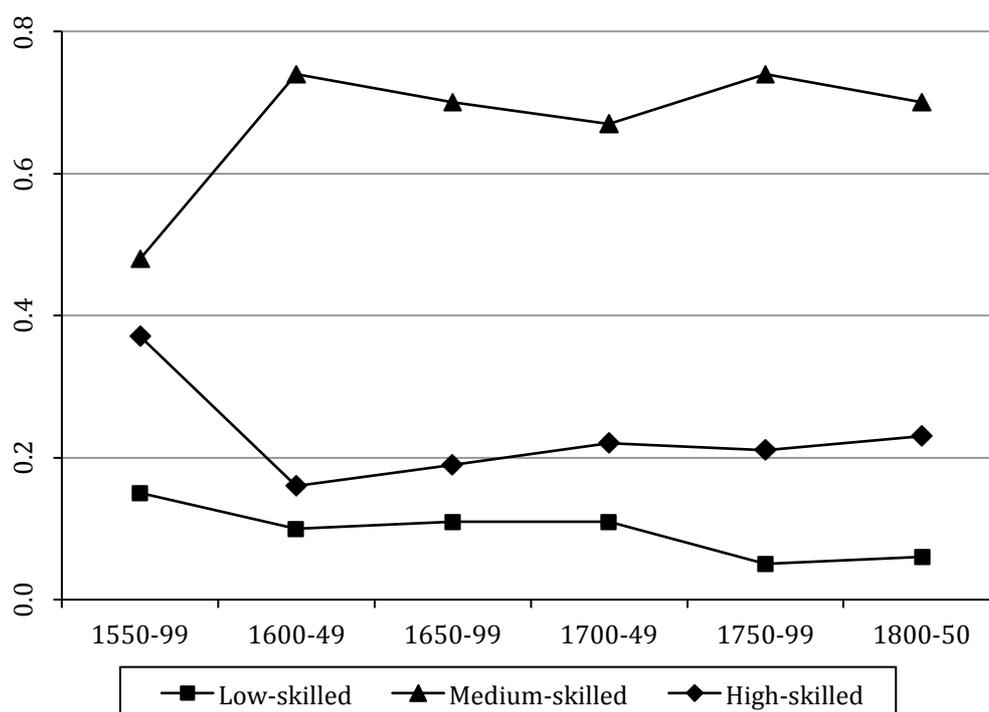


Sources: CAMPOP data (see text); social tables: Lindert and Williamson (1982); church book data: Shaw-Taylor et al (2010); census data Booth (1886).

White-collar workers have no category for unskilled labour in the HISCLASS, so Figure 4 tracks the evolution of the shares of lower-, medium-, and highly-skilled white-collar workers. The share of lower-skilled white-collar workers remains largely constant over time, with one in five workers falling into this category. Among the white-collar workers there were 54-70% that were deemed medium-skilled and 24-33% that were deemed highly-skilled. The early seventeenth century saw a rise in the share of medium-skilled white-collar workers and a comparable fall in the share of lower-skilled white-collar workers (Table A4 in the Appendix). After 1700, the share of medium-skilled white-collar workers rose again, this time fed primarily by a fall in the share of highly-skilled white-collar workers, implying a weak deskilling effect among the white-collar sample during the Industrial Revolution.

Figure 4

The Share of Skills Among White-Collar (Non-Manual) Workers, 1550-1850

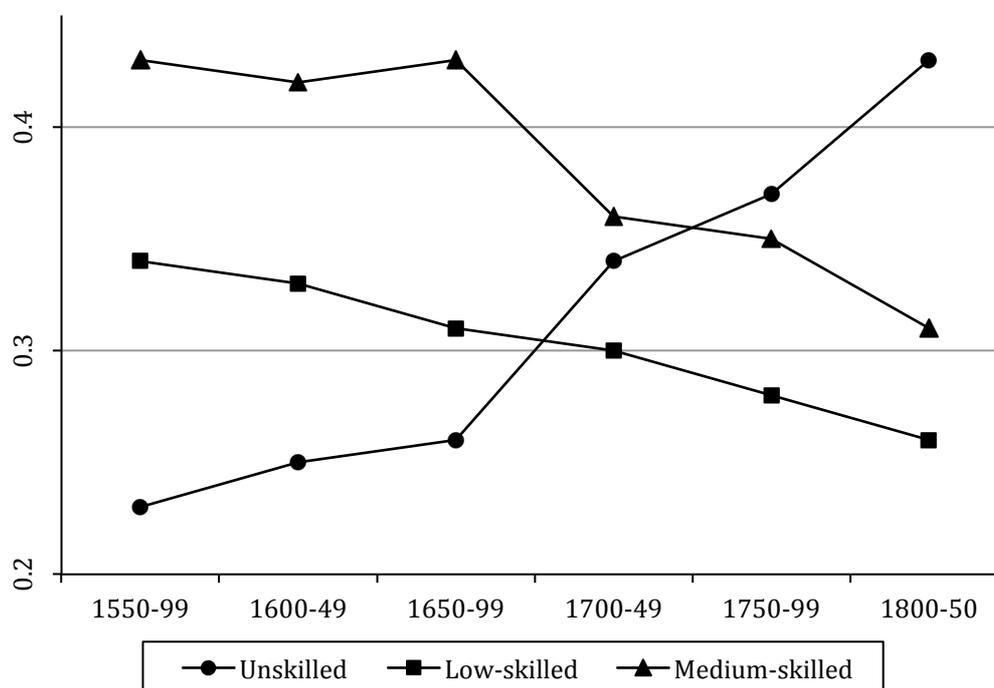


Source: CAMPOP data (see text).

There were far more dramatic changes occurring among blue-collar workers (Figure 5). This group of workers has no category for highly-skilled workers. To begin with, the blue-collar workforce is dominated by medium-skilled workers (42%) and lower-skilled workers (36%), with less than one out of four workers coded as unskilled. Up until 1700, the shares of medium- and unskilled blue-collar workers rose modestly, fed by a falling share of lower-skilled blue-collar workers (see also Table A5 in the Appendix). After 1700, the share of unskilled blue-collar workers rose substantially, from 26% in around 1700 to 42% in around 1850. This came with a modest fall in the share of lower-skilled blue-collar workers (from 31% to 26%) and a considerable drop in the share of medium-skilled blue-collar workers (from 43% to 31%). From this, it is clear that the deskilling was mainly a blue-collar phenomenon.

Figure 5

The Share of Skills Among Blue-Collar (Manual) Workers, 1550-1850



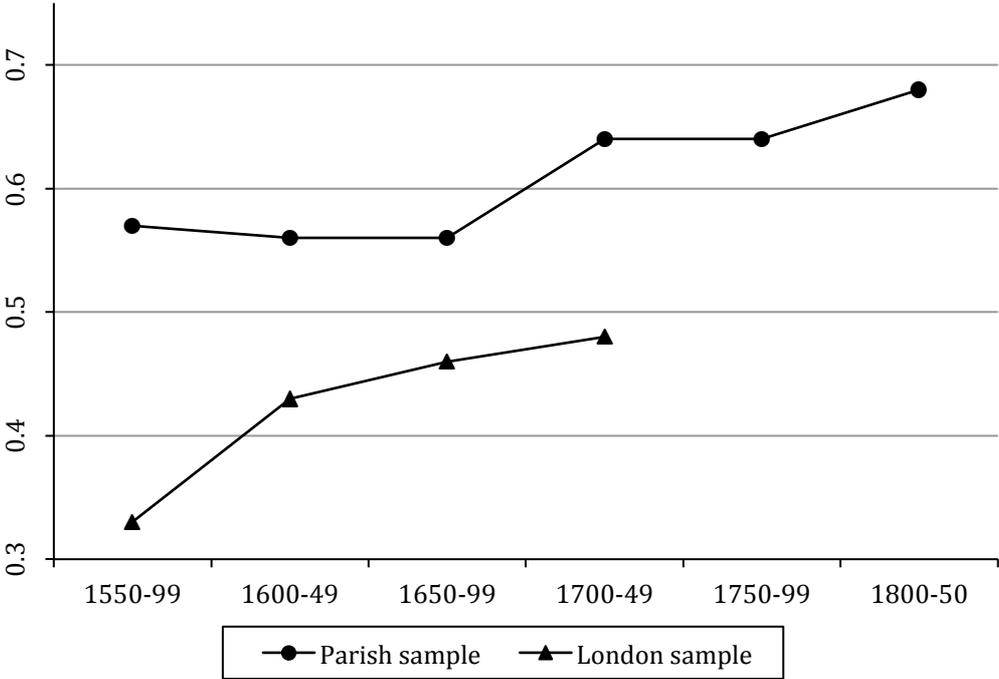
Source: CAMPOP data (see text).

It is no secret that much of the deskilling observed in our data comes from a growing number of men recorded as ‘Labourers’ in the registers. These ‘Labourers’ are likely to have comprised a diverse group of men with a wide range of skill levels, and the mix of the skills may even have changed over time in ways not picked up by occupational data and, hence, by HISCLASS. Also, some would argue that even ordinary labourers were able to accumulate a fair amount of working skills across their life-cycle, and hence that they should eventually be coded as ‘lower-skilled’ workers rather than ‘unskilled’. A simple way in which to deal with this issue is by ‘upgrading’ all labourers to lower-skilled workers. Figure 6 shows the outcome of collapsing lower- and unskilled workers into one group in London and in the provinces, respectively (Table A6 in the Appendix). The graph largely replicates the patterns from Figure 3, with deskilling in

London rising until 1750 (from 29% in 1550 to 43%) and in the provinces after 1700 (from 50% to 63% by 1850).

Figure 6

The Share of Lower- and Unskilled Workers in London and the Provinces, 1550-1850

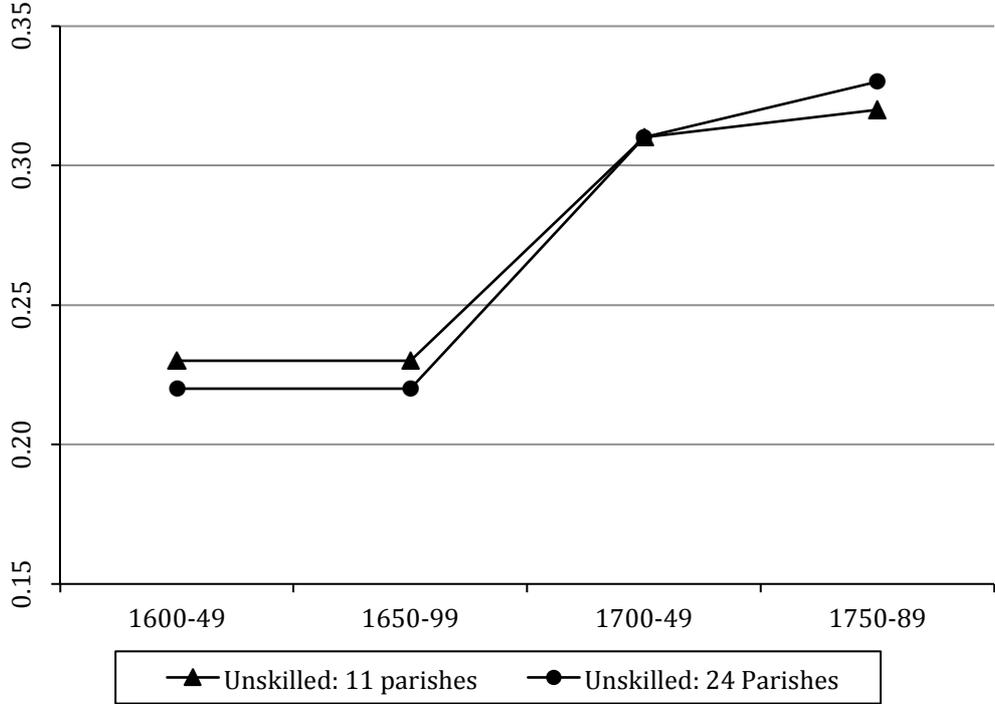


Sources: CAMPOP data (see text); London sample: Newton (2007) and Newton and Baker (2007).

Another well-known issue is that the composition of parishes included in the sample change across the period of observation (Wrigley et al. 1997). This could obviously give rise to compositional effects. For example, deskilling could be caused by the sampled parishes shifting from being locations with relatively few unskilled workers to parishes with relatively many. Fortunately, there are several ways in which to control for such compositional effects. We address the issue formally in the regression analysis below in three ways: (i) by using a sub-sample of 11 parishes, identified by Wrigley et al., that cover the years 1600-1789; (ii) by using a sub-sample of the eight most

populous parishes that cover the entire period of observation, 1550-1850; and ultimately (iii) by investigating those eight parishes individually. An immediate impression that compositional effects are not a big problem is provided by Figure 7. This graph plots the deskilling trend in the full samples against that of the sub-sample containing the 11 parishes that continue during the period 1600-1789, showing that the two samples are reasonably similar (see Table A7 in the Appendix for exact numbers).⁵

Figure 7
Controlling for Compositional Effects, 1600 -1789



Notes: The 24 parishes: Birstall and Shepshed excluded. The 11 parish: see footnote 5. *Source:* CAMPOP data (see text).

⁵ These include Aldenham, Banbury, Bottesford, Colyton, Gainsborough, Gedling, Methley, Odiham, Shepshed, Southill and Terling.

III Regression Analysis

The most appropriate way to deal with the entire set of issues discussed in the previous section is to run regressions that control for them. This also allows us to use the data at the individual level rather than the aggregated level used in the graphs above. Table 3 reports the results of using a standard OLS model to regress the skill-status of the sampled males (i.e. skilled or unskilled in HISCLASS) on a number of explanatory variables that include a mix of individual- and parish-level dummy variables.⁶ Column (1) of Table 3 shows the results of including the entire 26 parishes in the regression. This analysis clearly confirms the deskilling trend observed in Figure 1 above. It shows that the probability of being tagged with an unskilled occupation rises by over 11% between 1550-99 and 1700-50 and by nearly 20% over the entire period. Column (1) also shows that having literacy skills reduces the probability of being unskilled; that migrant workers, i.e. workers not baptised in the parish of observation, were less likely to be skilled; and finally that there is upward occupational mobility over the life-cycle: that is, males were more likely to be unskilled if recorded with an occupation at their marriage rather than later on in life. Many of these conclusions are subject to local variations, which we explore in more detail below.

⁶ The OLS model is used for ease of interpretation; the statistical significances remain if we use a Probit model instead.

Table 3: Dependent Variable: Unskilled Occupation, by Parish Type

Model:	(1)	(2)	(3)	(4)	(5)
OLS	Full sample	Subsample agricultural	Subsample industrial	Subsample retail	Subsample mixed
1550-99	REF	REF	REF	REF	REF
1600-49	0.0349** (-2.32)	-0.105** (-2.01)	0.139*** (-2.59)	-0.0513** (-1.97)	0.0325 -1.58
1650-99	0.0353** (-2.36)	0.0519 -0.97	0.0807 -1.5	-0.0212 (-0.82)	0.0105 -0.51
1700-49	0.112*** (-7.63)	0.219*** -4.55	0.0553 -1.08	0.0321 -1.25	0.130*** -6.27
1750-99	0.131*** (-9.23)	0.202*** -4.11	0.0594 -1.19	0.0788*** -3.05	0.160*** -7.56
1800-50	0.207*** (-14.65)	0.304*** -6.43	0.054 -1.1	0.135*** -5.13	0.261*** -12.56
Baptism occupation	-0.0181** (-2.26)	-0.00827 (-0.28)	0.0191 -1.09	0.012 -0.99	0.024 -1.28
Burial occupation	-0.0554*** (-5.44)	-0.0982*** (-2.62)	0.00446 -0.2	0.0288 -1.57	0.0246 -1.09
Born in parish	-0.0271*** (-5.15)	0.00976 -0.52	-0.0435*** (-4.25)	-0.0313*** (-3.68)	-0.0494*** (-5.51)
Literate male	-0.299*** (-31.63)	-0.429*** (-16.25)	-0.0610*** (-5.38)	-0.426*** (-20.79)	-0.336*** (-18.98)
Agricultural	REF	.	.	.	.
Industrial	-0.311*** (-29.59)	.	.	.	.
Retail	-0.0921*** (-9.15)	.	.	.	.
Other	-0.0661*** (-6.54)	.	.	.	.
Constant	0.478*** -25.35	0.643*** -10.13	0.0251 -0.47	0.458*** -12.27	0.425*** -13.02
Parish FE	NO	YES	YES	YES	YES
R2	0.09	0.15	0.06	0.06	0.13
Obs	30516	3083	4512	12278	10643

Notes: Columns (2) to (4) split the parishes into sub-groups depending on their main economic activity in 1831 following Schofield (2005). The time reference category is the 1550-99 period. The *t*-values are reported in parentheses. The asterisks *, **, and *** denote significance at the 10%, 5%, and 1% level. *Source:* CAMPOP Data (see text).

By dividing the sampled parishes by their main economic activity following Schofield (2005), Column (1) shows that workers in parishes that were predominantly

agricultural (the reference category) were significantly more likely to be unskilled than workers in parishes that had industry or retail and handicrafts as their main activities.⁷ Columns (2) to (5) confirm this pattern by splitting the sampled parishes into sub-groups depending on their main economic activity (and controlling for parish-fixed effects). In parishes dominated by agriculture (meaning the most rural parishes of the sample), the time-period estimates in Column (2) show that the probability of holding an unskilled profession rose by over 30% between 1550-99 (the reference period) and 1800-50. Parishes of mixed activities followed closely, showing that the risk of being unskilled increased by 26% over the same period (Column 5). Parishes dominated by retail and handicrafts saw half as much deskilling (13% increase) and industrial parishes comparatively little (5% increase, insignificant). Columns (2) to (5) also establish that the upward life-cycle mobility is chiefly an agricultural phenomenon, while the underperformance of migrants concerns parishes dominated by non-agricultural activities.

The two main issues discussed above – compositional effects and occupational under-recording – also demand attention. The results reported in Table 4 speak directly to these concerns. First, Column (1) shows the results of using the full sample of 26 parishes and controlling for parish-fixed effects. The estimates are virtually identical to those reported in Column (1) of Table 3, which divided the parishes by their main economic activity. Column (2) of Table 4 goes back to the discussion above about Birstall

⁷ Schofield (2005) divides the 26 parishes into four groups depending on their main economic activity as reported in the 1831 national census. 'Agricultural' parishes include Willingham, Great Oakley, Terling, Aldenham, Ash, Hartland, Morchard Bishop, and Bridford. 'Industrial' parishes include Birstall, Gedling, and Shepshed. 'Retail and handicrafts' parishes include Gainsborough, Lowestoft, Alcester, Banbury, and Dawlish. 'Mixed' parishes include Earsdon, Methley, Bottesford, Austrey, March, Southill, Odiham, Reigate, Colyton, and Ipplepen.

(and Shepshed) in the data section, showing that their exclusion has no critical impact on the deskilling result.⁸

Next, Table 4 addresses the compositional effects that occur because the composition of parishes in the pooled sample changes across the period of observation. Later on we treat the issue of compositional effects in the best way possible, namely by studying the most populous parishes individually. For now, Column (3) of Table 4 reports the results of running the regression with a sub-sample containing those 11 parishes that, according to Wrigley et al. (1997), consistently remain under observation between 1600 and 1789 (see also Figure 7 above).⁹ Note that the time reference period (1600-49) in Column (3) is different from that of the baseline analysis (1550-99) reported in Column (1). That, however, does not deny the fact that the risk of being tagged with an unskilled occupation increased by over 10% between 1600-49 and 1750-89 (Column 3). A broader period coverage can be achieved by narrowing the sample down to the eight most populated parishes that cover the entire period.¹⁰ Column (4) shows that, when we control for compositional effects in this way, the deskilling is both larger and more significant than when we use the full sample (Column 1).

⁸ Birstall and Shepshed were the parishes that distorted the occupational structure of the 26 sampled parishes vis-à-vis the national sample (Wrigley et al. 1997). The deskilling result is also robust to entering Birstall and Shepshed in the regression with reduced weights.

⁹ These are Aldenham, Banbury, Bottesford, Colyton, Gainsborough, Gedling, Methley, Odiham, Shepshed, Southill and Terling.

¹⁰ These are Austrey, Banbury, Bottesford, Earsdon, Gainsborough, Great Oakley, Shepshed, and Southill.

Table 4: Dependent Variable: Unskilled Occupation, Robustness

Model: OLS	(1) Full sample	(2) Not Birstall and Shepshed	(3) Subsample 11 parishes	(4) Subsample 8 parishes	(5) Subsample 95%-criteria
1550-99	REF	REF		REF	REF
1600-49	0.0104 -0.69	-0.00273 (-0.18)	REF	0.0826*** -2.87	0.118** -2.25
1650-99	0.00758 -0.5	0.00508 -0.33	-0.00912 (-0.71)	0.0843*** -2.96	0.167*** -2.62
1700-49	0.0897*** -6.06	0.0952*** -6.26	0.0655*** -5.3	0.195*** -7	0.160*** -3.16
1750-99	0.121*** -8.17	0.128*** -8.31	0.105*** -9.15	0.203*** -7.29	0.184*** -3.65
1800-50	0.197*** -13.26	0.210*** -13.64		0.216*** -7.71	0.218*** -4.35
Baptism occupation	0.00504 -0.58	0.00974 -1.04	0.00047 -0.04	-0.0262* (-1.92)	0.00205 -0.14
Burial occupation	0.0115 -0.98	0.00788 -0.61	0.0246 -1.62	0.0274 -1.37	0.0359 -1.18
Born in parish	-0.0346*** (-6.60)	-0.0323*** (-5.56)	-0.0341*** (-4.72)	-0.0443*** (-5.10)	-0.0318*** (-2.76)
Literate male	-0.292*** (-31.36)	-0.385*** (-32.54)	-0.189*** (-13.47)	-0.125*** (-6.83)	-0.266*** (-13.35)
Constant	0.295*** -11.83	0.356*** -13.62	0.411*** -10.01	0.285*** -8.12	0.388*** -8.19
Parish FE	YES	YES	YES	YES	YES
R2	0.12	0.11	0.10	0.07	0.07
Obs	30516	26171	14589	12441	7129

Notes: Column (2) includes all parishes except Birstall and Shepshed. Column (3) uses a subsample of those 11 parishes that cover the period 1600-1789. Column (4) includes the eight parishes cover the entire period. Column (5) include the same eight parishes, but only those years in which 95% or more of the males had an occupational descriptor. The time reference category vary by sample. The *t*-values are reported in parentheses. The asteriks *, **, and *** denote significance at the 10%, 5%, and 1% level. *Source:* CAMPOP Data (see text).

However, we are still confronted with perhaps the most critical problem, namely that of occupational under-recording. In addressing this, Column (5) reports the results

of using the same eight parishes as used in Column (4). But this time we only include those years where 95% or more of the recorded males had an occupational descriptor. If the deskilling observed in Column (4) was caused entirely by a growing proportion of low-status males being tagged with an occupation over time, then the magnitude of the time-estimates reported in Column (5) after 1500-49 would not be statistically different from that observed in 1500-49 (the reference period). Reassuringly, that counterfactual is incorrect: the deskilling result remains *regardless* of whether we impose the 95% criteria or not. This finding thus establishes that the sub-group of eight parishes do not suffer from any under-recording of lower-status occupations early during the period.

When we adjust for occupational under-recording, the estimates show that most of the deskilling occurred before 1700. That conclusion could, however, be caused by compositional effects created *this time* by imposing the 95% criteria. This is so because the eight parishes may not meet the 95% criteria during the same years. The only way to completely eliminate this potential problem is to run the regression for the eight parishes individually (and of course still uphold the 95% criteria). Glancing over the results of doing this, reported in Table 5, confirms that deskilling was the rule rather than the exception: the likelihood of being tagged with an unskilled profession in 1800-50 was always markedly higher (with one exception) than in the (varying) time reference periods. This is true of Austrey (25% increase), Banbury (10% increase), Bottesford (21% increase), Earsdon (12% increase), Gainsborough (14% increase), Great Oakley (23% increase) and Southill (5% increase). Hence, the loss of skills is clearly evident in the data also after dealing with the issues discussed above.

Table 5: Dependent Variable: Unskilled Occupation, by Parish

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Model:	Austrey	Banbury	Bottesford	Earsdon	Gainsb.	Great Oakley	Shepshed	Southill
OLS	95%- criteria Mixed	95%- criteria Retail	95%- criteria Mixed	95%- criteria Mixed	95%- criteria Retail	95%- criteria Agriculture	95%- criteria Industrial	95%- criteria Mixed
1550-99	REF							
1600-49	-0.0356 (-0.51)		REF		REF	REF	REF	
1650-99	0.179 -1.51		.		0.103 -1.54	0.145 -1.39	-0.0718 (-0.61)	REF
1700-49	0.126* -1.78	REF	.	REF	0.169*** -2.74	0.383*** -7.02	-0.170** (-2.43)	0.0579 -0.47
1750-99	0.0892 -0.91	0.0521** -2.06	0.0135 -0.18	0.142** -2.28	0.115*** -3.29	.	.	0.0635 -0.46
1800-50	0.272*** -4.16	0.104*** -3.69	0.206*** -3.09	0.120* -1.78	0.144*** -2.71	0.231*** -3.29	-0.154** (-2.57)	0.0529 -0.43
Baptism occupation	-0.128** (-2.13)	0.0688*** -3.06	0.03 -0.53	0.0258 -0.2	-0.0558* (-1.84)	-0.221*** (-2.69)	0.00742 -0.16	0.102 -0.59
Burial occupation	0.244** -2.2	0.0251 -0.28	-0.011 (-0.15)	0.132 -0.93	-0.074 (-1.29)	-0.0299 (-0.21)	-0.0542 (-0.66)	0.0594 -0.31
Born in parish	-0.0291 (-0.58)	-0.000762 (-0.04)	-0.0369 (-0.74)	-0.0829** (-2.39)	-0.0451 (-1.63)	0.083 -1.11	-0.0504 (-1.27)	0.0291 -0.78
Literate male	-0.381*** (-3.36)	-0.401*** (-13.24)	-0.505*** (-5.72)	0.0138 -0.32	.	-0.497*** (-4.35)	-0.0912** (-2.13)	-0.727*** (-3.85)
Constant	0.543*** -4.93	0.456*** -11.83	0.625*** -5.97	0.178 -1.56	0.302*** -7.89	0.411*** -3.67	0.394*** -4.56	0.739*** -3.73
R2	0.12	0.08	0.12	0.02	0.11	0.12	0.04	0.06
N	406	2605	352	831	1282	225	613	812

Notes: The results concern those years when 95% or more of the males had an occupation descriptor. The fourth row reports the main economic activity of the parish in 1831 following Schofield (2005). The time reference category varies by parish. The *t*-values are reported in parentheses. The asterisks *, **, and *** denote significance at the 10%, 5%, and 1% level. Source: CAMPOP Data (see text).

Two things are worth noting at this point. First, the large rise in the risk of being unskilled in Great Oakley confirms the previous finding (but this time with the 95%

threshold) that parishes dominated by agriculture, such as Great Oakley, are especially prone to deskilling (see also Table 3, Column 2). Second, the only exception to the rule of deskilling, namely Shepshed, saw the likelihood of being unskilled *decline* by over 15% between 1600-49 (the reference period) and 1800-50. Interestingly, Shepshed is also the only parish in the sub-sample of eight with over 50% of its male workforce employed in manufacturing in 1831 (Wrigley et al. 1997, p. 43). This confirms our previous observation (Table 3, Column 3) that parishes dominated by industry were less subjected to a loss of skill than parishes not dominated by industrial activities. Also, and interestingly, most of Shepshed's skill-formation occurred during the seventeenth century rather than during the classical years of the Industrial Revolution.

VI A Closer Look

The deskilling observed above raises important questions about its sectorial origin. Was the loss of skill mainly an agricultural phenomenon, or was it one of industry? And, in either case, can we shed light on the main driving force behind the loss of skill? Our findings above show that workers observed in those parishes that Schofield (2005) has identified as predominantly agricultural were more prone to lose their skills than those recorded in parishes mainly engaged in industry. That conclusion rests, however, on a crucial assumption, implicitly made by Schofield (2005), about how to allocate the unskilled 'labourers' whose work cannot be classified and, hence, identified by sector of employment. Previous studies have struggled, inconclusively, with the same problem (e.g. Broadberry et al. 2015; Shaw-Taylor 2012).

One way forward is to separate out those occupations that we *can* actually categorise by sector. That approach allows us to study the loss of skill within the main

sectors of production that is *not* driven by a rising number of 'labourers'. Of course, the more we break down the data, the fewer observations will be available for analysis. Two further complications are that we still wish to uphold the 95% criteria to avoid occupational under-recording, and that we wish to study the parishes individually to avoid compositional effects. These restrictions leave us with a rather scant amount of data. Still, two of the largest parishes in the sample, Banbury and Gainsborough, contain enough occupational information to be made subject to closer inspection.

Although Banbury and Gainsborough are in principle observed across the entire period, 1550-1850, neither provides sufficient information to invoke the 95% criteria over the full 300 years. Gainsborough supplies what seems to be an adequate number of observations for the period 1600-1750 (Table 5, Column 5), and the same is true for Banbury for the period 1700-1850 (Table 5, Column 2). Conveniently for our analysis, Gainsborough experienced a large shift of labour away from agriculture in the period 1600-1750, which coincided with a large episode of deskilling in this parish. Our analysis below may thus shed light on whether Gainsborough's loss of skill is only linked to its declining primary sector or also to organisational changes within this sector. Similarly, Banbury had a relatively large share of workers employed in its manufacturing sector in the period 1700-1850 (close to 50% not including the 'labourers') and experienced deskilling over the same years. This can help inform us whether or not some of the loss of skill in Banbury is explained by the Goldin-Katz workshop-to-factory hypothesis (Goldin and Katz 1998).

Table 6 illustrates the occupational structures for Gainsborough and Banbury during the relevant years mentioned above. For each of the parishes, the occupational

titles are divided into four groups: one group for each of the three main sectors – primary, secondary and tertiary – and one group including the uncategorised ‘labourers’. The categorised occupational titles were classified by sector using the PST system developed by Wrigley (2010). Within each sector, the occupational titles were then divided into the four major skill-groups in HISCLASS: high-, medium-, low-, and unskilled workers. Table A1 in the appendix provides an overview of the most frequent occupations and how they were categorised by skill.

Looking at the group of unskilled, uncategorised ‘labourers’ first, it is clear that both parishes saw rising shares: about 7-8 percentage points over the two respective periods (Table 6, top row). Our main interest here, however, concerns the skill developments *within* the main sectors of production. In Gainsborough, the share of the workers engaged in primary activities declined between 1600-49 and 1700-49, from 23% to 7% of the sampled workforce (Columns 1 and 2). Note that, even if we allocate the entire group of uncategorised ‘labourers’ to primary activities, Gainsborough’s agricultural sector would still decline, from 40% to 31%, during this period. Indeed, Gainsborough’s shrinking primary sector aligns with recent work on England’s early structural transformation, which documents a considerable shift of labour out of agriculture taking place many years prior to 1750 (Broadberry et al. 2015). The corresponding rise in the size of the non-agricultural sectors in Gainsborough also accords with evidence of GDP per capita growth in England, which is shown to have appeared long before of the classic years of the Industrial Revolution (Broadberry et al. 2015; Nuvolari and Ricci 2013).

Table 6: Skill-structures in Gainsborough (1600-1750) and Banbury (1700-1850)

Sector:	Skill-level:	Gainsborough		Banbury	
		(1) 1600-49	(2) 1700-49	(3) 1700-49	(4) 1800-50
Unknown	Labourer (unskilled)	17.2	33.3	20.8	28.5
	<u>Share of workforce</u>	<u>17.2</u>	<u>33.3</u>	<u>20.8</u>	<u>28.5</u>
Primary	Unskilled	6.6	20.1	25.6	48.3
	Low-skilled	70.1	20.0	28.2	0.0
	Medium-skilled	23.3	59.9	35.9	44.5
	High-skilled	0.0	0.0	10.3	7.2
	<u>Share of workforce</u>	<u>23.1</u>	<u>4.6</u>	<u>9.0</u>	<u>6.7</u>
Secondary	Unskilled	11.5	19.8	1.6	11.6
	Low-skilled	30.0	20.1	38.8	28.2
	Medium-skilled	58.5	60.1	59.6	60.2
	<u>Share of workforce</u>	<u>48.5</u>	<u>49.1</u>	<u>56.4</u>	<u>48.3</u>
Tertiary	Unskilled	16.7	0.0	1.7	3.7
	Low-skilled	3.3	7.2	25.0	29.7
	Medium-skilled	73.4	57.1	60.0	57.9
	High-skilled	6.6	35.7	13.3	8.7
	<u>Share of workforce</u>	<u>11.2</u>	<u>13.0</u>	<u>13.8</u>	<u>16.5</u>

Source: Cambridge Data (see text)

Columns (1) and (2) of Table 6 also establish that Gainsborough's agricultural sector was subject to deskilling *even* when we exclude the unskilled, uncategorised 'labourers'. The share of low-skilled workers employed in agriculture drops from 70% to 20%, while the share of unskilled workers rises from 6% to 20%. Some skill-formation did take place, however, in the form of a rising share of medium-skilled workers, from 33% to 60%. This suggests that organisational changes took place in

agriculture, which needed more unskilled workers *and* medium-skilled workers at the cost of lower-skilled ones. Drilling further into the data informs us that much of this change was caused by lower-skilled cottagers and husbandmen virtually disappearing between 1600 and 1750, dropping as a share of the primary workforce from over 12% to less than 1%. This development was counterbalanced by rising shares of unskilled workers (e.g. 'Farm worker', 'Forestry worker', 'Gardener', 'Groom', 'Hostler', 'Shepherd', etc.) and medium-skilled farmers and thus suggests a concentration of land following a change from peasant to large-scale commercial farming.

Gainsborough's manufacturing sector shows similar trends, with a loss of skills in the shape of fewer lower-skilled workers (30% to 20%) and more unskilled ones (12% to 20%). Note that 'labourers' are still excluded from the analysis. The share of medium-skilled workers remains largely constant (59% to 60%). The service sector, contrastingly, shows remarkable evidence of skill *formation*. Contrary to the development of Gainsborough's primary sector, unskilled tertiary-sector workers effectively disappear (17% to 0%) and medium-skilled workers decline markedly (73% to 57%). This is offset by a modest rise in lower-skilled workers (3% to 7%) and an extraordinary rise in higher-skilled workers (7% to 36%). Deskilling in the tertiary sector could of course in principle have emerged if a sufficiently large number of the uncategorised 'labourers' were employed in services (which we would not expect to be the case). What we can be sure of, though, is that the overall deskilling observed in Gainsborough (Column 5 of Table 5) was driven by a loss of skills in agriculture *and* industry, and that this is true regardless of how the unskilled, uncategorised 'labourers' were *actually* employed by sector.

Turning to Banbury (Columns 3 and 4 of Table 6), less than 10% of the sampled workforce was engaged in primary activities by the beginning of the 18th century (still excluding 'labourers'). Even if we allocate the entire group of 'labourers' to the primary sector, the bulk of Banbury workers were still involved in non-agrarian activities during the classical years of the Industrial Revolution. Banbury's manufacturing sector, net of 'labourers', remained largely constant and employed roughly half the workforce, while services kept around 15% of the sampled males busy. The changes in the skill-structures within Banbury's primary and secondary sectors between 1700 and 1850 in many ways looks remarkably similar to those observed in Gainsborough between 1600 and 1750, with the replacement of lower-skilled workers by unskilled ones and with modest growth in the shares of medium-skilled workers. By contrast to Gainsborough, even Banbury's tertiary section saw deskilling in the form of higher- and medium-skilled workers being replaced by lower- and unskilled ones. So the average loss of skill observed in Banbury (Column 2 of Table 5) applied to all three main sectors of production, regardless of how the unskilled, uncategorised 'labourers' were actually distributed across the economy.

A closer look at the most common occupations in Banbury's secondary sector shows that craftsmanship declined between 1700 and 1850. A common lower-skilled profession such as 'weaver' dropped from 9.2% to 5.9%, and 'tanners' and 'dyers' jointly fell from 1.6% to 0.5% of the sampled workforce. Medium-skilled artisan professions, such as 'smith', fell in importance, from 4.8% to 2.8%. The halving in the demand for this sort of craftsmanship and artisanal employment fits well both with Goldin and Katz's workshop-to-factory hypothesis and with Allen's idea that highly-paid skilled workers incentivised the mechanisation of Britain (Allen 2009; Goldin and Katz 1998). The

declining shares of lower- and medium-skilled manufacturing workers and growing shares of unskilled workers, including ‘factory workers’, also motivated the rise of resistance groups in the early 19th century, such as the Luddites,¹¹ underpinning why skilled workers were afraid that factory production would render their skills redundant (Nuvolari 2002). These findings also link to studies on the formation of skills inferred from trends in the skill premium, i.e. the wage rate paid to unskilled workers relative to skilled ones (e.g. Williamson 1985; Clark 2005; Van Zanden 2009; Allen 2009). In a basic supply and demand framework, skill-premia and occupational composition can be seen as reflecting price and quantity dimensions of the overall labour market. Allen’s evidence showing that the real wages in the first half of the nineteenth century stagnated while output per worker expanded (Allen 2009) thus aligns with the episode of deskilling we observe.

On the other hand, the replacement of craftsmen and artisans by machines would arguably have increased the demand for ‘high-quality workmen’, such as instrument makers, joiners, turners, engineers, mechanics, and wrights (i.e. machine erectors and installers). According to Mokyr (2009) and Meisenzahl and Mokyr (2012), these professions were necessary to manage the technical innovations that the Industrial Revolution entailed. The Banbury data show that ‘carpenters’, ‘joiners’, ‘turners’, and ‘wrights’ grew modestly, from 11% to 14% of the manufacturing workforce between 1700 and 1850. Similarly, new occupational titles emerging in Banbury in the same period, including ‘engine operators’ and ‘watch-makers’, came to make up nearly 3% of the Banbury manufacturing workers by 1800-50. This lends credence to the notion that industrialisation through mechanisation demanded more high-quality professionals.

¹¹ Ned Ludd, the legendary figurehead of the Luddites, supposedly lived and worked in Anstrey, which is located not far from Banbury (Hammond and Hammond 1919).

IV Conclusion

Early modern England underwent significant transformations in terms of structural and technical change. But what happened to the use of working skills in productive activities during these transformations? Previous work has relied on trends in literacy rates or skill-premia to try to quantify the formation of human capital during England's Industrial Revolution. These measures are, however, either very crude proxies for the acquisition and, even more so, the application of working skills in productive activities (such as literacy rates). Or they provide a rather indirect measure of human capital formation (such as skill-premia).

In this paper, we combine a novel use of the occupational titles recorded in the Cambridge Group's 26 historical parish registers with a new approach to quantifying human capital used in productive activities. Specifically, we employ the HISCLASS scheme to code the sampled occupational titles according to their skill content and then trace the evolution in the share of unskilled workers across three centuries of English history, from the second half of the sixteenth century to the first half of the nineteenth century.

We find that the risk of being tagged with an unskilled occupation rose considerably across those three centuries, from 20% to almost 40%. This loss of skill finding is robust to dealing with issues arising from compositional effects and from unsystematic recording of occupations. The likelihood of being listed as unskilled varied across the sampled parishes, in time and in extent, depending on the main economic activity of the parish and on the literacy status and migration history of the sampled individuals. Parishes identified by Schofield (2005) to be dominated by industrial

activities saw less deskilling on average than those dominated by retail and handicrafts and, especially, agriculture. But, above all, deskilling in the sampled parishes was the rule rather than the exception.

A closer examination of the skill-structures in two of the largest parishes, Banbury and Gainsborough, showed that the loss of skill was not limited to a single sector of production. Rather, it was found in agriculture and industry alike, and sometimes also in the service sector. In Gainsborough, the disappearance of low-skilled husbandmen and cottagers occurred in parallel with a growth in the shares of unskilled farm workers and farmers, and suggests that deskilling in agriculture emerged from organisational changes linked to land concentration. This occurred in combination with a shift of labour out of agriculture.

In Banbury, a parish dominated by retail and handicraft activities during the classic period of the Industrial Revolution, deskilling came in the form of a decline in craftsmanship and artisanal production, as predicted by Goldin and Katz (1998). This motivated the rise of the Luddites, a group of machine-breaking artisans who carried out their activities in the name of their leader Ned Ludd (Nuvolari 2002). While our data supports the workshop-to-factory hypothesis, it is important to note that an additional process of deskilling could have occurred *within* a given profession, which is something that the HISCLASS scheme is unable to detect. For example, a seventeenth-century tailor would have been a highly skilled artisan making bespoke clothes, but in the nineteenth century he may have been a sweatshop operative undertaking only a small part of the production process. Similarly, an eighteenth-century weaver was likely to be male and

quite often a highly skilled, independent craftsman, but by the mid nineteenth century a weaver was more likely to be a female factory operative with fewer skills.

Some skill formation did emerge in manufacturing captured by the rising shares of 'high-quality workmen' thought necessary to facilitate the Industrial Revolution (Mokyr 2012). This resonates with van der Beek's demonstration that the number of apprenticeships among these professions increased during the eighteenth century (van der Beek 2012) and with the evidence provided by Squicciarini and Voigtländer (2014) that the French Industrial Revolution was not achieved by an accumulation of skills among the average worker, but by the ingenuity and technical ability of a minority. It also squares with the theory proposed by O'Rourke et al. (2013) showing how technical progress during the early stages of industrialisation can be skill saving and skill demanding at the same time.

The sampled workforce makes up a minute (and possibly even biased) fraction of the entire English workforce at the time. Still, if the loss of skill observed in our sample applies more broadly, then it not only highlights the need for a deeper understanding of the impact of early modern England's structural and technical transformations on the demand for skilled workers, but also reinforces the pessimistic interpretation of early modern living standards in England. Indeed, working hours went up (Voth 1998, Allen and Weisdorf 2011); child labour increased (Humphries 2010); heights declined (Cinnirella 2008); and wages stagnated (Clark 2007). The loss of skill would certainly have contributed to a less stimulating work-life among English labourers.

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Appendix

Table A1

Examples of Coding of Occupational Titles in HISCLASS

Skill-level	Occupational Titles
Unskilled:	Boatman, chapman, chimney sweeper, clothier, hostler, porter, suckler, warrener, farm worker, factory worker
Low-skilled:	Barber, basket maker, brick maker, builder, coachman, carder, cottager, shepherd, dairyman, dyer, fisherman, gardener, weaver, glover, needle maker, painter, thatcher, postman, sawyer, servant, soldier, spinner, stonecutter, turner, clerk
Medium-skilled:	Baker, brewer, butcher, carpenter, chandler, cook, clock maker, cutler, dealer, farmer, glazier, innkeeper, maltster, mason, miller, millwright, looker, plumber, printer, saddler, sergeant, shoemaker, smith, tailor, yeoman
High-skilled:	Apothecary, attorney, bailiff, captain, chemist, clergyman, doctor, lieutenant, rector, surgeon

Table A2

The Shares of Lower- and Unskilled Workers, Provinces

	Unskilled	Lower- and Unskilled	N
1550-99	0.20	0.52	986
1600-49	0.22	0.51	2,879
1650-99	0.22	0.51	3,089
1700-49	0.31	0.59	4,528
1750-99	0.33	0.59	6,708
1800-49	0.39	0.63	9,816
			28,006

Table A3

The Share of Unskilled Workers: Social Tables and Census Data

	Unskilled: CAMPOP	<i>N</i>	Unskilled: Social tables	<i>N</i>
1675-99	0.23	1,698	0.29	1,390,586
1700-24	0.30	2,372	0.31	1,482,803
1825-50	0.41	4,558	0.42	6,630,700

Table A4

The Share of Workers by Working Skills, White-Collar Workers

	Low- skilled	Medium- skilled	High- skilled	<i>N</i>
1550-99	0.15	0.48	0.37	124
1600-49	0.10	0.74	0.16	371
1650-99	0.11	0.70	0.19	431
1700-49	0.11	0.67	0.22	476
1750-99	0.05	0.74	0.21	644
1800-49	0.06	0.70	0.23	863
				2,909

Table A5

The Share of Workers by Working Skills, Blue-Collar Workers

	Unskilled	Low-skilled	Medium- skilled	<i>N</i>
1550-99	0.24	0.35	0.41	1,052
1600-49	0.24	0.33	0.43	2,402
1650-99	0.27	0.30	0.43	2,773
1700-49	0.33	0.31	0.36	4,139
1750-99	0.36	0.29	0.35	5,954
1800-49	0.43	0.26	0.31	8,742
				25,062

Table A6
The Shares of Lower- and Unskilled Workers, London

	Unskilled	Lower- and Unskilled	<i>N</i>
1550-99	0.01	0.28	151
1600-49	0.08	0.38	181
1650-99	0.11	0.41	398
1700-50	0.16	0.43	985
			1,715

Table A7
The Shares of Unskilled Workers, 11 and 25 Parishes

	Unskilled: 11 parishes	<i>N</i>	Unskilled: 25 parishes	<i>N</i>
1600-49	0.23	2,041	0.22	2,879
1650-99	0.23	2,093	0.22	3,089
1700-49	0.31	2,833	0.31	4,528
1750-89	0.32	4,101	0.33	5,306
		11,068		15,802