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Industrialization and Intergenerational Mobility in Sweden

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ABSTRACT

The relationship between industrialization and intergenerational mobility has been a topic of discussion for over forty years. In this article both total mobility and relative mobility chances are studied in the decades preceding industrialization and the decades during industrialization. A high-quality data set is used covering the male population of a region in the north of Sweden during the 19th century. Total intergenerational mobility increased during industrialization until, at the end of the century, both industrialization and the growth of mobility stagnated. Sectorial barriers resulted in unequal relative mobility chances before and also during industrialization. However, sons from self-employed classes were less likely to inherit the class position of their father after the onset of industrialization. At the same time, mobility between classes differing in status became less frequent. These results show a decline in the importance of the direct transfer of resources between generations and may indicate the increasing importance of education.

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1. Introduction

According to the 'logic-of-industrialism' school, industrial societies are characterized by more equal relative mobility chances and higher total mobility than pre-industrial societies (Kerr 1960). In industrial societies, production methods are continuously changing, requiring employees to change jobs during their lifetime, and children to have jobs that are different from those of their parents. Instead of traditional caste, racial groups, gender, or family status, education is becoming the principal means of assigning persons to occupations. Industrial society thus becomes an 'open' society. Forty years after this firm statement was made, however, there are still a number of unresolved issues – both empirically and theoretically – surrounding the relationship between industrialization and intergenerational mobility.

Research findings do not unequivocally show higher total mobility rates in countries after industrialization than before or during

industrialization (cf. van Dijk et al. 1984; Fukumoto & Grusky 1993; Kaelble 1985; van Leeuwen & Maas 1996; Makowski 1993; Miles & Vincent 1991). One reason for this may be that the relationships between industrialization, the changing occupational structure and total mobility are not as sketched by the logic-of-industrialism thesis. Secondly, it may be the case that industrial societies are not more open, in the sense of having more equal relative mobility chances, than pre-industrial societies. Thirdly, the inconsistent findings may be due to measurement errors. Total mobility numbers are vulnerable to sample selectivity problems and changes in research designs. Though total mobility numbers are perhaps easier to calculate than relative mobility rates, it is definitely more difficult to attain reliable numbers. We will first elaborate on the relationships between industrialization, the changing occupational structure and total mobility, and turn to changes in openness later.

It seems, in the first place, unlikely that

industrialized societies change as much as predicted in the logic-of-industrialism thesis. On the contrary, nowadays, industrialized societies are often described as very stable, offering lifetime jobs to most of their employees (e.g. Mayer 2001). Besides, changes in total mobility are only to be expected if the occupational distribution is changing at an increasing or decreasing speed. Stable pre-industrial and industrial societies could just as well show similar levels of total mobility. This is also the case in societies in which the occupational structure changes, as long as the pace of change is more or less regular. Combining these two arguments, we can predict that total mobility should indeed increase during the first phase of industrialization. In this period the pace of change in the occupational structure increases per definition. During industrialization there may be periods of accelerating change. It is, however, unlikely that an industrial society changes with the same speed as an industrializing society. At the end of the industrialization process, therefore, inevitably a period of decreasing speed of change, and therefore lower total mobility, will come.

For a proper test of this modified hypothesis it is necessary either to observe mobility rates before, during and after industrialization, or to have good measurements of the speed of industrialization. Even then, we may fail to observe the predicted relationship between a changing occupational structure and total mobility, because the changing demand for certain occupational groups can be solved in other ways than by intergenerational mobility. Career mobility, in- and out-migration and changing class-specific fertility may disturb the relationship between pace of industrialization and total mobility.

A second reason for the inconsistencies in findings on the relationship between industrialization and total mobility may be that industrial societies do not have more equal relative mobility chances than pre-industrial societies. Empirically, consensus has not yet been reached. There has been a dearth of research comparing relative mobility patterns (also called social fluidity) within the pre-industrial and industrializing phase, or the industrializing and industrial phase of the same society (there is more research comparing pre-industrial and industrial societies at one moment in historical time – e.g. Ganzeboom et al. (1989) – this is, however, not the same issue). Studies that compare social fluidity in one country at

different stages of industrialization reach conclusions varying from ‘increasing social fluidity’ (van Leeuwen & Maas 1996; Miles 1999) to ‘no change in relative mobility’ (Fukumoto & Grusky 1993; van Leeuwen & Maas 1997) and ‘some mobility barriers weaken, some get stronger’ (Van Bavel et al. 1998) to ‘decreasing social fluidity’ (Guest et al. 1989; de Sève & Bouchard 1994).

There is more research comparing relative mobility patterns over time in societies that have passed the stage of early industrialization. But it is still a debated issue whether the association between class of origin and class of destination changes over time (cf. e.g. Erikson & Goldthorpe 1992 and Ganzeboom et al. 1989). From these studies it is clear that change – if any – is slow and research covering a long stretch of time is needed to make it visible.

The theoretical relationship between industrialization and relative intergenerational mobility chances has been described by Treiman (1970). He gives a number of reasons why relative intergenerational mobility chances can be expected to be more equal for members of different social classes in industrial societies. The greater demand for highly skilled workers leads to more selection on the basis of achieved characteristics, such as education and experience, and less selection on the basis of ascribed characteristics. Besides, educational participation broadens knowledge of alternative occupational careers and provides individuals with the social skills necessary to follow these alternative routes. Through the distribution of mass communication, lifestyle differences between classes become smaller, aspirations may become more alike, and there are fewer reasons for discrimination. Urbanization and a higher rate of geographical mobility, often accompanying industrialization, force individuals to make a career on the basis of their own talent instead of relying on family.

In an opposing view, however, it is stated that elites will continue to secure the better positions in societies for their own children in industrial societies exactly as they did in pre-industrial societies (Bourdieu & Passeron [1977] 1994; Collins 1971). The persistent association between family background and educational achievement in many societies offers support for this view (Shavit & Blossfeld 1993). In combination with the strengthening of the association between own education and achieved occupational status – as predicted by Kerr (1960) and Treiman (1970) alike – relative

intergenerational mobility chances may stay as unequal as before.

Finally, it is unclear whether changes in relative mobility in industrialized or industrializing societies are actually caused by industrialization. Especially in the later phases of industrialization, other potential determinants of equal mobility chances – such as democratization, a social-democratic government, and educational reforms – also change. Only a few studies relate relative mobility to a measure of industrialization and these measures are often highly correlated with other potentially explanatory factors.

In this article, we will not be able to resolve all these issues. Our main aim will be to compare total and relative rates of intergenerational mobility over a long period of time including the decades before and the decades during industrialization. The data are of excellent quality and refer to the total population of a region in the north of Sweden. They provide reliable data, not only on relative, but also on total mobility. The contribution of our analyses to the other open issues will be discussed at the end of this article.

2. Research on changing intergenerational mobility in Sweden

Changes in intergenerational mobility in Sweden in the first half of the 20th century have been studied by Carlsson (1969). He compares cohorts born between 1899–1905, 1908–14 and 1917–23. Occupation of the father is measured at birth of the son (birth certificate); occupation of the son is measured in the census of 1950. Carlsson finds no indication at all that total mobility changed during this period and relates this finding to a number of changes in Swedish society. The first half of the 20th century was a period of industrialization and changing occupational structure in Sweden. However, this was a steady process, without acceleration, and therefore not reflected in increasing mobility. Other changes in Swedish society, such as the domination of politics by the Social Democratic Party since 1932 and educational reforms, may have come too late to affect the educational and occupational careers of these birth cohorts. Yet other changes work in opposite directions, such as the raising of the standard of living for the underprivileged groups (favouring mobility) and the levelling-off of differences in fertility (opposing mobility).

Carlsson (1969:109) concludes, however, that ‘our tentative conclusion, that the rate of mobility has not changed, no doubt would be false if the points of time compared were, say 1940 and 1840’.

Studies comparing 1940 and 1840 Swedish intergenerational mobility patterns do not exist yet. Instead, Carlsson’s data have been compared with mobility studies from the second half of the 20th century (Erikson 1983). Using the Level of Living Surveys of 1968 and 1974, Erikson points to increased intergenerational mobility among younger cohorts. He interprets this increase as a consequence of industrialization, rather than of social democratic government. Effects of social democratic government should be most visible in the youngest cohorts. But it is precisely in these cohorts that the increase in total mobility stabilizes. Erikson also analyses relative social mobility chances (social fluidity) using a log-linear level model. Although the pattern of social fluidity has not changed over time, the amount of fluidity has. There has been a decrease in the relative rate of mobility for the cohorts born before 1920 and an increase for the cohorts born after that year. Because the increase occurred at a faster pace in recent years, Erikson attributes this change to social democratic policy rather than to industrialization.

More recently Jonsson and Mills (1993) compared men’s and women’s relative mobility chances in the 1970s and 1980s. The trend towards increasing social fluidity that was visible in earlier decades (Erikson 1983) seems to have come to an end in the 1980s. In general, men’s social fluidity did not change during these two decades, although the barrier between manual and non-manual classes became easier to cross. However, women’s relative mobility chances became more equal over time.

Though comparisons of 20th- and 19th-century mobility rates are lacking, a number of studies on mobility in Sweden during the 19th century exist. It is not feasible to do justice here to the rich historical detail these studies have in the offering. Some general remarks only are possible. Most works – and all historical studies – describe total mobility numbers only. The focus is often on one social group traced over time. For example, Martinus (1977) followed a cohort of 500 Swedish peasants and crofters from birth at the beginning of the 19th century up to the age of 50. Lundh (1999) studies the social background and further career of servants married between 1740 and 1894. This study documents both a change in the occupa-

tional structure during the 19th century and an accompanying increase of downward and decrease of upward mobility of servants.

Other studies – starting with that of Thomas in 1938 – focus on the relation between geographical and social mobility. Kronborg and Nilson (1978) published an article on the city population of Halmstad, followed over the life-course in the years 1898–1913. They compared their tables with those of a few other Swedish studies on career and intergenerational mobility, the so-called ‘Three City Project’, with contributions by Eriksson and Åkerman (1974), Norman (1974) and themselves (1975).

A third topic concerns the consequences of changes in the organization of large agricultural estates in the middle of Sweden in the period 1750–1900. Gerger (1984) carried out a detailed study of a small number of career mobility patterns. The effect of the organizational changes on mobility and migration of rural populations had previously been topic of study by Eriksson & Rogers (1978). Sundin (1989) investigated the life-course mobility of 500 men born on the estates of iron foundries in the North of Sweden in the 1830s.

Notwithstanding the exceptionally good historical records and the concentration on one segment of the population, the numbers of persons under scrutiny in historical studies has been small to very small. A few hundred persons under observation stand as a large number in this context. This has been justified by the fact that ‘very great efforts are required in order to obtain the data in a historical investigation. For this reason it has been necessary to limit the investigation to the analysis of the behaviour of one birth cohort’ (Martinus 1977:13–14).

Summing up: there is evidence that (1) there were large changes in the occupational distribution during industrialization (not surprisingly); (2) during industrialization the amount of total mobility was relatively constant, although the pattern changed (more downward and less upward mobility); (3) during industrialization a decrease in social fluidity seems to have taken place. The last-mentioned finding is in contradiction to the ‘logic-of-industrialism’ thesis and asks for further research.

3. Industrialization in the Sundsvall region

The Sundsvall region, situated in the North of

Sweden, in the province of Western Bothnia (Västerbotten), consists of the town of Sundsvall and its hinterland. During the 19th century Sundsvall was the administrative centre, a regional market, and a major export port of timber. The hinterland consisted of a coastline and vast stretches of forest, traversed by long rivers. Many small settlements existed, notably at the intersections of the rivers. Settlements were organized in parishes, which might contain up to two dozen villages.

In the beginning of the 19th century, the inhabitants of these settlements by and large gained a livelihood from cultivating arable land in the river valleys and meadows higher up in the hills. Small, water-powered sawmills were in existence since the 17th century, as were small iron foundries, using leftover wood from the sawmills as fuel. Trees were usually transported via the waterways to the coast and, in part, cut there in the many sawmills. The inhabitants of the villages along the coast had the opportunity to work in these mills, but most of them lived on the land or by the sea.

During the 19th century the number of sawmills increased rapidly (for data on the amount of wood exported and the number of sawmills, see Hjulström et al. (1955:220–221); Wik (1950:200–209)). The growth was led by an increasing demand for wood in various European countries, notably England, and spurred by the gradual abolition of export duties in the receiving countries after 1840 (Layton 1984). The appearance of the mills changed as well. The first steam-driven sawmill dates from 1849. As the mills grew in size, a specialization of the workforce took place. Ostergren (1990:41–42) sketches the growth of jobs at the Matfors sawmill and iron works as time went by and the ensuing functional division of labour:

For much of the first decade of the sawmill’s existence [since 1793], only a single sawyer lived on the premises along with his family. He carried on much of the work by himself, with only occasional help from day laborers taken on during the sawing season. ... Around 1803, however, a combination manager and bookkeeper was hired to provide some oversight and to keep track of the sawmill’s affairs. ... The functions of manager and bookkeeper were soon separated to form two new posts ... In 1836 two more bookkeepers were added primarily to accommodate the additional workload generated by the new iron works. The iron works also required the importation of skilled smiths. It eventually came to employ a full range of

specialized smiths and their apprentices ... all working under a master smith. Meanwhile expansions in the scale of the saw milling operation drove up the size of the labor force, which began to reveal discernible functional divisions. The millwork gradually became subdivided into a variety of specialized tasks. In addition to the sawyers, who operated the giant saw frames, and the foremen who oversaw operations, there were men employed specifically to sort and lay timbers into the saw frames, to draw off and stack the bark hinds, planks and laths as they came off the frames and to sweep away the sawdust. Outside the mill, additional manpower was needed to stack finished planks and boards in the mill's lumberyard, to draw saw timber into the mill and to prepare rafts of finished planks and boards for downstream floating to the loading docks at Svartvik. Others were engaged in converting the rough bark hinds to charcoal, which was burned along with the sawdust to fire the forges of the iron works. Men performing all of these tasks were assisted from time to time by unskilled day laborers, while a bit further afield others were employed to deliver charcoal, float timber and finished lumber on the Ljungan River, and perform necessary construction, service, and maintenance work on the grounds of the estate.

The growth of industry affected farm life in several ways. It supplied an alternative occupational career for farmers' sons. Through subdivision of plots of land the number of farms was growing, though this growth was dwarfed by that of the population, increasing by a factor 10 during the 19th century (Alm Stenflo 1994; Layton 1984). But at the same time the average size of farms dwindled over time (Egerbladh 1989; Gaunitz 1979). The division of the common land of the villages into private properties from the 1830s onward probably accelerated this process. The decrease in farm size was in all probability not compensated for by a concomitant rise in productivity. Thus it implied impoverishment and the need for additional sources of income. It was for this reason, so it may be assumed, that the industrial estates with their high-level wages became attractive (Ostergren 1990; Schön 1972).

However, the change from farmer to industrial worker was not always voluntary. Up until the middle of the 19th century most timber was produced via timber delivery contracts (for this and the following, see Fagerberg (1973)). A farmer agreed to deliver a certain amount of wood for an agreed price and had to see to it that his trees were cut and transported to the sawmill. After the middle of the century, more and more wood was obtained via cutting

contracts and these became dominant after 1870. A cutting contract gave the buyer the right, for a period of, as a rule, 50 years, to cut trees over a certain height. In addition, they almost always granted the buyer the right to transport the wood over land to the river and float it further to the mill. In the last quarter of the century, timber companies began to buy large plots of forest land from the farmers (Gaunitz 1964). This meant that the farms to which the forestland belonged had to be bought as well. As a consequence substantial numbers of farmers were bought out of business.

The iron foundries may have formed a bridge between proto-industry and modern industry. Some people owned both sawmills and iron foundries and workers migrated from the iron foundries to the sawmills (Sundin 1989; Sundin & Tedebrand 1981). Sundin (1989:288) describes the blacksmiths of the iron foundries:

... people who had been brought up in this proto industrial and paternalistic milieu seem to have managed the transition to a more modern industrial system relatively easily. Their particular culture, partly urbanized, partly industrialized, but still with many roots in old handicrafts and in agrarian society, formed an important link between preindustrial and industrial Sweden. Some of the traits of modern industry in Sweden were not innovations, but can be traced back to the small iron foundries.

A periodization of the 19th century according to industrialization would start with a more or less pre-industrial period (up to the middle of the century), via a period of early industrialization in the 1850s, to that of full growth in the 1860s and 1870s and stagnation in the later decades.

4. The data

Data on intergenerational mobility in the Sundsvall region during the 19th century have been extracted from the computerized files of the Umeå Demographic Database (DDB). These are based on Sweden's exceptionally rich historical sources. Not only are there registers of baptisms, burials and marriages – as is standard in Europe – but also registers of migration, and, most importantly, the *husförhållningar*. These are a remarkable blend of catechetical lists – as noted by a Lutheran priest – and a population register – as noted by the same person in his function as civil servant.

They cover all major demographic and quite a few major social aspects of the life of all inhabitants of towns and villages during the whole year. The lists contain information on date and place of birth, of marriage, and of death, cause of death, migration movements, household composition, civil status, occupation, vaccination, penance, communion, confirmation and catechetical assessments, on reading ability, on understanding the Heidelberg catechism and the ability to memorize parts of it (for a discussion of these sources, see Jeub (1993); Kälvevemark (1979); Willigan & Lynch (1982) (with a photograph of two pages from a register); and Brändström et al. (1994)).

From the sources were selected all men who lived in the region, had reached the age of 27, and whose father was also present in the registration (N = 11,464). For many men, more than one occupation was registered. We use the occupation that was registered closest in time to the year a person (father or son) became 27 years old. Age 27 was chosen because this was the median age of marriage in the region. The results of our analyses can therefore be compared more readily with those of others using marriage registers. Another advantage of measuring occupations at this age is that the information on occupations in the sources is richest around the age of marriage. In the case of the sons, 93.1 per cent of the occupations were recorded between the ages of 22 and 32; in the case of the fathers, this was 76.2 per cent. For 953 men (8.3 per cent) either their own, or their father's occupation was missing. Unlike many studies making use of marriage records of bridegrooms only and therefore studying the occupation of the groom say at age 25 and that of his father at age 50, this study (1) contrasts the generations at approximately the same phase in the life cycle, and (2) includes unmarried sons. An important drawback of the data is that mobility data are only available if both generations lived in the Sundsvall region. From 1850 onward there was considerable immigration into the industrialized regions of Sundsvall (Alm Stenflo 1994). Outmigration was not as extensive as immigration, except in the last decade of the 19th century when migration to the United States was frequent (Emigrationsutredningen 1910; Tedebrand 1972). Our research is therefore restricted to the question of whether during industrialization the intergenerational mobility chances of the 'original' population of Sundsvall changed, bearing in mind that they had to compete

with immigrants and that some others had left the region to try their luck elsewhere.

The DDB sources are not only rich, but also generally reliable. This is confirmed by comparisons with unpublished statistical material, assembled at the time by local authorities for purposes of the State (Alm Stenflo 1994). One anxiety does exist in what may seem an historian's paradise. Comparisons with lists of employees of sawmills show that the catechetical registers inadvertently omit a part of the transitional migrant workers (Cornell 1982; Ostergren 1990:15, but cf. p. 56:note 1; Rohndal 1972:chapter 8). Since our analyses focus on the stable population of Sundsvall, this under-representation should not bother us.

We will use the class scheme that was especially developed by the Umeå Demographic DataBase to describe the region and period under research. Although this class scheme is not the same as the frequently used EGP class scheme (Erikson & Goldthorpe 1992), it makes the same basic distinctions: between skilled and unskilled occupations, white- and blue-collar workers, employed and self-employed, agricultural and other sectors (cf. Figure 1). Appendix A presents data on intergenerational mobility of Swedish men (sons) who turned 27 between 1800 and 1889. Mobility tables are given per decade, save for the first period in order to retain a fair number of cases.

5. Changes in the occupational structure and total mobility

As expected, the occupational distribution of the male labour force in the Sundsvall region changed during industrialization (Figure 1). An outstanding development can be seen in the growth of the group of unskilled workers after 1850. The growth of the skilled working class occurred later and was much smaller. The agricultural groups – farmers, crofters and farmhands – grew until 1850 and then declined in relative but hardly in absolute size. Attracting less attention, but nevertheless worth mentioning, is the gradual relative growth of white-collar occupations, although still small in number in 1885.

What consequences did these changes have for total intergenerational mobility? During the whole of the 19th century, the population was growing naturally at a rate of about 10 to 15 per cent every 10 years (Alm Stenflo 1994). This development is mirrored in the slow

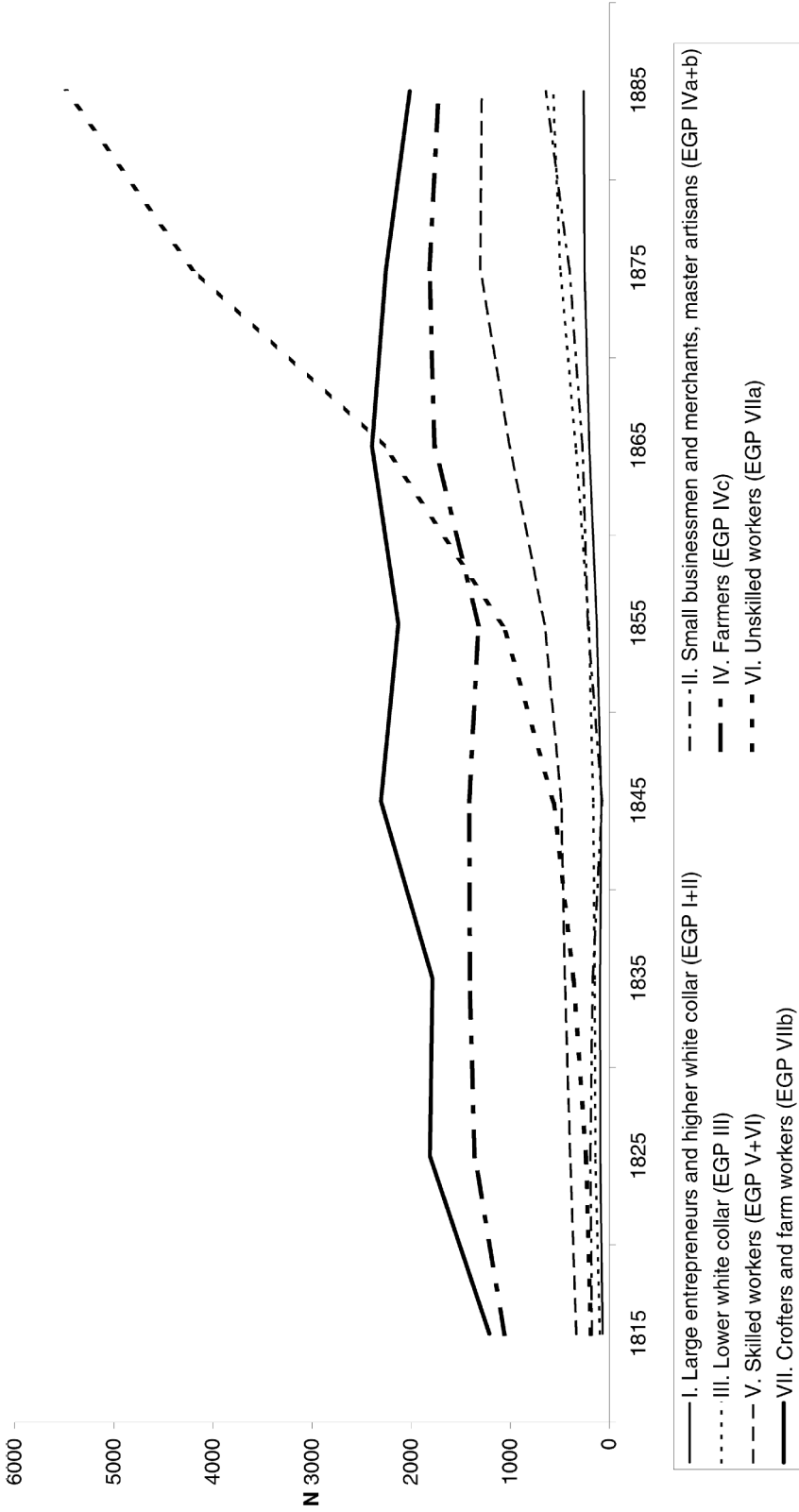


Fig. 1. Changes in occupational structure of the Sundsvall region, male population above age 15. Note: The numbers in this figure are not restricted to the stable male population, but describe all men over 15 present in the region in each year.

Table 1. Total intergenerational mobility by period and class (per cent).

Period	Total mobility ^a	Outflow mobility per class ^b						
		I	II	III	IV	V	VI	VII
1800–29	43	69	40	92	37	78	81	22
1830–39	49	67	61	80	43	74	79	38
1840–49	49	71	70	82	46	71	63	36
1850–59	56	68	82	97	55	74	66	47
1860–69	58	71	75	88	47	80	45	60
1870–79	64	71	87	83	56	86	37	69
1880–89	60	62	89	74	48	83	24	78

I: Large entrepreneurs and higher white collar; II: small businessmen and merchants, master artisans; III: Lower white collar; IV: farmers; V: skilled workers; VI: unskilled workers; VII: crofters and farm workers.

^a Total mobility is the number of men changing classes as a percentage of the total number of men.

^b Outflow mobility per class is the number of men in a certain class of origin changing classes as a percentage of the total number of men in that class.

Source: Tables in the appendix.

growth of almost all classes between 1815 and 1850. After 1850, however, the growth of the largest class – that of farm workers and crofters – stagnated. Under the assumption that class-specific fertility did not change much over time, as a consequence sons of farm workers either had to find an occupation in another class – most likely in the growing unskilled working class – or they had to migrate out of the region.¹ At the same time – between 1850 and 1890 – there was a migration surplus in the Sundsvall region (Alm Stenflo 1994). Most immigrants entered the unskilled working class:

. . . crofters, sons of farmers, and landless laborers came by thousands from Western and Northern Sweden and even from Ostrobothnia in Finland to find work in the saw mills and timber yards of the Sundsvall district. (Tedebrand 1986:86)

Thus, the growth of the unskilled working class was probably attributable partly to the mobility of sons from the original Sundsvall population out of the class of farm workers and partly to immigration. The driving force behind the increased total mobility of the stable population, however, was the stagnation of the growth of the farming class in combination with continuing population growth, as opposed to the large increase in the unskilled working class. We now turn to actual mobility patterns, to see whether this is true.

In Table 1 we present the number of men changing classes as a percentage of the total number. Intergenerational mobility was substantial even in the pre-industrial period. In the

period 1800–29, 43 per cent of men aged 27 were in a different occupational class from that of their father at the same age. Most frequent moves were inside the agricultural sector: sons of farmers (still) being farm workers at age 27 (40 per cent of all mobility). In addition, many sons of skilled workers moved into the class of farm workers (15 per cent of all mobility). A comparison of the first three decades with the fourth and fifth decades shows that as early as during the pre-industrial period total mobility had increased. Sons of farm workers, in particular, were more likely to become farmers themselves.

In the second half of the century, parallel to the industrialization process, mobility gradually developed further, from 49 to 64 per cent in the period 1870–79. When industrialization stagnated at the end of the century, the growth in mobility did so too. As expected, total mobility increased most for the sons of farm workers. They were much more likely to seek a career other than that of their father at the end of the century than at the beginning. All three classes that grew in size show decreasing mobility out of these classes. This is especially true for unskilled workers. In the beginning of the 19th century only every fifth son of an unskilled worker became an unskilled worker himself. At the end of the century this number had risen to over 75 per cent. But also sons from the skilled working class and the lower white-collar class tended more often to follow in their fathers' footsteps at the end of the century than at the beginning.

Two findings are unexpected. Sons of small-scale entrepreneurs showed considerably more

mobility at the end of the century than at the beginning, although their class was growing over time. And perhaps more importantly, total mobility continued to grow during industrialization, although the pace of change in the occupational structure, fertility and migration were relatively constant during these decades. This indicates that other factors also caused increasing movement between classes. One of these factors may have been increasing social fluidity.

6. Social fluidity

To analyse changes in relative mobility patterns we used a topological or level model based on the 'model of core fluidity' as described by Erikson and Goldthorpe (1992:121–131). Although this model has been developed in order to analyse class mobility in modern industrialized countries, the basic distinctions made – immobility versus mobility, mobility at the same status level versus at different levels, and mobility within the same sector versus between different sectors – are also relevant for pre-industrial countries. The first idea behind the model is that mobility is less likely between occupational classes at different hierarchical levels. We defined three hierarchical levels (Table 2). The first level consists of large-scale entrepreneurs and higher white-collar workers (I), the second of small-scale businessmen, merchants, and master artisans (II), lower white-collar workers (III), farmers (IV), and skilled workers (V), and at the third level, unskilled workers (VI), and crofters and farm workers (VII) are combined. The first hierarchy parameter demonstrates that if sons leave their class of origin, they tend to move to a class of similar status in society. The second hierarchy parameter describes the additional difficulty of moving over a long status distance. If these parameters are negative, they indicate that hierarchical barriers existed.

Secondly, the high probability of immobility is modelled. All classes are expected to show some tendency towards immobility, but especially the self-employed in classes I and II, and the farmers. The first inheritance parameter models the general tendency to stay within one's own social class. With the help of a second inheritance parameter, it is investigated whether this tendency is especially strong for the self-employed classes (entrepreneurs, self-employed, and farmers), and a third parameter indicates whether farmers are even more likely

to inherit the class position of their fathers than the other self-employed. Positive parameter estimates support the existence of a tendency to immobility. The strength of this tendency for farmers is indicated by the combination of all inheritance parameters; that for the other self-employed classes by a combination of inheritance parameters 1 and 2; and that for the other classes by inheritance parameter 1 only.

Finally, mobility into and out of the agricultural sector is expected to be less likely than mobility within sectors. Negative parameter estimates indicate that it is difficult to cross sectorial borders. The model of core fluidity also contains 'affinity' parameters, modelling more or less mobility between certain pairs of classes. However, since these affinity patterns seem less basic than the three dimensions of mobility described earlier, we will not include them here.

The lower half of Table 2 shows that all parameters significantly attribute to the fit of the model. Mobility between occupational classes at different hierarchical levels is difficult. This is especially true for classes that are far apart. Sons of large-scale entrepreneurs and higher white collar-workers are much more unlikely to become unskilled workers, crofters or farm workers than to end up in one of the other classes, and vice versa. There is also a strong sector effect, indicating that movements into and out of the agricultural sector are less likely than movements within or outside this sector. If hierarchical and sectorial effects are taken into account, there is only a weak tendency for sons of all classes to stay in the class of their father. Much stronger immobility exists, however, for the self-employed in classes I and II, and to a smaller extent for the farmers in class IV.

The main question of this article, however, is whether the barriers to intergenerational mobility have become weaker over time. We therefore first estimated a set of models in which for each time period one parameter is allowed to differ between all periods (Models 8 to 13). Models 10, 11 and 12 fit better than Models 8, 9 and 13 (Table 3). This indicates that if change occurred, it most likely occurred on the strength of inheritance. This finding is confirmed by the significance of the change parameters of Model 14. In the multivariate Model 14, which considers all possible changes simultaneously, only the Inheritance 2 and Inheritance 3 parameters change significantly over time, indicating that especially immobility of the self-employed classes and farmers changed.

Table 2. *Topological models.*

Structure		Hierarchy	Inheritance	Sector
Class				
I	Large entrepreneurs and higher white collar	1	2	1
II	Small businessmen and merchants, master artisans	2	2	1
III	Lower white collar	2	1	1
IV	Farmers	2	3	2
V	Skilled workers	2	1	1
VI	Unskilled workers	3	1	1
VII	Crofters and farm workers	3	1	2

Parameters

Hierarchy 1: one step mobility: between levels 1 and 2, or between levels 2 and 3
Hierarchy 2: two step mobility: between levels 1 and 3
Inheritance 1: immobility of all classes
Inheritance 2: extra immobility of the self-employed (class 1, 2 and 4)
Inheritance 3: even more immobility of farmers (class 4)
Sector: mobility from one sector to another

Fit		L ²	df	BIC
1	Model of independence	4,006	252	1,719
2	Model 1 + hierarchy 1	3,143	251	865
3	Model 2 + hierarchy 2	2,992	250	724
4	Model 3 + inheritance 1	1,603	249	-656
5	Model 4 + inheritance 2	1,182	248	-1,068
6	Model 5 + inheritance 3	1,145	247	-1,096
7	Model 6 + sector	772	246	-1,460

Parameter estimates of model 7

	est.	s.e.
Hierarchy 1	-0.20	0.03
Hierarchy 2	-1.64	0.19
Inheritance 1	0.11	0.05
Inheritance 2	2.13	0.13
Inheritance 3	-0.80	0.13
Sector	-0.63	0.03

Sons of the self-employed classes (classes I, II and IV) became increasingly likely to leave their father's class (the positive Inheritance-2 parameter becomes smaller over time – in the period 1880–89 it decreased from 2.77 to 0.94 (2.77–1.83)). The significant Inheritance-3 parameter at the end of the century indicates that farmers, who used to be less likely to follow in their father's footsteps than other self-employed, have become more like these others. Another important finding of Model 14 is that no change in the barriers to mobility is visible before the onset of industrialization.

According to the likelihood ratio test Model 14 fits the data better than Model 7, which allows no change. The alternative fit measure (BIC) – which is more conservative and might be more applicable because of the large number of

cases – shows that Model 14 offers far too many degrees of freedom. We therefore continued to investigate more parsimonious models of change. First, we investigated whether relative mobility differed between the pre-industrial and industrializing period only. Secondly, we investigated whether all, or only some barriers to mobility changed.

In Model 15 all barriers to mobility are presumed to be different before and after industrialization. According to the BIC, this model clearly fits the data better than Model 14. The parameter estimates at the bottom of Table 3, however, show that not all changes are in the predicted direction of increasing openness. The hierarchical barriers to mobility became stronger over time (indicated by negative change parameters). In the pre-industrial period, mo-

Table 3. Topological models with period-specific parameters.

Fit	L ²	df	BIC
8	741	240	-1,435
9	766	240	-1,411
10	718	240	-1,458
11	722	240	-1,454
12	735	240	-1,441
13	753	240	-1,424
14	660	210	-1,238
15	715	240	-1,461
16	721	242	-1,473
Change-parameters in models 14–16			
	1830–39	1840–49	1850–59
Ref. cat.	1800–29	1860–69	1870–79
Ref. cat.	1880–89		
Model 14			
Hierarchy 1	-0.16	0.05	0.06
Hierarchy 2	-1.53	-0.21	-0.73
Inheritance 1	0.27	-0.19	-0.26
Inheritance 2	2.77	0.25	-0.67
Inheritance 3	-1.01	-0.47	0.13
Sector	-0.69	0.04	0.06
Model 15			
Hierarchy 1	Ref. cat. < 1850:	-0.06	After 1850:
Hierarchy 2	Ref. cat. < 1850:	-0.91	After 1850:
Inheritance 1	Ref. cat. < 1850:	0.28	After 1850:
Inheritance 2	Ref. cat. < 1850:	2.80	After 1850:
Inheritance 3	Ref. cat. < 1850:	-1.36	After 1850:
Sector	Ref. cat. < 1850:	-0.65	After 1850:
Model 16			
Hierarchy 1	Ref. cat. < 1850:	-0.15	After 1850:
Hierarchy 2	Ref. cat. < 1850:	-0.92	After 1850:
Inheritance 2	Ref. cat. < 1850:	2.99	After 1850:
Inheritance 3	Ref. cat. < 1850:	-1.34	After 1850:

Note: Parameter estimates in bold type are significant ($p < 0.05$).

bility between social classes that differed moderately with respect to status was just as likely as mobility between social classes at the same status level. After the onset of industrialization, however, short distance status barriers appeared and long distance status barriers became stronger. The results with respect to changes in immobility and in sectorial barriers are the same in this model and in Model 14.

Model 16 is even more parsimonious than Model 15. Since there are no indications that the sectorial barrier and the general tendency to inheritance changed over time, these barriers are assumed to be constant in Model 16. The conclusions with respect to changes in mobility patterns over time are similar to those on the basis of Model 15, with the exception that the strengthening of short-distance status barriers is not visible in Model 16.

In summary, of the three barriers to mobility – hierarchical barriers, the tendency to inheritance, and the sectorial barrier – only the sectorial barrier did not change when the Sundsvall region moved from a pre-industrial to an industrializing society. After 1850 it was just as difficult to cross the border between the agricultural and non-agricultural sector as it had been before 1850. Relative chances of mobility became to some extent more equal because sons from the self-employed classes were more likely to leave the class of their father. This change was smaller for farmer's sons than for the sons of the other self-employed. At the same time, though, it became more difficult for sons to move to classes that differed in status from their class of origin.

7. Conclusion

In this article we started with a list of unresolved issues around the relationship between industrialization and intergenerational mobility. To what extent have our analyses shed new light on this relationship?

In the first place, we add further evidence that total intergenerational mobility was higher during industrialization than before. It is even visible in our data that the amount of total mobility stopped increasing at the same time as industrial development began to stagnate. We think these findings are more reliable than most of the earlier findings on changes in total mobility. All the data derive from one source and include both married and unmarried men. The loss of data owing to unknown occupation

of either the father or the son is very small, even compared with modern data sets. Finally, the occupations of father and son are measured at more or less the same age. In this way there is less confusion over intergenerational and intra-generational mobility than when the occupation of the father is measured at the same historical point in time as that of the son (but therefore at an older age). The only drawback to our data is that they refer to the stable population, i.e. both father and son lived in the region, of only one Swedish region. Compared with most historical studies, however, the region, period of time, and the number of cases in our study are large.

We also tried to relate the changes in total mobility to the pace of industrialization combined with our knowledge of natural population growth and immigration. Total mobility was expected to increase after the onset of industrialization in 1850. It did indeed, but contrary to what we expected on the basis of changes in the occupational structure alone, it continued to increase in the decades thereafter. Furthermore, mobility of the small self-employed increased more than was expected.

Part of the increase in total mobility may have been a consequence of the, to some extent, more equal relative mobility chances during industrialization than before. To our knowledge, our study is the first to compare relative mobility chances in more than one pre-industrial period with a series of periods during industrialization. The results clearly show that relative mobility chances did not change during the pre-industrial period. During industrialization, however, some barriers to equal mobility chances became weaker and some stronger. The sons of the self-employed classes, in particular, became less likely to inherit the occupation of their father. At the same time, however, it became more difficult for sons to obtain a class position at a different status level than that of their father. The sectorial barrier to intergenerational mobility stayed upright.

These findings are interesting in the light of the theoretical discussion on changing relative mobility patterns. They indicate that industrialization did not unequivocally lead to weakening mobility barriers, but instead to the replacement of certain barriers by others. The direct transfer of property became less effective (and less frequent when propertied classes started to shrink). Instead, higher-status groups were better able to set themselves apart from children from a lower-status background and to prevent

their own children from downward mobility. Together these findings suggest that the hypotheses of Bourdieu and Passeron ([1977] 1994) and Collins (1971), predicting that elites would be able to secure their own position by switching to new mechanisms to favour their own children above those of others, perform better than the hypotheses of Kerr et al. (1960) and Treiman (1970), predicting that changes in these mechanisms would create better chances for the sons of a lower social background.

Probably, the hierarchical barriers have much to do with differences in skills and education. It has often been claimed that industrialization created the need for a, if not educated, at least literate workforce. For Denmark, it is said that the creation of 350 local technical schools in the period 1870–1930 made it easier to rise to the ranks of, for example, engineers (Kristensen 1992). For Finland, it is claimed that the sawmills, led by engineers, in the 19th and early 20th centuries were the centre of technological innovation requiring a selection of the workforce on the basis of educational qualifications (Lilja et al. 1992). A seminal study on industrialization in Britain from the 18th century onwards reminds us, however, that the relations between industrialization, education and social mobility may have been time, sector and country specific. Industrialization in 18th century Lancashire is said to have created an overall less literate workforce (Sanderson 1972:102). According to Sanderson, however, this did not apply to all sectors of the British economy (such as wood work) and certainly did not characterize the type of industrialization that occurred later on, from the second half of the 19th century, in Britain.

Although the sawmill industry in North Sweden attracted great numbers of unskilled workers, there are some indications that in this country industrialization also went together with an increasing recognition of the importance of education. In Sweden, schooling became compulsory by law in 1842, but in many places it took longer before regular schooling was established in practice. Before 1842 education took place at home, and the Lutheran priests checked the knowledge at catechetical meetings. In the sawmill industry in the North of Sweden, vocational training generally took place on the job. The traditional way was the artisan career of apprentice, journeyman and master. In the iron foundries, smiths were also trained on the job (Sundin 1989; Sundin & Tedebrand 1981). At the saw-

mills, workers often started with unskilled tasks and later on had the opportunity to become a sawyer or a supervisor in charge of the sawing process. In the late 19th century the influence of the sawmill owners on the educational system becomes visible. Schools could teach boys and girls reading and writing, as well as gardening, handicrafts and domestic science. Changes in formal schooling in one parish in our region, the parish of Skön, in the 19th century have been studied (Johansson 1987). In this parish, gardening (i.e. lessons in cultivation of crops) was not introduced until the beginning of the 20th century, and then only in two of the fourteen schools in the parish. Domestic science (read: cooking) was taught earlier, after the Sundsvall strike of 1879, as was handicraft (read: woodwork), at the special request of the sawmill owners, who wanted 'practical' schooling. It is, however, important to bear in mind that this growing importance of education did not lead to relatively better mobility chances among the lower classes, but to better opportunities for the upper classes to secure their privileged positions.

Our data relate to the early stage of industrialization. This has the advantage that alternative explanations for changes in relative mobility, such as educational expansion and political reforms, are very unlikely to be true. Of course it would be interesting to extend the period under investigation to the decades in which industrialization was fully developed. This will be possible in the near future with the availability of the HISCO classification of occupations (van Leeuwen et al. 2002). With this scheme, historical occupations can be classified in a way that is very similar to the ISCO classification, which is usually used to classify modern occupations. A comparison with Carlsson's data and the Level of Living Surveys could reveal whether the opposing trends in the different barriers to mobility continued with the further progress of industrialization, how great the decrease in openness was that Erikson (1983) observed in the beginning of the 20th century compared with the increase in openness in the earlier decades, and whether relative mobility chances in the fully developed industrial society were more equal than those in the pre-industrial decades.²

Notes

¹ Although the way this is formulated suggests that the sons of farm workers were 'forced' to move, they were just as likely to have moved voluntarily (because opportunities were better elsewhere), with the changing opportunity structure as a consequence. In fact, a combination of the two is likely to have happened.

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Appendix A

Intergenerational mobility of men in the Sundsvall region 1800–89.

1800–1829		I	II	III	Son IV	V	VI	VII	Total
	I	4	4	1	0	2	1	1	13
F	II	3	55	5	9	5	6	9	92
A	III	1	1	3	16	4	5	7	37
T	IV	3	6	8	436	25	5	212	695
H	V	3	8	4	8	34	13	82	152
E	VI	0	2	0	2	6	8	24	42
R	VII	0	0	1	24	19	4	166	214
	Total	14	76	22	495	95	42	501	1,245
1830–39		I	II	III	IV	V	VI	VII	Total
	I	2	1	1	0	1	0	1	6
F	II	3	18	7	5	5	5	3	46
A	III	1	0	4	5	5	0	5	20
T	IV	1	3	9	276	20	15	161	485
H	V	2	4	4	12	34	16	58	130
E	VI	0	1	1	7	4	7	14	34
R	VII	0	0	2	41	25	22	146	236
	Total	9	27	28	346	94	65	388	957
1840–49		I	II	III	IV	V	VI	VII	Total
	I	4	1	1	0	2	3	3	14
F	II	4	12	4	7	4	5	4	40
A	III	1	2	6	4	7	5	8	33
T	IV	2	2	10	274	29	22	170	509
H	V	5	1	5	16	47	19	69	162
E	VI	1	0	5	6	13	22	13	60
R	VII	0	1	2	60	35	34	238	370
	Total	17	19	33	367	137	110	505	1,188

(continued overleaf)

Appendix A. *Continued.*

1850-59		I	II	III	Son IV	V	VI	VII	Total
	I	7	1	6	1	5	2	0	22
F	II	2	8	6	12	4	7	5	44
A	III	2	2	1	9	8	5	6	33
T	IV	2	3	9	239	23	50	201	527
H	V	3	6	4	15	46	42	59	175
E	VI	0	1	7	11	15	30	25	89
R	VII	1	7	5	95	68	102	320	598
	Total	17	28	38	382	169	238	616	1,488
1860-69									
	I	4	2	6	1	0	1	0	14
F	II	1	9	8	7	1	5	5	36
A	III	1	1	5	8	8	13	7	43
T	IV	2	8	6	257	14	73	120	480
H	V	1	10	7	22	43	80	49	212
E	VI	1	6	7	8	15	84	31	152
R	VII	2	13	5	84	46	153	200	503
	Total	12	49	44	387	127	409	412	1,440
1870-79									
	I	4	1	4	1	3	1	0	14
F	II	3	5	4	4	6	15	1	38
A	III	3	0	8	5	8	15	7	46
T	IV	2	14	14	227	23	128	104	512
H	V	3	4	23	17	35	138	33	253
E	VI	1	5	9	26	25	174	35	275
R	VII	4	14	11	93	41	314	213	690
	Total	20	43	73	373	141	785	393	1,828
1880-89									
	I	13	1	11	1	4	3	1	34
F	II	8	6	15	5	8	14	0	56
A	III	5	2	15	7	6	22	1	58
T	IV	4	15	11	248	6	127	63	474
H	V	5	21	15	23	61	197	42	364
E	VI	5	12	26	14	37	435	43	572
R	VII	1	15	9	124	55	427	176	807
	Total	41	72	102	422	177	1,225	326	2,365

I: Large entrepreneurs and higher white collar;

II: Small businessmen and merchants, master artisans;

III: Lower white collar;

IV: Farmers;

V: Skilled workers;

VI: Unskilled workers;

VII: Crofters and farm workers.