STRUCTURAL CHANGE AND SOCIAL MOBILITY BEFORE AND AFTER INDUSTRIAL TAKE-OFF

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Abstract

In the absence of historical income or educational data, intergenerational studies of historical populations have turned to the study of changing occupations over time as a measure of socio-economic mobility. This paper investigates intergenerational occupational mobility following a two generation approach for settler South Africa over a century spanning the transition from an agricultural to early-industrialised society (1800-1909). Pervasive structural changes in the labour market as a result of the process of industrialisation by definition generate intergenerational occupational mobility as new occupations are created while those occupied by members of older generations may fall away. The paper examines both absolute and relative social mobility in South Africa to determine whether there has been a long-term trend towards increased social mobility amongst European settlers in South Africa during the nineteenth century, and whether there was an increase in relative mobility during industrialisation. I identify fathers and sons for whom complete information on occupational attainment exists and employ both a discrete approach - which interprets a greater likelihood of transitioning from one occupational category into another as evidence of greater social mobility, as a well as a continuous approach - which estimates the correlation between fathers and son's occupational ranks. I find increasing upward social mobility over time, becoming significant following the mineral revolution beginning in 1868. Consistent with the qualitative evidence of a shift away from agriculture as the dominant sector in the economy, a general shrinking of the farming class matched by a growing skilled and professional class can be seen. However, I find that sons of farmers experienced virtually no improvements in mobility over time, net of these structural changes in the labour market.

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Introduction

A universal consequence of industrialisation is said to be the evolution of social stratification systems from being almost entirely predicated on ascription by birth, to that of personal achievement (Hoogvelt, 1978). This chapter seeks to explore this notion by investigating whether, comparable to the way in which industrialisation combines non-human factors of production efficiently, it will also maximise human capital by putting the 'right man' in the 'right place'? Are men really successful, as Landes (1969) suggests, 'not for who they are and whom they know, but for what they can do?'

Social stratification is a system according to which a society hierarchically ranks classes of people. It is therefore often thought to be influenced by factors that affect the society as a whole rather than by individual characteristics. Social mobility, the movement of individuals within or between social strata, is therefore often attributed to factors such as economic development, demographic transitions and industrialisation and the associated improvements in education, occupation and income for the members of society. Industrialisation necessitates changes in both the structure of the stratification system and the process of social mobility within that structure (Treiman, 1970; Grusky, 1983). Industrialisation is typically associated with a shrinking agricultural sector, for example, as manufacturing and service sector employment become increasingly attractive to individuals formerly employed as farmers or agricultural labourers.

Social mobility depends then, not only on the structure of the economy, but also on the flexibility of the labour market. Bourdieu et al., (2009) note that the likelihood of becoming a famer might diminish as the structure of the economy moves away from agriculture as its dominant sector, whereas the likelihood of being employed in a skilled profession can increase, in lieu of a change in the structure of the labour market, as a result of an expansion in the availability of high quality education. The process of stratification and the process of status attainment are therefore highly interrelated. Understanding and accurately measuring social mobility during a period of industrialisation is the primary aim of this chapter. Finding a suitable measure of socio-economic status is the first step.

Measures of social mobility

Socio-economic status can be measured either by discrete categories, for example, by membership in hierarchically ordered classes, or continuously, by earnings, income, or wealth (Bowles & Ginitis, 2002). [2] The discrete approach has the advantage that it provides a thorough representation of the process of intergenerational mobility, using the probability of transitioning between the relevant social ranks as an indicator of greater mobility, but interpretation thereof is not always straightforward (Erikson & Goldthorpe, 1992). By contrast, a continuous measure allows for a simpler measure of social mobility, based on the correlation between the social statuses of successive generations.

Owing to the availability of comprehensive panel data, modern studies of intergenerational mobility have typically followed the continuous approach, as economic status is usually available in a variety of convincing measures. Such data allow for the comparison of income (earnings or wealth) of one generation to the next by estimating intergenerational income elasticities (IGE) ranging from 0 to 1. An elasticity close to one indicates a lower level of intergenerational mobility while an elasticity close to zero indicates a higher level of mobility between generations. Contemporary studies of the earnings of fathers and sons commonly estimate an IGE of between 0.3 and 0.4.[3]

Some such studies have used historical mobility to predict future mobility (Piketty, 1995) while others have demonstrated how past mobility can explain the persistence of societal inequalities (Benabou & Ok, 2001; Bowles & Ginitis, 2002). These studies are not without limitations, as income is often criticised for being a one-dimensional measure of socio-economic status. Observed variation can, for example, often be explained away by measurement error (Lechtenfeld & Zoch, 2014). Most importantly, however, this method can rarely be applied in historical studies due to a lack of

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[2] Education, occupation and income are not the only dimensions of stratification systems. Individual prestige and the role of ethnic and religious group membership in the process of status attainment are a few which are not explored here.

[3] Solon (1999) reviews these studies and Mazumder (2005) provides more recent evidence that they may underestimate the true elasticity.

income data. Fortunately historical registries are often rich in alternative measures of socio-economic status that can be traced across multiple generations.

Intergenerational occupational mobility, which is usually calculated between fathers and sons, attributes a greater likelihood of transitions between discrete occupational categories as evidence of increased social mobility.[4] While the leading question in this literature has always been whether or not there has been more mobility over time, recent studies have focussed on examining the degree of differentiation between social mobility systems across countries at different stages of economic development and at different stages in the industrialisation process (Bordieu et al., 2009; Long & Ferrie, 2013).

Earlier studies in this field, notably Lipset and Zetterberg (1959), find that the general pattern of social mobility was highly similar across the industrial societies of various Western countries. Eriksson and Goldthorp (1993) come to a similar conclusion when they compare intergenerational class mobility in industrial societies for the twentieth century in their seminal work *The Constant Flux*. Ganzeboom et al., (1989) oppose these conclusions, finding substantial differences in relative mobility between countries. More recent empirical studies have generally refuted the Lipset and Zetterberg conclusion, finding significant differences in the amount of mobility between industrialised societies (Van Leeuwen & Maas, 2010).

In what looks to become a seminal contribution, Long and Ferrie (2013) compare intergenerational occupational mobility between Britain and the United States and find that significant differences in social mobility exist, even after accounting for differences in these countries' occupational structures during the second half of the nineteenth, and the first half of the twentieth century. They attribute these differences to differences in economic development in the two countries, which had disappeared by the second half of the twentieth century. Bourdieu et al., (2009) conduct a similar analysis comparing France and the US and find significantly higher mobility rates for the US during the mid-nineteenth century. Unlike Long and Ferrie, the authors cannot attribute this difference to superior economic development, since both countries were at similar levels of development. They suggest that these

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[4] Van Leeuwen & Maas (2009 & 2010) review the leading studies on historical occupational mobility.

differences arose, inter alia, from differences in political systems, the movement of wealth from one generation to the next, the composition of the population, and the willingness to invest publically in education (Bourdieu et al., 2009: 526).

Lipzet and Zetterberg (1959) also argued that intergenerational mobility remained relatively stable over time. Subsequent research has found mixed evidence relating to the change in total mobility before and after industrialisation, no doubt due to the complex nature of said transitions but also as a result of inadequate data which covers both the pre- and post-industrialisation periods. Since structural changes in the labour market per definition generate intergenerational occupational mobility, a clear distinction between absolute and relative mobility is therefore necessary to understand changing mobility over time. Absolute mobility is the observed amount of movement out of one category and into another. It is the combined effect of changes in the marginal distributions of occupations (changes in the structure of the labour market), and changes in the relationship between occupations across generations (Hodge, 1966; Featherman et al., 1975; Hauser, 1980; Erikson & Goldthorpe, 1992).

Measurements of absolute mobility therefore provide a description of the overall change in social structure, and the share of individuals who remain immobile, or end up in higher or lower classes than their parents. Relative mobility measures intergenerational status persistence net of structural changes in the labour market. This could be as a result of a reduction of the barriers to mobility, for example, an expansion of educational system offering new opportunities to the less affluent, the diminishing importance of social networks and the growing importance of achievement over ascription by birth.

Measuring intergenerational occupational mobility is not without its own limitations. The first limitation has to do with the fact that simply observing intergeneration occupational mobility does not indicate whether the standard of living of a son in relation to his father has necessarily improved. Variation in income and wealth within occupations can be quite large suggesting that in the absence of occupational mobility there may still be substantial income or wealth mobility.

The aim of this paper is to study both absolute and relative social mobility in South Africa during the transition from an agricultural to industrialised society. It will do so

by examining how patterns of intergenerational social mobility and class attainment changed over the nineteenth century. The research question is thus twofold: (i) Was there a long-run trend towards increased intergenerational mobility amongst European settlers in South Africa during industrialization? And (ii) was this trend exclusively the result of structural changes in the labour market?

Periodization: When did industrialisation begin?

Since primary goal of this chapter is to investigate changing intergenerational mobility over a period during which the South African settler economy underwent a substantial transformation, the data are divided into four cohorts intended to capture the various phases of industrialisation. These include: (i) the British period (1806-1834); (ii) the pre-industrial economic stagnation period (1835-1867); (iii) the mining revolution (1868-1886); and (iv) the industrial take-off period (1887-1909); each of which is now described in more detail.

The British period (1806-1834)

From the arrival of the first Dutch East India Company men in 1652 until the first British occupation in 1795, trade at the Cape was monopolised by the VOC. At no time during those years was it the mandate of the Company to promote secondary industry. The Company was a trading rather than a colonising unit, and any suggestions for the establishment of manufacturing concerns were strongly opposed on the basis that it would be detrimental to the Company's factories in Holland (Lumby, 1983: 196). Under VOC control wheat and wine production expanded until the latter part of the eighteenth century after which pastoralism dominated, particularly on the eastern frontier (Illife, 1999: 88).

When the Cape became subject to British rule in 1795, Britain was still largely under the influence of mercantilism and required colonies to supply the mother country with raw materials and agricultural produce in return for the manufacturing they required (Lumby, 1983: 196). Between 1803 and 1806 the Cape was briefly handed back to the Dutch, this time under the control of the Council for Asiatic Possessions since by that time the VOC no longer existed. When conflict with Napoleon broke out again, Britain reoccupied the Cape in 1806, and the Colony was once again incorporated it into its vast and dynamic imperial economy. In the 1820's

approximately 4000 British settlers made the eastern regions of the colony their home. In the following decades these settlers took up Merino sheep farming. Their frequent trade with the native African population and success in stock farming made the region an economic growth point.

Importantly, the core of labour force on most settler farms up to the early nineteenth century was made up of slaves, especially in the more productive and densely populated areas. But the early decades of the nineteenth century witnessed a steady trend away from slavery, as wage labour became increasingly prevalent. Ross (1986) views the system of slavery as being operated in an increasingly commercialized and capitalist environment. He suggests that the indigenous population in these areas had been sufficiently proletarianized to form the basis of what would essentially become a wage labour force. The abolition of slavery in 1834 prompted the organised mass migration into the interior by frontier settlers, known as *voortrekkers*, who had become dissatisfied with British rule.

Pre-industrial economic stagnation (1835-1867)

A new policy of free trade following Britain's loss of its American colonies was now gradually coming into being. Although it did not prevent the Cape from trading with foreign countries, it favoured a system of preferential duties for the protection of British trade and shipping. By this time, Cape Town was the centre of some 70 manufacturing concerns, including 15 brickfields, 9 fish-curing firms, 7 steam flour mills, 6 soap and candle factories, 6 snuff mills, and 5 iron and brass foundries. Manufacture was by no means confined to Cape Town, and nearly all the districts of the colony had some factories, either processing agricultural products or manufactures to supply a local need such as wagon building, furniture-making, brick-making and stone quarrying. It has been suggested that this development was sponsored in part by the 7.5% duty on imports which was raised to 10% in 1864 (Lumby, 1983: 196).

But the early years of the 1860's saw a period of economic recession in South Africa. The imminence of the opening of the Suez Canal was causing apprehension, particularly amongst farmers and traders in the Cape Colony, as it was rightly feared that the advent of the canal would substantially reduce the profits to be made from

trade. In addition, the international price of wool, the colony's only export of real significance, had dropped dramatically after the end of the American civil war (Goodfellow, 1931: 4). The poor economic outlook was compounded by a severe drought which affected major portions of the country (Nattrass, 1981: 24). According to the census of 1865, the economy was still predominantly agricultural. Out of the total working population only 8.5 per cent were employed in manufacturing and 4.4 per cent in commerce as opposed to 55 per cent in agriculture.

South African farms were typically large in size, five thousand acres being a common size, and it was not unusual for wealthy farmers to buy up more than one. Many of the manufacturers, especially outside Cape Town, provided services for the farming communities, as wagon-builders or brick-makers; or in the processing of agricultural products as distillers, millers and wool-washers (Ross, 1986: 57). Nevertheless by the mid-nineteenth century, the necessary market, skill and capital were not available for industrialisation to truly begin. Ross (1986) maintains that Cape agriculture, in majority of those parts of the rural areas dominated by settlers, could be characterised as 'capitalist' well before the mineral discoveries that were to transform the political economy of the country. Agricultural production throughout the Cape Colony, and to a lesser extent, in Natal and the southern Orange Free State was largely geared to the market, and indeed to export trade. Substantial amounts of credit were available for agricultural investments, first through merchant firms and wealthier families, and later as country banks were established throughout the territory. Morris (1976: 283) on the other hand maintains that:

> *When capitalist mining was introduced in the late nineteenth century although a rudimentary exchange economy existed [with] quasi-feudal peasant relations as the principal means of extracting a surplus in the absence of a strong capitalist fanning class, the dominant mode of production in agriculture was not yet capitalist, hence it is erroneous to apply concepts of capitalist technical efficiency in an analysis of this period.*

This may well have been the case for the Transvaal and the northern Orange Free State, which were the backwaters of colonial South Africa before 1870. What these regions had in common was a tendency to accumulate land as the major route to status and the exercise of patronage. The existence of a manufacturing industry prior

to 1886 in Transvaal was virtually unheard of because distances between farms were too great making specialisation and commercial trade impossible (Goodfellow, 1931: 168).

The mining revolution (1868-1886)

The discovery and subsequent extraction of precious minerals marked the beginning of the industrialisation of South Africa's agrarian economy. The first discovery of the mineral deposits came from the copper mines of O'okiep in Namaqualand in 1852, the first parcel of diamonds was sent to Europe in 1867,[5] and the goldfields of the Witwatersrand were proclaimed in 1886.[6] The Namaqualand copper deposit did not create spectacular wealth for its exploiters on the scale of diamonds and gold, and while it had become the second most important export after wool by 1860, the Cape government could not afford to provide adequate roads in the area let alone a rail link, with the result that copper cannot be said to have had a significant influence on the development of the colony (Webb, 1983: 166).

The discoveries of diamonds and later gold, however, led to the creation of industries directly related to mining, including for example the production of explosives, cement, and certain branches of engineering (Lumby, 1983). Within a year of the discovery of diamonds in Kimberly, a market was bourgeoning, not only for labour, but for every necessity and convenience of life to support its growing population. While the agricultural sector was slow at first in gearing itself towards to meet the new demand, there were new opportunities for individuals to profit from. A good living could be made for instance by providing ox wagon transport to and from the fields (Webb, 1983: 167). Indeed, before the railway link between Wellington and Kimberly was completed in 1885, there was no alternative to oxen for transporting the necessary equipment and materials to and from the mines, a journey which could take weeks to complete (Gilbert, 1933).

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[5] For a more detailed analysis of the effects of diamond discoveries on the South African Economy, see South Africa's City of Diamonds: Mine workers and Monopoly Capitalism in Kimberly 1867-1895 by Worger (1987).

[6] For a more detailed analysis of the effects of gold discoveries on the South African Economy, see Katzen (1964), Webb (1983) & Gilbert (1993).

More recent scholarship suggests that the completion of the railway link not only had important implications for the expansion of the interior economy but also for South Africa's ability to compete internationally. Using agricultural prices, Boshoff & Fourie (2015), show that South Africa's integration into the global market had already began in the 1870's, with local wheat prices beginning to follow international trends. Fourie and Herranz-Locan (2015) add to this by showing that the railway was responsible for at least half of the increase in labour productivity that occurred between 1873 and 1905.

Industrial take-off (1887-1909)

Following the discovery of the main Witwatersrand reef in 1886, South African gold mining expanded rapidly. Noted South African historian C. W. de Kiewiet once remarked: 'From 1886 the story of South Africa is the story of gold' (Ally, 2001: 1). As early as 1888, there were already 44 producing companies and output increased by 4000 per cent between 1886 and 1889 (Gilbert 1993: 557). Breakthroughs continued to be made as new depths were able to be reached with improved machinery and more innovative mining technologies. The completion of a second rail link from the Cape to the Transvaal and thereafter to Delagoa Bay, gave the mines new prosperity. The railways provided inter alia, 'a market for coal, created demand for electricity and steel, and gradually integrated the widely separated regional economies, concentrating heavily on the Witwatersrand industry' (Illife, 1999: 100).

The remaining years of the nineteenth century, however, witnessed little expansion in general manufacturing. This is argued to have been a result of the absorption of available capital and labour into the mining sector, coupled with to a relatively geographically dispersed population which made large-scale manufacturing impossible due to the lack of markets (Lumby, 1983: 197). By 1896 the economy was in recession which would continue to the end of the century.

While gold output steadily increased over this period, the Second South African War (Anglo-Boer War) halted nearly all mining activities until 1902. A short-lived post-war boom was followed after 1903 by several years of depression, due largely to the scarcity of mining labour (Gilbert 1993: 560). Despite the upheaval experienced during the War, the turn of the century did witness significant progress in the

manufacturing sector: the years 1890-1910 saw a rise in the number of factories from 550 to 1500, producing a total gross output in 1911 valued at £17 million (Lumby, 1983: 199). It has been suggested that much of the growth that occurred was a rather a result of the cyclical recovery from the South African War. Approximately half of the £17 million gross output in 1911 comprised the processing of farm products for the food, drink and tobacco industries, and that the other half consisted mainly of building materials, waggons and carts, printing, explosives, matches, tanning and leather harness, soap and candles, some clothing, and a small percentage of the boots and shoes consumed (Lumby, 1983: 199). It is clear therefore that manufacturing consisted of a few protected industries primarily dependent on the gold-mines.

In sum, the discovery and subsequent exploitation of the significant deposits of diamonds in the Kimberley area and gold on the Witwatersrand resulted in the transformation of the economy in the space of fifty years. The period 1868-1910 was one in which there was a substantial change in the economic structure and one that saw the economy evolve from being almost entirely dependent on agriculture, to become a modern economy that was based on a highly profitable mining industry, supported by an infant manufacturing sector and growing commercial and service industries (Nattrass, 1981: 24). It is against this background of economic transformation that this study takes place.[7]

The sample

For this chapter, I use a sample of males from the South African Families database (SAF). The measure of socio-economic status is taken as an individual's occupation. Occupations reported in the dataset have been coded into the Historical International Standard Classification of Occupations (HISCO) (Van Leeuwen, Maas & Miles, 2002). HISCO codes were subsequently classified according to the Historical International Social Class Scheme (HISCLASS) (Van Leeuven & Maas, 2011). The twelve HISCLASS groupings were re-categorised into five broad class categories: professionals, skilled

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[7] For a more detailed overview of the available studies on South Africa's industrialisation see Illife (1999) and Verhoef (1998).

workers, semi-skilled workers, farmers and fishermen, and low and unskilled workers.[8]

As the focus of this study is on the intergenerational processes of status attainment, an occupation must be observed for both the individual and his father in order for the pair to be selected into the sample. I observe 9,484 father-son pairs with complete occupation and birth date information during the period of interest.[9] Although the data provides information on the occupations of fathers and sons, it does not follow individuals who emigrated out of the country. While an unfortunate limitation to the study, these individuals, being geographically mobile, may have differed in socio-economic mobility from those who remained behind, and ought therefore to be considered separately.

In order to determine how representative this sample of males is of the true population, the estimates in the sample should be checked against available census records for evidence of over- or under-sampling of certain occupations. This poses a number of difficulties: firstly, the only available census figures are those reported in the Blue Books for the Cape of Good, for the years 1845, 1865, 1875, 1891 and 1911. While the Blue Books do provide a crude gauge of the share of individuals employed in different sectors of the economy, they only apply to the Cape Colony and not the country as a whole.

Moreover, it is very difficult to make an accurate comparison of the sample to these available censuses for any occupational group other than farmers due to a number of definitional issues. Occupational categories in the census change over time and it is not possible in some instances to identify which occupations made up certain categories. Fortunately the category 'agriculture', defined in the census as, 'persons engaged in agricultural employment: possessing, working, or cultivating land, or raising and dealing in livestock', is reported consistently over time. I am therefore able to make a direct comparison of this group with my 'farmers' group if I restrict the sample to father-sons pairs who resided in the Cape Colony and not in other parts of the country.

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[8] See Appendix B for details.

[9] An individuals who appeared once as a son, may appear again in the dataset as a father.

The 1845 census of the Cape of Good Hope offers only a rough estimate of the number of persons engaged in agriculture, stated as four sixths of the European working age population. Later censuses are slightly more reliable. According to the census of the Cape of Good Hope for 1865 and 1875, the economy was still predominantly agricultural. Out of the total working population of European men, 55 and 54 per cent were employed in agriculture respectively. By 1911, this figure had fallen to 46 per cent. These figures appear to be in line with the proportions of farmers reported in the SAF sample for the different periods under observation (see Table 11).

Since no evidence of the occupational structure for the rest of the country is available, there is nothing against which to judge the representativeness of the full SAF sample. I therefore choose to limit this study to the Cape Colony region for which oversampling of the farming class has shown to be limited. This reduction results in 5,634 father-son pairs remaining in the sample for the period of interest.[10]

Table 11 - European or White Males in working population with specified occupations employed in agriculture.

Periodization (Cape Colony)	SAF (Cape Colony) sample	Cape of Good Hope Census Year	Cape of Good Hope Census estimate
1806-1834	75%	n/a	n/a
1835-1867	69%	1845	67%
1868-1886	58%	1875	54%
1887-1909	49%	1911	46%

The sample sizes for all occupational groups according to period are reported in Table 12. It is clear that only a small amount of change in the structural composition of the labour market took place in the first two periods. Given the previous account of these periods, one would not expect to find substantial mobility during this time. Importantly, a reduction in the size of the farming class over time, gradually at first, from roughly three quarters of the population in the first periods less than half in the early phase of industrialisation can be seen.

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[10] All the results were replicated for the full sample and can be found in Appendix A. An interpretation of these results should be approached with caution as their representativeness of the entire population has not yet been established.

There appears to have been a movement into the professional and skilled classes by individuals from the farming and semi-skilled groups in absolute terms. This is an early indication that, as a result of the changing structure of the labour market, upward occupational mobility would most certainly have taken place. The small low and unskilled class over time is not surprising, given that these occupations were typically filled by member of other race groups.

Table 2 - Size of occupational groups by period.

	British Period 1806-1834	Pre-industrial stagnation 1835-1867	Mineral revolution 1868-1886	Early industrialisation 1887-1910	Overall change in proportion*
Professional	8.7	12.9	22.7	29.6	20.9
Skilled	6.8	8.3	11.5	13.4	6.6
Semi-skilled	5.1	5.8	5.1	4.6	-0.5
Famers	75.2	68.8	57.7	48.5	-26.7
Low/unskilled	4.2	4.2	2.9	3.9	-0.3
Total	100.0	100.0	100.0	100.0	
Sample size	1,043	2,143	1,249	1,238	5,634

*Positive values indicate the class grew

Finally it must be noted that studies of intergenerational mobility typically measure occupational attainment at a specific time during an in individual's life (usually between the ages of 25 and 45). A further limitation of the data is that while multiple occupations may have been recorded for an individual throughout his life, no dates or ages are associated with these entries. Multiple occupations are listed chronologically so it is possible to distinguish between the different occupations an individual may have held over his working life. In order to discern whether any life-cycle effects are likely to confound the results, Table 13 reports the proportion of individuals in each occupational class by first occupation held versus the highest occupation held.

Not unexpectedly, I observe a small amount of upward intra-generational mobility. A slightly larger proportion of individuals appear to start their careers as farmers and low skilled workers when compared with those for whom this is the highest achieved occupational class. Likewise, a slightly smaller share of individuals began their careers as professional, skilled or semi-skilled workers, than the share of the individuals for whom this will be the highest achieved occupational class. For

simplicity, I have selected to observe the highest social class attained by an individual throughout his life.[11]

Table 3 - Intra-generational occupational mobility.

	Proportion of the sample	
	First occupation	Highest occupation
Professional	14.5	18.0
Skilled	9.0	9.8
Semi-skilled	4.5	5.3
Farmers	67.7	63.1
Low/Unskilled	4.3	3.8
Total	100.0	100.0
N	5,634	5,634

Methodology

Discrete approach: Contingency tables

Since the discrete approach to measuring occupational mobility uses the probability of transitioning between the different discrete occupational categories, an accurate comparison of intergenerational mobility across different periods requires the comparison of two contingency tables. Consider a table which compares the occupations of sons to the occupations of their fathers, for each of the four periods (as can be seen in four panels of Table F1 in the data appendix). Each of the four periods contains a different sample of father-son pairs. While this table is useful in revealing how much mobility actually occurred between successive generations, it is ill-suited in answering two additionally important questions, namely: (i) how much mobility would have occurred if the distribution of occupations remained the same across time? And (ii) how strong was the overall relationship between fathers' and sons' occupations?

Altman and Ferrie (2007) suggest adjusting the marginal frequencies of one contingency table to match those of another, in order to answer the first question, and adopting a summary measure of overall mobility and a measure of how mobility differs across two tables, in order to answer the second. This is simplified by two facts

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[11] It is noted that the use of first occupation did not significantly alter the results.

about contingency tables: (i) the cross-product ratio for a 2 × 2 table, or a function of multiple cross-product ratios in a table of more than two rows or columns, is the measure of association in the table; and (ii) this measure is invariant to the multiplication of entire rows or columns by arbitrary constants.

For a 2 × 2 matrix M:

$$M = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

the cross-product ratio is *ad/cb*. If each element in the first row is multiplied by an arbitrary constant *r*1, each element in the second row by an arbitrary constant *r*2, each element in the first column by an arbitrary constant *s*1, and each element in the second column by an arbitrary constant *s*2, the resulting matrix is:

$$M' = \begin{bmatrix} ar_1s_1 & br_1s_2 \\ cr_2s_1 & dr_2s_2 \end{bmatrix}$$

which has as its cross-product ratio (ar1s1dr2s2)/(cr2s1br1s2) = *ad/cb*. This result generalizes to the case of matrices with more than two rows or columns. This property of matrices allows one to multiply the rows and columns of a matrix by arbitrary constants without altering the underlying association between rows and columns in the matrix. In matrix M, there are a + b observations in the first row, c + d observations in the second row, a + c observations in the first column, and b + d observations in the second column. For the total number of observations in the first row to be the same as the total number of observations in the first column, the first column of M should be multiplied by (a + b)/(a + c). The resulting matrix will have the desired property, which results in a new matrix where:

a′= (a)(a + b)/(a + c) and c′= (c)(a + b)/(a + c).

For the total number of observations in the second row equal to the total number of observations in the second column, an additional manipulation can be performed by multiplying the second column of M′ by (c′+ d)/(b + d). This will then change the total number of observations in the first row. So to keep the number of observations equal in the first row and column, an additional iteration will be necessary. But this will

change the total in the second column. This iterative process will eventually converge to the point where the row and column sums achieve the desired equality.

Deming and Stephan (1940) showed how this mechanism can be generalized to tables with more than two rows and columns, and the Deming and Stephan algorithm can easily be applied to each panel so that each subsequent period will have the occupational structure of the earliest period imposed upon it. The contingency tables with adjusted marginal frequencies can be found in Table F3 in the appendix. Any mobility observed in the subsequent periods of Table F3 can be the result only of differences in the underlying, or interaction, mobility.

Even after adjusting the marginal frequencies and finding (theoretically) that the difference between two periods is 0, there may still be differences in mobility between two tables. Again, for a 2 × 2 matrix, the fundamental measure of association between rows and columns is the cross product ratio. For a table with more than two rows or columns, there will be many cross product ratios, so a summary measure of association is needed to take account of all of them. Altham (1970) offers one such measure. For an r × s table P with elements $\{p_{ij}\}$ and an r × s table Q with elements $\{q_{ij}\}$, the difference in the degrees of association between P and Q can be measured by the *Altham Statistic*:

$$d(P,Q) = \left\{ \sum_{i=1}^{r} \sum_{j=1}^{s} \sum_{l=1}^{r} \sum_{m=1}^{s} \cdot \left| \log[(p_{ij}p_{lm}q_{im}q_{lj})/(p_{im}p_{lj}q_{ij}q_{lm})] \right|^2 \right\}^{1/2}$$

which is equal to the sum of the squares of the difference between the logs of the cross-product ratios in tables P and Q. The Altham statistic ranges from zero (in which case the association between rows and columns is identical in the two tables) to ∞. These distance measures have likelihood ratio chi-squared test statistics (G^2) to test the null hypothesis that the associations do not differ, so that one can assess whether two tables differ from one another, and from independence. The statistic does not reveal which table has the stronger association. That can be determined by calculating d(P, I) and d(Q, I), which uses the same formula as d(P, Q) but replaces one table with a matrix of ones. If d(P, I) < d(Q, I) and d(P, Q) > 0, then Table P has greater mobility than Table Q (that is, Table P has an association between rows and

columns that is closer to what would be observed under independence than does Table Q) (Altham & Ferrie, 2007).

Since contingency tables are often dominated by elements along the main diagonal (which, in the case of mobility, captures immobility or the inheritance of socioeconomic status), an additional version of d(P,Q) must be calculated to examine only the off-diagonal cells. This result will show whether, conditional on status mobility occurring between fathers and sons, the patterns of mobility are similar in P and Q, thus testing whether P and Q differ to so-called 'quasi-independence'.

For an r × s contingency table, this additional statistic $d^i(P,Q)$ will have the same properties as d(P,Q), but the likelihood ratio χ^2 statistic G^2 will have $[(r - 1)^2 - r]$ degrees of freedom. This version measures the strength of association fathers' and sons' occupations among those who did not enter the same occupation as their father.

As a pure function of the odds ratios in tables P and Q, d(P,Q) is invariant to the multiplication of rows or columns in either table by arbitrary constants; d(P,Q) measures the difference in row–column association between two tables apart from that induced by differences in marginal frequencies. As a simple sum of the squares of log odds ratio contrasts, $[d(P,Q)]^2$ can be easily decomposed into its constituent elements: For an r × s table, there will be $[r(r-1)/2][s(s-1)/2]$ odds ratios in d(P,Q). Calculating how much each odds ratio contributes to $[d(P,Q)]^2$ makes it possible to locate where in P and Q the differences between them are greatest.

One of the limitations of the discrete approach relates to the a priori classification of occupations into categories. This can be problematic if the choice of classification scheme is not appropriate to the context, but more importantly, the size of the groupings is likely to influence the amount of mobility measured. Broad categories are likely to underestimate true levels of mobility. For example doctors and accountants are both occupations that appear in the 'professional' category meaning that a father-son pair in which the father was an accountant and the son was a doctor will classified as a 'no-mobility' case. One way to avoid this is to use narrower occupational categories, for example, the original 12 category HISCLASS scheme. However, this will result in 12 by 12 transition matrices, which can be cumbersome

to work with and difficult to interpret. The alternative is to follow a continuous approach.

Continuous approach: Rank-rank regression

Following a variation of Chettty et al., (2014a, 2014b) I measure the overall relationship between father and son's occupational achievement using a rank-rank specification. Each son's occupation is ranked relative to others in his birth cohort on prestige score of 1-100 using the HISCO minor sub-groupings as a guide.[12] Likewise, father's occupations are ranked relative to one another in the same birth cohort. Unlike Chetty et al (2014), I am unable to impute an occupational wage as wage data for this period are not sufficient. The empirical specification of the intergenerational relationship can then be expressed as:

$$Y_{it} = \alpha + \beta\left(Y_{i,t-1}\right) + \varepsilon_{it}$$

where Y_{it} is the occupation rank for an individual in family line i in generation t, Y_{it-1} is the corresponding outcome for another individual in family line i in generation t-1, and ε_{it} is an error term with the usual properties.

The full empirical analysis that follows will be carried out in four steps: (i) Patterns of absolute mobility are calculated by way of discrete category descriptive contingency tables. (ii) Relative mobility will be distinguished from absolute mobility by adjusting the marginal frequencies of the contingency tables to see how much mobility would have occurred if the distribution of occupations remained the same across time (iii) Altham statistics are calculated to see how strong the overall relationship between fathers' and sons' occupations was. (iv) Uncontrolled OLS regressions, measuring the overall effect of fathers' occupational rank on sons' occupational rank will be presented as an alternative measure in response to the aforementioned limitations of the discrete approach.

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[12] A breakdown of the HISCO minor sub groupings used and the creation of the occupational prestige score can be found in Appendix B.

Results

Discrete approach results

For simplicity, the full 5 by 5 transition matrices have been summarized into sons who experienced 'downward mobility', 'no mobility' or 'upward mobility' based on their father's occupation, in Table 14. In the earliest birth cohort (panel 1 of Table 14), a staggering 85 per cent of sons of famers were farmers themselves, while only 13 per cent of sons of farmers moved into higher classes. This figure remains largely unchanged at 83 per cent in the second birth cohort. A decline in immobility for farmers can be seen for the third birth cohort, with immobility down by 9 per cent and nearly one quarter of sons of farmers achieving higher occupational outcomes than their fathers.

It is only in period 4, when the effects of the country's industrialisation begin to be felt, that the immobility within farmers drops markedly to 64 per cent, now with one third of sons of farmers experiencing upward social mobility in absolute terms. While this is an 18 percentage point improvement in rate of upward mobility between the first and last birth cohorts in our sample, it is perhaps not as large as one would expect given the transformation of the economy from being largely agricultural to being largely dependent on mining and its supporting industries.

When mobility is compared over time, holding the occupational structure of the society constant, as in Table 15, sons of farmers are seen to experience virtually no improvements in relative mobility. Within the farming community it appears as though ascription by birth trumped personal achievement, possibly as a result of the importance of social networks, but most certainly as a result of land ownership. Indeed, the possession of physical capital, here in the form of land, might have been far more important than human capital.

Those fortunate enough to find themselves within the farming class, might have been saved from falling into the ranks of wage labourers, but were at the same time deterred from seeking to improve their lot, as productive land would have been highly valued and not parted with easily. Moreover, variation in income and wealth within occupations, particularly within the farming class, is likely to have been be quite large in this sample; suggesting that in the absence of occupational mobility

there may still have been substantial income or wealth mobility. There were certainly great differences in the extent of landownership amongst farmers. While some famers were able to accumulate large stretches of land and with it, influence and patronage, others owned subdivisions of farms that by themselves were insufficient to ensure families their independence. As Keegan (1987: 20) notes:

> *By no means were all Boers (farmers) landowners in the nineteenth century, or wished to be given the fluidity of the pastoral and hunting economy. Non-landownership was not necessarily an economically disadvantageous condition while the Boer economy required and allowed great mobility and an ill-defined sense of proprietary right. Land was always a highly desirable commodity in speculative terms, and land accumulation was a road to status and office in the Boer state, but absentee proprietorship was extensive, farms were ill-defined and un-surveyed, and fencing was non-existent before the final decade or two of the nineteenth century. Non-landownership did not initially entail any disabling economic disadvantages. It was only later – towards the end of the century – that landlessness became a decisive determining factor in the process of class differentiation in Boer society.*

Sons of semi-skilled workers were those who stood to increase their chances of upward mobility most dramatically over time, joining the ranks of the skilled and professional classes. In absolute terms the probability for sons of skilled fathers to be upwardly mobile more than doubled from 20 per cent in the earliest birth cohort to 45 per cent in the last. In absolute terms the probability for sons of semi-skilled fathers to be upwardly mobile more than trebled, from 17 per cent for those born in the first cohort to 58 per cent for those born in the last cohort.

Only part of this improvement can be attributed to a shift in the structure of the labour market resulting in the availability of new high skilled job opportunities. The other part of the improvement was net of these changes, as can be seen by the increase in the probability of upward mobility for sons of medium-skilled workers in relative terms from 17 per cent for the first birth cohort to 29 per cent for the last. Barriers to entry into white collar positions which required formal training or schooling were therefore low for individuals from semi-skilled class origins. This is characteristic of an attainment system based on achievement. Employers were

presumably recruiting into these positions on the basis of merit instead of ascription. Workers, on the other hand, presumably began to invest in the education of their children who took advantage of opportunities for upward mobility.

The growing professional sector of the labour market meant that formal education became increasingly important for status attainment rather than transfer of status or resources from the parental generation (Treiman 1970). Necessary skills could be acquired through formal schooling through the expansion of public education, or increased on-the-job training. However, adult literacy in the Cape was fairly low throughout the century. By 1860 only two thirds of the European population were literate. While the Department of Education introduced a number of policies during the 1870's and 1880's to increase white children's access to education, standards of education remained low and schools were poorly attended. By 1878 more than half of the colony's white children still were not attending school. Those who did receive a formal education would likely have come from the existing middle class. As Duff (2011:267) notes:

> *The Cape's system of education did not cater to the needs or lifestyle of a rural population, which was poor, widely scattered, frequently nomadic, and occasionally suspicious of the motives of the colonial government. This education system was designed to suit a relatively affluent population which was settled for long periods of time, in or near urban centres. This was a model suited for middle-class living – to middle-class parents who were deferential to the authority of civil servants, and who saw the education of their children, and particularly their sons, as absolutely crucial for preparing them for middle-class occupations.*

It was rarely the case that members of the lowest classes of society had access to this type of formal education and the likelihood that barely literate parents would send their children to school was low (Duff, 2011:266). This is reflected by the fact that the prospects for upward mobility for sons of unskilled labourers remained fairly unchanged over time in both absolute and relative terms. Despite the relatively small size of this group, low and unskilled labourers were essentially excluded from the general increase in mobility opportunities existed for other members of society.

Table 4- Absolute intergenerational mobility, summarised by birth cohort.

1806-1834	Downward	No mobility	Upward
Professional	69.5	30.4	-
Skilled	40.0	40.0	20.0
Semi-skilled	54.7	28.3	17.0
Farmers	2.1	84.7	13.3
Low/ Unskilled	-	21.1	79.0
All	13.4	72.0	14.6
N	140	751	152

1835-1867	Downward	No mobility	Upward
Professional	53.3	46.7	-
Skilled	38.7	32.4	28.9
Semi-skilled	45.7	27.2	27.2
Farmers	3.0	82.8	14.2
Low/ Unskilled	-	45.1	54.9
All	13.9	70.5	15.6
N	298	1510	335

1868-1886	Downward	No mobility	Upward
Professional	42.4	57.6	-
Skilled	34.8	24.1	41.1
Semi-Skilled	36.2	23.3	50.5
Farmers	2.9	73.9	23.2
Low/ Unskilled	-	21.7	78.3
All	13.2	62.0	24.8
N	165	773	309

1887-1909	Downward	No mobility	Upward
Professional	31.1	68.9	-
Skilled	27.9	27.3	44.8
Semi-skilled	15.0	27.5	57.5
Farmers	4.3	64.1	31.5
Low/ Unskilled	-	25.0	75.0
All	11.3	57.6	31.0
N	140	713	384

Table 5 - Relative intergenerational mobility, summarised by birth cohort. Marginal frequencies adjusted to match first birth cohort.

1806-1834	Downward	No mobility	Upward
Professional	69.6	30.4	-
Skilled	40.0	40.0	20.0
Semi-skilled	54.7	28.3	17.0
Farmers	2.1	84.7	13.2
Low/ Unskilled	-	21.1	78.9
All	140	751	152
N	13.4	72.0	14.6

1835-1867	Downward	No mobility	Upward
Professional	62.9	37.1	-
Skilled	45.8	32.3	21.9
Semi-skilled	50.9	27.9	21.3
Farmers	2.7	86.2	11.2
Low/ Unskilled	-	43.5	56.5
All	137	777	129
N	13.1	74.5	12.4

1868-1886	Downward	No mobility	Upward
Professional	65.9	34.1	-
Skilled	58.4	20.3	21.3
Semi-skilled	40.7	30.4	29.0
Farmers	3.3	84.7	12.1
Low/ Unskilled	-	28.6	71.4
All	144	753	145
N	13.8	72.2	13.9

1887-1909	Downward	No mobility	Upward
Professional	64.6	35.4	-
Skilled	60.4	21.5	18.1
Semi-skilled	30.5	40.9	28.6
Farmers	3.5	85.4	11.1
Low/ Unskilled	-	27.5	72.5
All	139	767	137
N	13.4	73.5	13.1

Turning now from the question of how much absolute mobility was observed over time and how much mobility would have occurred if the distribution of occupations remained the same across time, I now calculate Altham statistics, shown in Table 16, to determine how strong the overall relationship between fathers' and sons' occupations was. For simplicity I split the periods into 'before 1868' and 'after 1868' and calculate the following distance measures and test statistics. For both 'before 1868' and 'after 1868', I reject the null hypothesis that the occupations of fathers and sons are independent.

I also reject the null hypothesis that the relationship between fathers' and sons' occupations is identical in the two tables. The period after 1868 (Q) has a relationship between fathers' and sons' occupations that is marginally closer to independence than before 1868 (P), so the period after 1868 had greater relative mobility in occupations across generations than the period preceding it. The last statistic, $d^i(P, Q)$ tests the difference between the two tables only considering mobility off the diagonal. This is not statistically significant implying that I cannot reject the null-hypothesis of no difference between before 1868 and after 1868 when only considering cells off the diagonal.

Table 6 - Altham statistics

	d(P, I)	d(Q, I)	d(P, Q)	d^i(P, Q)
Before 1868 (P) compared with After 1868 (Q)	32.55***	31.97***	12.96**	10.60

*** p<0.01, ** p<0.05, * p<0.1

An alternative method for measuring relative mobility is offered by Dribe et al., (2013) who propose a multivariate logistic regression model with the estimated parameters being presented as odds ratios or relative risks. Upward, downward or no mobility are competing outcomes in the model. Controls are included for period of birth which allows one to distinguish relative mobility from absolute mobility by including a variable measuring the relative size of the origin class. The variable measures the share of the population at the individual's time of attainment that was observed in the individual's origin class (i.e. his father's highest attained occupational class).

Originating from a large or growing class is expected to lower the chances of ending up in a different class, due to the comparatively greater opportunities within that group. Table 17 contains the result of the model which further ratify the contingency table and Altham statistic results. They confirm increasing absolute and relative upward social mobility over time becoming statistically significant for sons born after 1868. They also reveal the decreasing probability of downward transitions over time, also becoming statistically significant following the mineral revolution.

Table 7 - Multinomial logistic regression, no mobility as base outcome. Estimates expressed as relative risks.

	Downward mobility	Upward mobility	Downward mobility	Upward mobility	Downward mobility	Upward mobility
1806-1834	1.000	1.000	1.000	1.000	1.000	1.000
1835-1867	1.059	1.096	0.866	1.030	0.737**	0.957
1868-1886	1.145	1.975***	0.783*	1.727***	0.603***	1.619***
1887-1910	1.053	2.661***	0.729**	2.318***	0.539***	2.301***
Origin class size			YES		YES	
Father's class					YES	
Pseudo R2	0.0153		0.1424		0.2134	
Log likelihood	-4806		-4185		-3838	
Prob>chi2	0.0000		0.0000		0.0000	
Observations	5,634		5,634		5,634	

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Rank-rank results

Finally, turning to the continuous measure of intergenerational mobility, Table 18 presents the results of an uncontrolled OLS regression that measures the effect of father's occupational rank on son's occupational rank. According to this measure intergenerational mobility appears to have remained extremely stable, although the definition of intergenerational mobility here is slightly different than in the previous estimates. What these rank-rank estimates measure is the extent to which an improvement in father's occupation will be inherited by sons. The interpretation, though slightly less intuitive than other measures presented in this chapter, is thus, for a 10 percentage point upward movement along the occupational ranking for fathers; sons can expect an associated 4.2 percentage point increase in their own occupational rank on average. The fact that this estimate remains stable over time

suggests that the magnitude by which a shock to father's occupation is inherited by a son is fairly constant .

Table 8 - OLS regression estimates of son's occupation rank on father's occupation rank by birth cohort.

	Before 1868	After 1868
Rank-Rank Slope	0.419***	0.422***
	(0.0177)	(0.0227)
Observations	3,137	2,497
R-squared	0.149	0.121

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Conclusions

This chapter investigates both absolute and relative social mobility during the transition from an agricultural to industrialised society. To do so, it employs a range of methodologies, using both discrete and continuous measures, in order to provide a comprehensive account of intergenerational social mobility and class attainment for the Cape Colony over the nineteenth century.

The study finds increasing upward social mobility over time, becoming significant following the mineral revolution beginning in 1868. Consistent with the qualitative evidence of a shift away from agriculture as the dominant sector in the economy, the results show a general shrinking of the farming class matched by a growing skilled and professional class.

However, sons of farmers experienced virtually no improvements in mobility over time, net of these structural changes in the labour market. This is not entirely surprising given the value of productive land which would not have been parted with easily by sons of farmers. It is difficult to imagine that the son of a farmer, who stood to inherit at least some portion of his father's land, would seek out a formal education in order to pursue a career as a doctor or lawyer. Rather, the declining role of agriculture in the economy mandated that sons of farmers take up different occupations.

Where all of the mobility for sons of farmers was as a result of the structural changes in the labour market, much of the mobility for the sons of semi-skilled workers was net of these structural changes. Sons of semi-skilled workers were able to substantially improve their occupational outcomes relative to their fathers, as barriers to entry into the upper classes were low for this group. This kind of achievement based mobility rather than purely ascription based mobility suggested that industrialisation did have an effect on total mobility in the settler South Africa.

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Appendix A: Mobility Tables

Appendix A Table 1 - 5X5 Absolute mobility tables by birth cohort (proportions): Cape sample only

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	30.4	10.4	8.7	41.7	8.7	100.0
Skilled	20.0	40.0	2.9	28.6	8.6	100.0
Medium Skilled	13.2	3.8	28.3	43.4	11.3	100.0
Farmers	4.9	5.2	3.1	84.7	2.1	100.0
Low/Unskilled	7.9	2.6	5.3	63.2	21.1	100.0
Column Total	8.7	6.8	5.1	75.2	4.2	100.0

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	46.7	17.9	3.9	29.3	2.2	100.0
Skilled	28.9	32.4	9.2	27.5	2.1	100.0
Medium Skilled	17.9	9.3	27.2	38.9	6.8	100.0
Farmers	6.2	4.6	3.5	82.8	3.0	100.0
Low/Unskilled	7.8	7.8	7.8	31.4	45.1	100.0
Column Total	12.9	8.3	5.8	68.8	4.2	100.0

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	57.6	15.8	3.4	20.9	2.3	100.0
Skilled	41.1	24.1	3.6	30.4	0.9	100.0
Medium Skilled	33.0	17.5	23.3	34.3	1.9	110.0
Farmers	11.3	8.4	3.5	73.9	2.9	100.0
Low/Unskilled	30.4	4.4	4.4	39.1	21.7	100.0
Column Total	22.7	11.6	5.1	57.7	2.9	100.0

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	68.9	12.0	3.6	14.4	1.2	100.0
Skilled	44.8	27.3	4.9	20.9	2.1	99.9
Medium Skilled	40.0	17.5	27.5	11.3	3.8	100.0
Farmers	18.2	10.8	2.5	64.1	4.3	100.0
Low/Unskilled	25.0	18.8	6.3	25.0	25.0	100.0
Column Total	29.6	13.4	4.6	48.5	3.9	100.0

Appendix A Table 2 - 5X5 Absolute mobility tables by birth cohort (values): Cape sample only

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	35	12	10	48	10	115
Skilled	7	14	1	10	3	35
Medium Skilled	7	2	15	23	6	53
Farmers	39	42	25	679	17	802
Low/Unskilled	3	1	2	24	8	36
Column Total	91	71	53	784	44	1043

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	107	41	9	67	5	229
Skilled	41	46	13	39	3	142
Medium Skilled	29	15	44	63	11	162
Farmers	96	71	55	1290	47	1559
Low/Unskilled	4	4	4	16	23	51
Column Total	277	177	125	1475	89	2143

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	102	28	6	37	4	177
Skilled	46	27	4	34	1	112
Medium Skilled	34	18	24	25	2	103
Farmers	94	70	29	615	24	832
Low/Unskilled	7	1	1	9	5	23
Column Total	283	144	64	720	36	1247

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	115	20	6	24	2	167
Skilled	64	39	7	30	3	143
Medium Skilled	32	14	22	9	3	80
Farmers	151	90	21	533	36	831
Low/Unskilled	4	3	1	4	4	16
Column Total	366	166	57	600	48	1237

Appendix A Table 3 - 5X5 Relative mobility tables by birth cohort. Marginal frequencies adjusted to match first cohort: Cape sample only

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	35	12	10	48	10	115
Skilled	7	14	1	10	3	35
Medium Skilled	7	2	15	23	6	53
Farmers	39	42	25	679	17	802
Low/Unskilled	3	1	2	24	8	36
Column total	91	71	53	784	44	1043

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	43	21	5	43	3	115
Skilled	8	11	4	12	1	35
Medium Skilled	7	5	15	24	3	53
Farmers	32	31	27	693	21	804
Low/Unskilled	2	3	3	13	16	36
Column total	91	71	53	784	44	1043

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	39	18	6	47	5	115
Skilled	7	7	2	18	1	35
Medium Skilled	8	7	16	20	2	53
Farmers	32	38	27	681	27	804
Low/Unskilled	4	1	2	19	10	36
Column total	91	71	53	784	44	1043

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	41	14	8	50	2	115
Skilled	6	8	3	17	1	35
Medium Skilled	8	7	22	13	3	53
Farmers	33	39	18	687	28	804
Low/Unskilled	3	4	3	16	10	36
Column total	91	71	53	784	44	1043

Appendix A Table 4 - 5X5 Absolute mobility tables by birth cohort (proportions). Full sample

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	31.4	13.6	10.7	39.6	4.7	100.0
Skilled	31.2	27.3	13.0	26.0	2.6	100.0
Medium Skilled	11.7	3.9	36.4	40.3	7.8	100.0
Farmers	4.7	4.5	3.8	85.9	1.2	100.0
Low/Unskilled	17.4	4.4	10.9	47.8	19.6	100.0
Column Total	10.2	6.8	7.2	73.1	2.7	100.0

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	45.5	14.0	3.4	33.6	3.4	100.0
Skilled	30.1	33.5	8.1	26.3	1.9	100.0
Medium Skilled	15.1	11.2	25.0	43.1	5.6	100.0
Farmers	5.9	4.0	3.1	85.2	1.9	100.0
Low/Unskilled	12.2	8.1	6.8	40.5	32.4	100.0
Column Total	13.0	7.7	5.2	71.1	3.1	100.0

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	52.1	13.7	3.8	28.1	2.2	100.0
Skilled	31.5	27.9	3.6	36.0	1.0	100.0
Medium Skilled	24.8	19.4	21.7	29.5	4.7	100.0
Farmers	8.7	7.6	3.3	77.7	2.7	100.0
Low/Unskilled	12.2	12.2	7.3	46.3	22.0	100.0
Column Total	17.6	10.9	4.5	64.0	3.0	100.0

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row Total
Professional	57.2	13.6	5.9	18.9	4.4	100.0
Skilled	34.4	37.8	7.2	19.2	1.4	100.0
Medium Skilled	33.3	18.9	27.0	13.5	7.2	100.0
Farmers	14.1	11.7	4.1	65.6	4.5	100.0
Low/Unskilled	16.3	18.6	9.3	25.6	30.2	100.0
Column Total	22.8	15.2	5.8	51.6	4.7	100.0

Appendix A Table 5 - 5X5 Absolute mobility tables by birth cohort (values): Full sample.

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	53	23	18	67	8	169
Skilled	24	21	10	20	2	77
Medium Skilled	9	3	28	31	6	77
Farmers	47	45	38	867	12	1009
Low/Unskilled	8	2	5	22	9	46
Column total	141	94	99	1007	37	1378

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	172	53	13	127	13	378
Skilled	63	70	17	55	4	209
Medium Skilled	35	26	58	100	13	232
Farmers	134	91	71	1946	43	2285
Low/Unskilled	9	6	5	30	24	74
Column total	413	246	164	2258	97	3178

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	163	43	12	88	7	313
Skilled	62	55	7	71	2	197
Medium Skilled	32	25	28	38	6	129
Farmers	139	122	53	1247	44	1605
Low/Unskilled	5	5	3	19	9	41
Column total	401	250	103	1463	68	2285

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	194	46	20	64	15	339
Skilled	100	110	21	56	4	291
Medium Skilled	37	21	30	15	8	111
Farmers	259	214	76	1205	82	1836
Low/Unskilled	7	8	4	11	13	43
Column total	597	399	151	1351	122	2620

Appendix A Table 6 - 5X5 Relative mobility tables by birth cohort. Marginal frequencies adjusted to match first cohort: Full sample

1806-1834	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	53	23	18	67	8	169
Skilled	24	21	10	20	2	77
Medium Skilled	9	3	28	31	6	77
Farmers	47	45	38	867	12	1009
Low/Unskilled	8	2	5	22	9	46
Column total	141	94	99	1007	37	1378

1835-1867	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	65	24	10	65	5	169
Skilled	19	25	10	22	1	77
Medium Skilled	8	7	27	31	3	77
Farmers	44	35	47	868	15	1009
Low/Unskilled	5	4	5	20	13	46
Column total	141	94	99	1007	37	1378

1868-1886	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	64	19	13	70	4	169
Skilled	16	16	5	38	1	77
Medium Skilled	11	10	27	27	3	77
Farmers	47	46	49	847	21	1009
Low/Unskilled	3	4	5	25	8	46
Column total	141	94	99	1007	37	1378

1887-1909	Son's Occupation					
Fathers' Occupation	Professional	Skilled	Medium Skilled	Farmers	Low/ Unskilled	Row total
Professional	59	16	16	73	5	169
Skilled	16	19	9	33	1	77
Medium Skilled	14	9	30	21	4	77
Farmers	49	46	39	858	19	1010
Low/Unskilled	4	5	6	23	9	46
Column total	141	94	99	1007	37	1378

Appendix A Table 7 - Absolute mobility tables summarized by birth cohort: Full sample

1806-1834	Downward	No mobility	Upward
Professional	68.6	31.4	-
Skilled	41.6	27.3	31.2
Medium Skilled	48.1	36.4	15.6
Farmers	1.2	85.9	12.9
Low/ Unskilled	-	19.6	80.4
All	14.3	71.0	14.7
N	197	978	203

1835-1867	Downward	No mobility	Upward
Professional	54.5	45.5	-
Skilled	36.4	33.5	30.1
Medium Skilled	48.7	25.0	26.3
Farmers	1.9	85.2	13.0
Low/ Unskilled	-	32.4	67.6
All	13.8	71.4	14.8
N	438	2270	470

1868-1886	Downward	No mobility	Upward
Professional	47.9	52.1	-
Skilled	40.6	27.9	31.5
Medium Skilled	34.1	21.7	44.2
Farmers	2.7	77.7	19.6
Low/ Unskilled	-	22.0	78.1
All	13.9	65.7	20.4
N	318	1502	465

1887-1909	Downward	No mobility	Upward
Professional	42.8	57.2	-
Skilled	27.8	37.8	34.4
Medium Skilled	20.7	27.0	52.3
Farmers	4.5	65.6	29.9
Low/ Unskilled	-	30.2	69.8
All	12.6	59.2	28.1
N	331	1552	737

Appendix A Table 8 - Relative mobility tables summarized by birth cohort. Marginal frequencies adjusted to match first cohort: Full sample

1806-1834	Downward	No mobility	Upward
Professional	68.6	31.4	-
Skilled	41.6	27.3	31.2
Medium Skilled	48.1	36.4	15.6
Farmers	1.2	85.9	12.9
Low/ Unskilled	-	19.6	80.4
All	14.3	71.0	14.7
N	197	978	203

1835-1867	Downward	No mobility	Upward
Professional	61.4	38.6	-
Skilled	43.7	31.9	24.5
Medium Skilled	45.0	35.1	19.8
Farmers	1.5	86.0	12.5
Low/ Unskilled	-	27.4	72.6
All	13.5	72.4	14.1
N	187	997	194

1868-1886	Downward	No mobility	Upward
Professional	62.3	37.7	-
Skilled	57.4	21.2	21.4
Medium Skilled	38.5	34.6	26.9
Farmers	2.1	83.9	14.0
Low/ Unskilled	-	18.3	81.7
All	14.5	69.8	15.7
N	200	962	216

1887-1909	Downward	No mobility	Upward
Professional	65.2	34.8	-
Skilled	54.8	25.0	20.2
Medium Skilled	31.9	38.8	29.3
Farmers	1.8	85.0	13.2
Low/ Unskilled	-	18.7	81.3
All	14.2	70.7	15.1
N	195	974	209

Appendix B: Re-categorization of HISCLASS Scheme

Appendix B Table 1 - Re-categorization of HISCLASS scheme

	Original 12-category HISCLASS classifications	5-category classification	
1	Higher managers	1 + 2	Professional
2	Higher professionals		
3	Lower managers	3 + 4 + 5	Skilled workers
4	Lower professionals, clerical and sales personnel		
5	Lower clerical and sales personnel		
6	Foremen	6 + 7	Semi-skilled workers
7	Medium-skilled workers		
8	Farmers and fishermen	8	Farmers and fishermen
9	Lower-skillled workers	9 + 10 + 11 + 12	Low-and unskilled workers
10	Lower-skilled farm workers		
11	Unskilled workers		
12	Unskilled farm workers		

Appendix C: HISCO Minor groups and occupational rankings

Occupation	HISCO	RANK	Occupation	HISCO	RANK
chemist	01110	100	sculptor	16120	85
geologist	01330	100	painter	16130	85
pharmacist	01110	95	artist	17000	84
physician	06105	95	craftsman	17000	84
medical doctor	06105	95	musician	17140	84
surgeon	06110	95	organist	17140	84
head surgeon	06130	95	radio-omroeper	17920	84
assistant surgeon	06210	95	member of parliament	20210	81
dentist	06310	95	politician	20210	81
economist	09010	92	local official	20210	81
accountant	11010	90	district councillor	20210	81
auditor	11010	90	councillor	20210	81
jurist	12000	89	manager	21000	80
magistrate	12000	89	bank manager	21110	80
attorney	12110	89	publisher	21110	80
solicitor	12110	89	superintendent	21110	80
law agent	12110	89	steward	21220	80
playwright	12110	89	contractor	21240	80
poet	12110	89	secretary	21940	80
editor	12110	89	church secretary	21940	80
judge	12210	89	overseer	22000	79
advocate	12910	89	postmaster	22220	79
teacher	13020	88	gold prospector	22620	79
lecturer	13020	88	explosives expert	22640	79
professor	13100	88	surveyor	3010	71
principal	13940	88	surveyor-general	3010	71
headmistress	13940	88	clerk	30000	71
minister	14120	87	chief clerk	30000	71
deacon	14120	87	paramount chief	31000	70
missionary	14130	87	prime minister	31000	70
sick comforter	14140	87	senator	31000	70
author	15120	86	State President	31000	70
newspaper owner	15920	86	mayor	31000	70

Occupation	HISCO	RANK	Occupation	HISCO	RANK
governor	31000	70	peace officer	58220	43
commissioner	31000	70	sheriff	58220	43
commissioner of commerce	31000	70	ensign	58300	43
bookkeeper	33110	68	captain	58320	43
guardian	36020	65	colonel	58320	43
bodyguard	36020	65	lieutenant	58320	43
messenger of the court	37040	64	bombardier	58320	43
telegraphist	38040	63	field cornet	58320	43
magistrate's clerk	39340	62	general	58320	43
railway officer	39960	62	harbour master	58320	43
railway official	39960	62	prison warder	58930	43
town clerk	39990	62	sea-captain	58320	43
merchant	41025	60	commandant	58320	43
lumberman	41025	60	major	58320	43
greengrocer	41030	60	corporal	58330	43
ships captain	4215	59	sergeant	58330	43
(sea-) captain	4215	59	soldier	58340	43
auctioneer	44320	57	Boer commandant	58340	43
wholesale merchant	45120	56	arquebusier	58340	43
assistant merchant	45190	56	artillerist	58340	43
boardinghouse keeper	51000	50	century	58340	43
tavern-keeper	51000	50	dragoon	58340	43
innkeeper	51020	50	farmer	61110	40
liquor merchant	51050	50	farm owner	61110	40
wine merchant	51050	50	fruit farmer	61110	40
cook	53100	48	grazier	61240	40
table servant	54020	47	sheepfarmer	61240	40
hairdresser	57025	44	dairy farmer	61250	39
barber	57030	44	farm labourer	62105	39
constable	58220	43	stable boy	62460	39
policeman	58220	43	gardener	62700	39
chief detective	58220	43	woodcutter	63190	38
police horseman	58220	43	fisherman	64100	37

Occupation	HISCO	RANK	Occupation	HISCO	RANK
miner	71105	30	ship's cabin boy	87450	14
digger	71105	30	jeweller	88010	13
diamond digger	71105	30	diamond-cutter	88030	13
miller	73490	28	silversmith	88050	13
tanner	76145	25	brickmaker	89242	13
butcher	77310	24	printer	89540	13
baker	77610	24	button maker	94990	7
confectioner	77660	24	wigmaker	94990	7
brewer	77810	24	stone mason	95135	6
snuff dealer	78990	23	carpenter	95410	6
tailor	79100	22	mill builder	95910	6
hatmaker	79310	22	road constructor	95910	6
mattress maker	79640	22	road-builder	95910	6
sail-maker	79920	22	sailor	98135	3
cobbler	80110	21	boatswain	98190	3
saddler	80320	21	chief mate	98190	3
harness-maker	80320	21	ferryman	98190	3
saddle and harness maker	80320	21	signal man	98430	3
cabinet maker	81120	20	transport driver	98500	3
turner	81230	20	transporter	98500	3
wheelwright	81925	20	transport rider	98600	3
cooper	81930	20	coachman	98620	3
master cooper	81930	20	port captain	98920	3
mason	82070	19	shipping agent	98920	3
blacksmith	83110	18	labourer	99910	2
smith	83110	18	slave	99910	2
gunsmith	83920	18	assistant	99999	2
locksmith	83930	18	dresser	99999	2
engineer	84100	17	apprentice	-1	1
clockmaker	84220	17			
electrician	85510	16			
coppersmith	87330	14			
shipwright	87450	14			