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Did it pay to be a pioneer?
Wealth accumulation in a
newly settled frontier society

Jeanne Cilliers, Erik Green & Robert Ross

Did it pay to be a pioneer? Wealth accumulation in a newly settled frontier society

Jeanne Cilliers¹, Erik Green², Robert Ross³

Abstract

While wealth-holding patterns in rural areas have been well studied, the link between initial conditions, prospects for wealth accumulation, and the persistence of inequality at an agricultural frontier is less clear. On the one hand, the frontier is thought to have had a levelling effect, with the availability of cheap land acting as an equalizer. On the other hand, land rents, accumulated during the settlement process, are thought to have the opposite effect. In this paper, we contribute to the debate on inequality in pre-industrial societies using a unique dataset that allows us to identify different wealth-accumulation strategies in an agrarian frontier society: the Graaff-Reinet district in South Africa's Cape Colony between 1786-1850.

Keywords: South Africa, pre-industrial, frontier, wealth accumulation, life-cycle

JEL codes: N00, N37

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1. Introduction

On 5 October 1848, the Governor of the Cape Colony, Sir Henry Wakelyn Smith ordered that a full list be compiled of landowners and their properties in all 30 districts of the Colony. His request was carried out in 1849 and 1850 and the findings later published in the Cape Colonial Gazette. In 2012, the society known as the *Drakenstein Heemkring*, republished the lists and provided maps of the farms within the various districts, on the basis of contemporary plans.⁴ This allowed the construction of a newly digitised farm-level map of the Cape Colony, in which farms could be differentiated on the basis of establishment date (shown in Figure 1). Taking a closer look at this map reveals a fascinating pattern with respect to settlement of Europeans in the newly opened eastern frontier regions of the colony. Those of settler descent who arrived before the end of the eighteenth century, i.e., in the very early years of the district, and those who arrived in the 1830s, respectively, appear to have clustered in the more fertile south-eastern regions of the district, distinct from those arriving in the intervening years.

Even more intriguing is that the latter group mainly consisted of British immigrants who bought up smaller tracts land than the Dutch settlers who arrived last, who chose to locate their farms in the more arid western regions of the district. This paper asks how important settlement timing and farm location was for a household's ability to accumulate wealth. Did early arrivals benefit from having access to superior land? If so, did this lead to a persistent wealth differential between groups on the basis of arrival time? In answering these questions, we contribute to the literature on wealth accumulation in rural pre-industrial societies in general, and in pre-industrial settler colonial frontier settings in particular.

There is a large literature on the role of land frontiers in settler economies.⁵ The continuous expansion of the land frontier has been used to explain the extensive growth that many settler economies experienced.⁶ It is acknowledged that European expansion of the frontier involved conflicts, violence and eventual dispossession of indigenous people.⁷ It was a gradual process in which the frontier remained "open" as long as no group gained political control over the area. In contrast, a frontier can be described as "closed", when a permanent authority is established, and conflict has become incidental rather than systemic. Frontier

⁴ Le Roux, Niemandt and Oliver, *Bewaarders*.

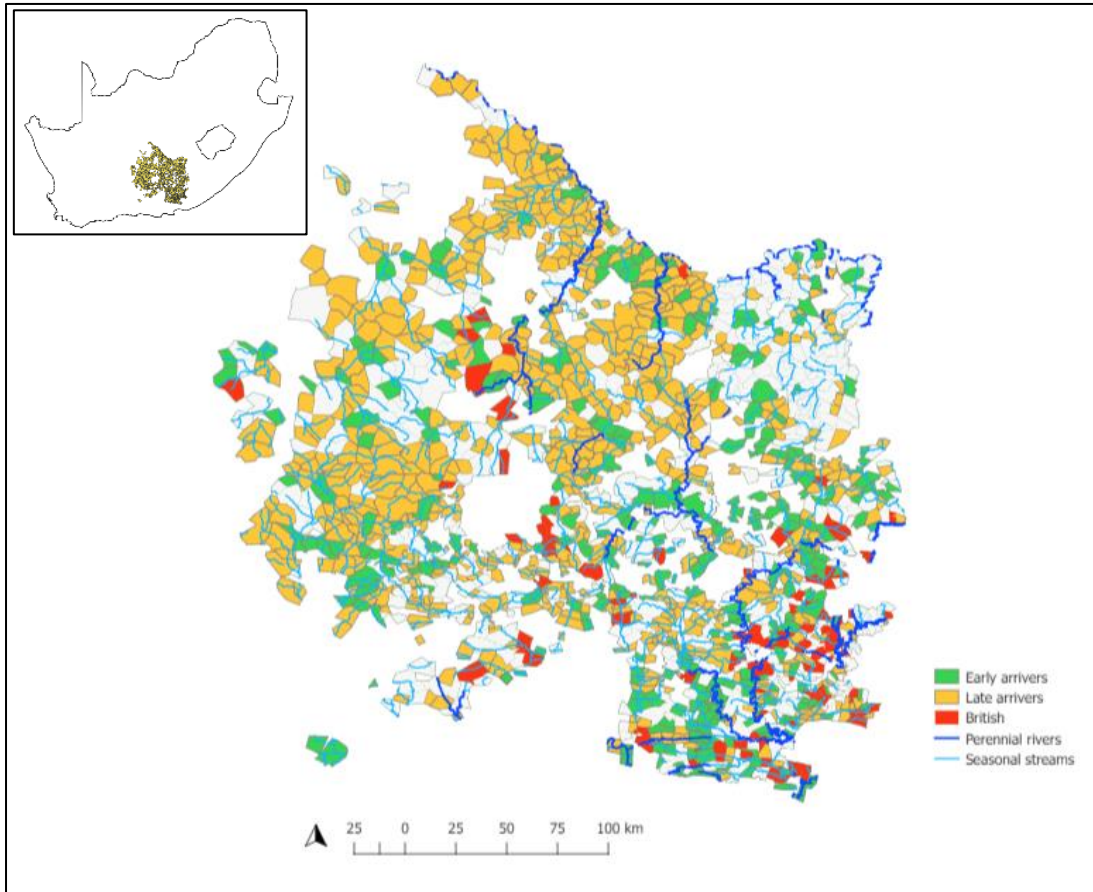
⁵ E.g., Findlay, *Factor proportions*; Carter and Sutch, 'Why the settlers soared'; Willebald and Juambeltz, 'Land frontier expansion', Weaver, *Great land rush*, Sutch, 'Settler colonialism', Willebald and Bértola, 'Uneven development', Lamar and Thompson, *Frontier in history*.

⁶ Barbier, *Frontier Expansion*; Webb, *The Great Frontier*.

⁷ Lamar and Thompson, *Frontier in history*, Penn, *Forgotten Frontier*; Denoon, *Settler capitalism*.

closure is characterised by major institutional changes, including shifts towards more secure property rights, the growth of financial institutions, and improvements in infrastructure.

Figure 1. Graaff-Reinet farm locations c. 1850, by settlement timing⁸



Taking our point of departure from the notion that land frontier expansion is a key factor in explaining how settler economies develop, we acknowledge that within a settler colony the variation in land quality will increase over time as the frontier expands. In other words, land in a settler colony context should not be treated as a fixed factor of production.⁹ This applies to frontier closure as well. With a continuous inflow of migrants to an open frontier, marginal lands will ultimately be brought into settler use. This temporal dimension is key to understanding the rise of so-called Ricardian rents. According to Ricardo, the rent is the difference in the yield of a plot of superior land compared to the yields produced on marginal lands.¹⁰ Following Ricardo, it is necessary to distinguish between rent on the extensive and intensive margin. In the latter, rent arises from the fact that some farmers respond to increased

⁸ Le Roux, Niemandt and Oliver, *Bewaarders*, with authors' calculations.

⁹ Abad, 'Persistent inequality', p. 44.

¹⁰ Ricardo, 'Principles of political economy'.

land scarcity by applying more labour and capital to the more fertile land, while rent on the extensive margin arises as some respond to shrinking land availability by moving into less fertile areas. Both processes can exist in parallel. Cilliers and Green show how European farmers in Graaff-Reinet reacted to land scarcity at the closing eastern frontier of the Cape Colony by differentially employing more labour and/or capital.¹¹ In this paper, we dig deeper into these processes by analysing differences in the location of farms of early- and late-arriving settlers and the extent to which this affected their path for wealth accumulation.

We are not the first to study, simultaneously, the role of location, land quality and wealth accumulation over time. Willebald and Juambeltz use a wide range of cases, including Chile, Uruguay, New Zealand, and Australia to show how the expansion of the land frontier, and consequently the increased productive use of marginal lands affected economic growth as well as inequality in the globalisation period from mid-eighteenth century up to the eve of World War I.¹² However, a general lack of data has prevented researchers from employing a micro-level approach. Until recently, it was only in the case of the North American frontier that data allowed for an investigation of how the location of individual farms impacted prospects for wealth accumulation. Pioneers on the North American frontier appear to have been enjoyed higher rates of wealth accumulation than late comers.¹³ Gregson argues that, not only were early arrivals able to capture Ricardian rents by seizing control of the most fertile lands; they also developed location-specific human capital about best farming practices, local prices, and sources of credit.¹⁴ If an early arrival premium does exist in frontier regions, the question of its persistence naturally arises. Theoretically, a premium could reinforce inequality over time by putting the early arrivals on a track of more rapid accumulation.

However, as the frontier literature shows, frontier expansion is a complex process that varied over time, and in which geography, technology, human capital, and institutions were all factors that played an important role.¹⁵ One or more of these factors may have counteracted an early arrival premium. Frontiers in general were typically characterised by a fluid social order and recurrent conflicts between the intruders and the indigenous populations.¹⁶ Investing in land, initially wrested from the indigenous populations, was

¹¹ Cilliers and Green, 'Land-labour hypothesis'.

¹² Willebald and Juambeltz, 'Land frontier expansion'.

¹³ Curti, 'American community'; Kearl, Pope and Wimmer, 'Household wealth'; Schaefer, 'Model of migration'; Burchell, 'Opportunity and the frontier', Galenson and Pope, 'Economic and geographic mobility'; Ferrie, 'Antebellum European immigrants', Gregson, 'Wealth accumulation'; Stewart, 'Agricultural frontier'.

¹⁴ Gregson, 'Wealth accumulation'.

¹⁵ Lamar and Thompson, *Frontier in history*; Bértola and Williamson, *Latin American Inequality*.

¹⁶ Lamar and Thompson, *Frontier in history*; Penn, *Forgotten frontier*.

characterised by great uncertainties for the early arriving Europeans. Often the indigenous populations launched counterattacks, sometimes successfully enough to chase away the European intruders, at least temporarily. Under such conditions it is far from certain that being a pioneer would have been beneficial. Second, limited access to markets and San could have made it difficult for early arrivals to set up profitable businesses. Thirdly, given the relatively high risks and high costs of production early arrivals could, on average, have been poorer than those who both arrived later and possessed the means to buy land once infrastructure and markets had developed. In that regard, opportunities for wealth accumulation may have been restricted for the early arrivals.

In this paper, we examine the link between initial conditions and wealth accumulation on an agricultural frontier in the eastern parts of the Cape Colony. We consider the following specific research questions: Were early arrivals generally wealthier than the latecomers? Did early arrivals capitalize on favourable initial conditions, which then reinforced inequality over time by putting them on a path towards higher wealth accumulation? To this we add one more important time dimension. Graaff-Reinet went through important institutional changes in the 1830s. The district was gradually transformed into the centre of commercial wool production at the Cape as new actors - mainly British immigrants - entered the scene. To explain the location patterns found in figure 1 we take both institutions and geography into account.

We find that those who arrived early located their farms in the more climatologically suitable areas of the district compared to latecomers. These pioneers utilized their superior lands to accumulate wealth more quickly than latecomers. However, the closing of the eastern frontier and its gradual incorporation in the global capitalist economy created incentives to shift towards more capital-intensive production. A considerable number of early arrivals - who had enjoyed a premium by having access to high quality land - sold their land to British immigrants with preferential access to capital. Because of these changes the existence of an early arrival premium did not mean persistence in land ownership. Through a novel combination of primary data sources, we are able for the first time to explore these developments quantitatively.

The paper is structured as follows. We begin with a summary of the establishment of Graaff-Reinet district in Eastern Cape. This is followed by an introduction to the sources and how we utilise them to reconstruct the European settler population and the locations of their farms in Graaff-Reinet district. The subsequent section empirically analyses the interplay between time of arrival, farm location, and wealth accumulation. This is followed by an

analysis of the institutional changes that occurred at the eastern frontier as it gradually evolved into the commercial centre of the Cape starting in the 1830s. The section reveals that these developments changed the rules of game that benefitted the latest group of arrivals, the British immigrants. We conclude with a discussion of the role of geography and institutions in a settler frontier society.

2. Establishment of the Graaff-Reinet district

From the early years of the eighteenth century, some fifty years after the foundation of the Cape Colony, stock farmers of European descent began to establish themselves in the interior of South Africa, across the first main mountain ranges.¹⁷ There they acquired rights to specific tracts of land, under a lease system known as ‘loan farms’.¹⁸ This marked the beginning of the expansion of the colonial borders that would continue throughout the eighteenth century. The European settler movements into the interior was not a smooth process but one characterized by tension and violence. Europeans did not move into empty land, as Eric Walker noted almost a century ago.¹⁹ To move east the settlers had to contend with the resistance of the Khoesan inhabitants of the region,²⁰ but the political power of the Khoesan chiefdoms quickly collapsed. Some of the Khoesan survivors became labourers on the settler farms; others were incorporated into the Xhosa²¹ polities; others again joined the Oeswana San, groups who were originally hunter-gatherers and who in the later eighteenth century waged a long and bloody guerrilla war against European incursion.²² From the 1770s onwards, Dutch²³ stock farmers were establishing permanent farms in the better-watered areas on the slopes of the Sneeuberge and in the Sundays River valley, around what was to become the town of Graaff-Reinet. Here, at least some were able to build up substantial herds of cattle and flocks of sheep.²⁴ The first years of settlement were turbulent. In the years around 1800, European settlers were driven from their farms in the south-east of Graaff-Reinet district by the amaXhosa, most notably in

¹⁷ Van der Merwe, *Die trekboer*; Van der Merwe, *Noordwaartse Beweging*.

¹⁸ Dye and La Croix, ‘Institutions for the taking’

¹⁹ Walker, *Frontier tradition*.

²⁰ Khoesan (previously Khoisan) were the indigenous inhabitants of the Southwestern regions of Africa. Conventionally they are divided between the Khoekhoe (or Khoe) who owned cattle and sheep and the San (“Bushmen”) who did not and lived as hunter-gatherers. The Oeswana were one such group, living between the Sneeuberge (mountain range) and the Gariep (Orange) River.

²¹ The amaXhosa were agro-pastoralist speakers of an Nguni language living immediately to the East of the Cape Colony. The prefix “ama” signifies “people”; prefixes are not employed when the term is used adjectivally.

²² Van der Merwe, *Die trekboer*; Ross, ‘Donald Moodie’; Sampson and Neville, *Seekoei River Bushmen*.

²³ These farmers spoke Dutch, or proto-Afrikaans, among themselves, and were of predominantly European descent; many of their antecedents were, however, German or French (Huguenot) by birth.

²⁴ Smith, *Frontier to midlands*.

1802, when they were in alliance with a number of Khoesan farm labourers in what has come to be known as the Servants' Revolt.²⁵ Thereafter, settler power was re-established in the regions around Graaff-Reinet, with the exception of the Fish River Valley, to the east of what was to become Graaff-Reinet district. Here, it was only after the Frontier war of 1811-12 that units of the British army cleared all amaXhosa living west of the Fish River with a ruthlessness and an organization which the Xhosa forces could not match.²⁶ As a result, a permanent shift to the east of the frontier between the Colony and the amaXhosa, with the result that the security of Graaff-Reinet farms in the long term was significantly increased. It was on the basis of these violent acts that the relatively peaceful Graaff-Reinet of the early nineteenth century was built.²⁷

Given the initial turbulent and fragile conditions at the eastern frontier one might ask why Europeans decided to take the risk and move further into the interior? Twentieth century South African historians have engaged in a long and fierce debate on the various economic and non-economic drivers of the expansion of European settlement in South Africa. While some accounts appear to be at odds with the North American experience at the frontier vis-à-vis the stages of agricultural development and the degree of market orientation, others stress the importance in both contexts of demographic pressure in driving the dispersion of people into the interior.²⁸ Moreover, consensus is yet to be reached on the character and motivations of Dutch settlement expansion into the eastern interior. While Neumark highlights the economic attractiveness of stock-farming on the eastern frontier,²⁹ Guelke stresses that migration to the frontier was a last resort for the impoverished descendants of the early Cape settlers.³⁰

The frontier districts fluctuated in size considerably over the course of the early-nineteenth century, both expanding as new areas were brought under colonial rule and contracting as new districts were formed on land excised from what had previously been Graaff-Reinet. For the purposes of this paper, our analysis relates to the district as it was at its greatest extent, just prior to the establishment of Somerset East in 1825. Thus, it ran from the Gariep (Orange) river to the Suurberg, just south of the Bushmans River, and from the

²⁵ Newton-King and Malherbe, *Khoikhoi rebellion*; Peires, *House of Phalo*; Giliomee, 'Eastern frontier'; Newton-King, *Masters and servants*.

²⁶ Laband, *Land wars*; Mostert, *Frontiers*.

²⁷ Van der Merwe, *Die trekboer*, pp. 64-5.

²⁸ Shell, 'Immigration'.

²⁹ Neumark, *Economic influences*.

³⁰ See the exchange between Guelke, 'Early Dutch South Africa' and Norton, 'Frontier agriculture'. Shell, 'Immigration', p. 38, argues that the main differences between North America and South Africa stem largely from the nature of the partible inheritance system at the Cape that was more favourable to women.

headwaters of the Black Kei west to the Pramberg. In terms of the districts as established by Governor Smith in 1848, it consisted of Graaff-Reinet, Richmond, Colesberg, much of Somerset East, Cradock, and small sections of Albany, Uitenhage, Fort Beaufort, Beaufort West and Albert. Its surface area was something in the order of 30,000 square miles (between 75000 and 80,000 square kilometres) and it comprised just over 1200 individual farms.³¹

As ever in Southern Africa, the availability of water determined the nature of the environment in any given place. In rough terms, rainfall decreased from east to west, as the storms originating over the Indian Ocean lost their power.³² In contrast, as is generally the case, it increased with height. The district of Graaff-Reinet, as constituted just before Somerset East and Cradock were split off from it, contained four main zones. The most easterly was characterised by a mosaic of thickety grassland and *Karoo* vegetation³³, drained by the Great Fish River and its tributaries. Secondly, there was the mountain massif of the Sneeuberg, rising to 2502 metres, which attracted considerable precipitation in the winter, as the name suggests often in the form of snow. Thirdly, there were the valleys of the generally non-perennial rivers, which ran off the Sneeuberg, both northwards to the Gariep, including the Seekoei River, and southwards, most notably the Sundays River. These could contain fertile areas. Finally, there were the arid plains to the west of the Sneeuberg, including the Camdebo, and other similar tracts. These physical and botanical distinctions of terrain, depicted in figure 2,³⁴ and of course many more local variations which we cannot describe in detail, obviously had their effect on the settlement patterns of the stock farmers.

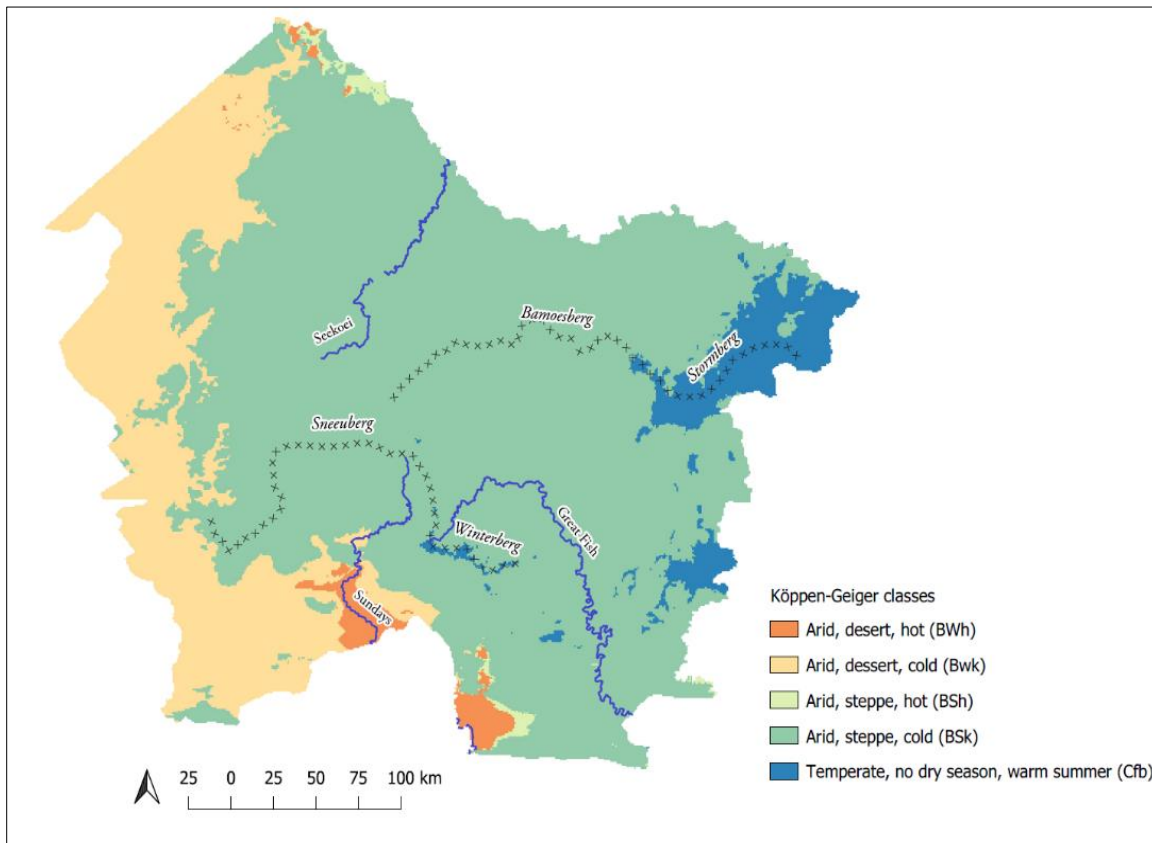
³¹ Blue book of the colony, 1849 for the area details, BVOE for the number of farms. Also, Bergh and Visagie, *Eastern Cape frontier zone*. Farms in the pre-1848 districts of Colesberg, Cradock and Graaff-Reinet, on the basis of contemporary surveys, come out at a mean of 4049 hectares, around 40 square kilometres, lower in Somerset West and highest in Colesberg, as some would expect. This is far greater than the size of US farms, for example. Atack and Bateman (1987) find, based on 1860 census data for Northern States, an average farm size of between 100-200 acres or 0.4-0.8 square kilometres.

³² See appendix A, figure A1 and A2.

³³ "Karoo" refers to both the semi-desert plains that stretch across the interior of South Africa from close to the west coast to the Great Fish River, and to the specific vegetation, sparse and characterised by low shrubs and succulents, that grow there.

³⁴ Beck et al., 'Present and future'.

Figure 2. Graaff-Reinet, with its main mountain ranges and rivers, with Köppen-Geiger climate classes based on seasonal precipitation and temperature patterns



3. Reconstructing the frontier population

Our analysis concerns four groups of interest (in chronological order of arrival): early arriving Dutch settlers, later arriving Dutch settlers, British immigrants and post-1830's non-British immigrants. To reconstruct the European settlement patterns in Graaff-Reinet we make use of three sources, the *Cape of Good Hope Panel* (CGHP), the *South African Families Database* (SAF) and *Bewaarders Van Ons Erfenis* (BVOE). To differentiate farms on the basis of years in observation we use data for Graaff-Reinet from the CGHP.³⁵ This panel is based on annual returns of the *opgaafrollen*: tax censuses collected between 1663 and 1834, first by the Dutch East India administration, and after 1795, by the British colonial government,³⁶ of all free households of the Colony.³⁷ This series of annual cross-sections were combined using a probabilistic record linkage strategy to form a household-panel, which, for Graaff-Reinet,

³⁵ Fourie and Green, 'Building', document the construction of the Cape of Good Hope Panel as well as the broader research aims of the CGHP project in more detail.

³⁶ Strictly speaking, the Cape returned temporarily to Dutch rule from 1803 -1806.

³⁷ All males over the age of 16 were assessed for tax purposes. Unless they headed a household, females were not included.

spans 1787-1828.³⁸ We take the first year a household appears in CGHP as its arrival year.³⁹ Household-level information includes the name and surname of the head of the household and their spouse, the number of children present in the household, the number of slaves and indigenous Khoesan employed, and several agricultural inputs and outputs, including cattle, sheep, horses, wheat sown, wheat reaped, vines, and wine produced. The panel contains 42,354 observations over 28 years, comprising 12,682 unique households.

These data do not contain information on birth nor death dates (crucial for controlling for life-cycle wealth effects) so we supplement the CGHP with individual-level demographic data (that of the household head) from the *South African Families Register* (SAF).⁴⁰ Obtained from the Genealogical Institute of South Africa, SAF contains complete family registers of all settler families from 1652 to approximately 1830 as well as those of new progenitors of settler families up to 1867. The probabilistic record linkage strategy that was used to identify and match households over time to create the CGHP is applied to identify and match heads of households across these two sources, resulting in a sample containing 3614 households.

To locate these households geographically, we use BVOE - a series of maps demarcating farm boundaries which provides a snapshot of property ownership in the district in 1850 and allows us to attribute land size and land quality indicators to individual farming households. Since two decades separate the end of the CGHP for Graaff-Reinet and the BVOE map, there was a high likelihood that we would not be able to link every CGHP-person to themselves in BVOE. Figure 3 illustrates the record-linkage possibilities available to us.⁴¹ In cases where we can identify an individual in both the CGHP and BVOE, linkages are made relatively simply, on the basis of the unique string combination of the farm owner's and his spouse's names and surnames. We can make 516 of these simple linkages.

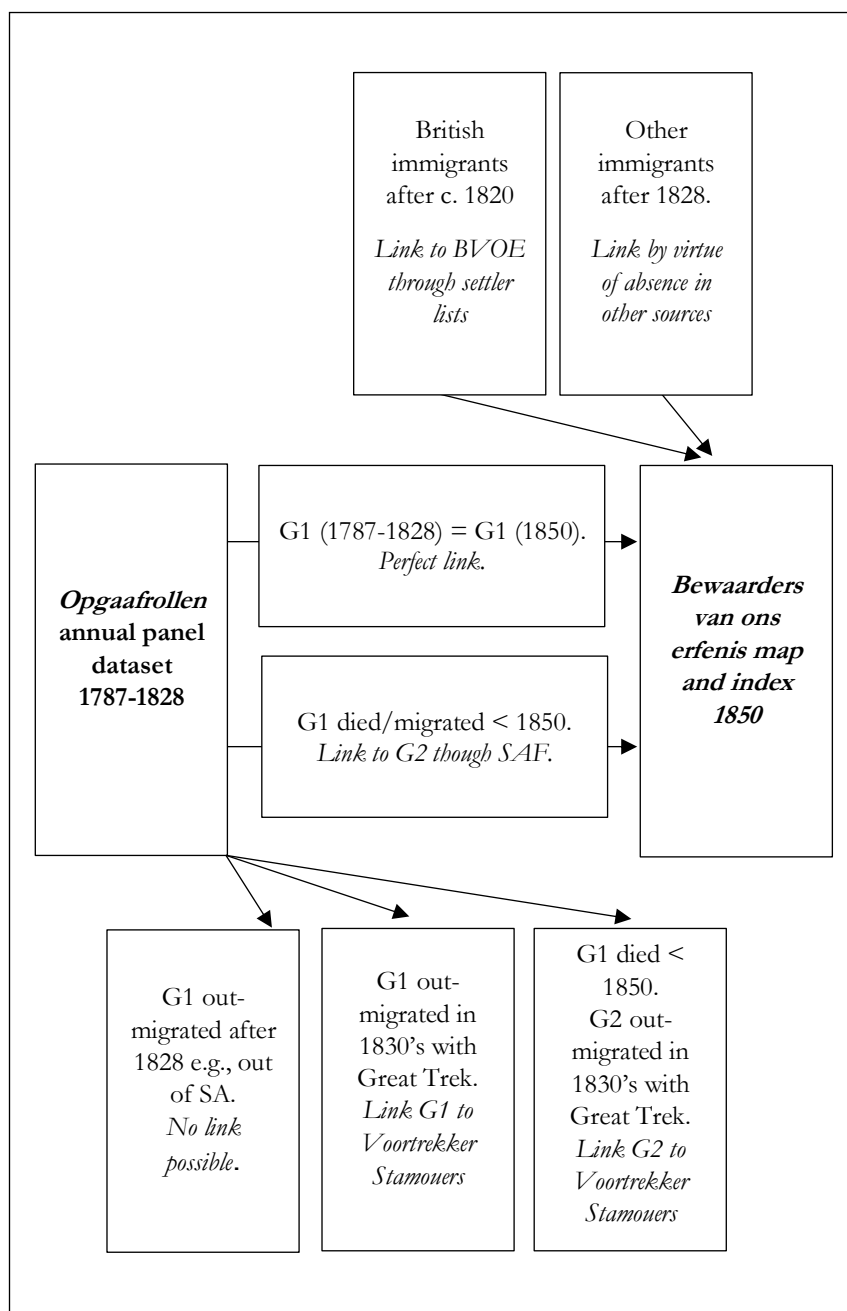
³⁸ Rijpma, Cilliers and Fourie, 'Record linkage', describes the automated record linkage procedure used to create this panel from Cape Colony census returns. They provide a more detailed account of the potential biases arising from both the linkage of individuals across time to form the CGHP and from the linkage of CGHP to SAF (described later), and the various strengths and weaknesses of these linked data, than the present paper has room to. The full CGHP is still under construction at the time of writing for the entire Cape Colony but complete for Graaff-Reinet and selected other districts.

³⁹ We are not able to observe those who arrived before the establishment of the district, i.e., those who 'opened' the frontier for European settlement, and who for various reasons had decided to abandon their farms before the region had been given the status of a district in the colony.

⁴⁰ Cilliers, 'South African Families', and Cilliers and Mariotti, 'Settler fertility transition', give complete account of transcription of SAF into a database fit for use in demographic analysis.

⁴¹ Due to the complexity of the record linkage problem, all linkage from this point forward is completed manually.

Figure 3. Schematic depicting record-linkage possibilities. ‘G1’ is a household-head in the *opgaafrollen* dataset. ‘G2’ is a direct descendent of ‘G1’



There are four possible reasons why an individual who was present in Graaff-Reinet before 1828 (i.e., someone observed in the CGHP) may not appear as a farm owner in 1850 (i.e., *not* observed in BVOE). First, they could have migrated out of South Africa at some point between 1828 and 1850. Secondly, they could have migrated out of Graaff-Reinet, but remained in Southern Africa. Most of these would have moved further into the interior of the country with the mass exodus of the 1830s known as the Great Trek. Thirdly, they may have

died at some point during the period 1828-50. Fourth, they were never strictly farm owners, but could have been residing in the district as tenants. In the first case, we simply cannot follow these individuals. In the second case, we discover these individuals on a list of Great Trek participants provided in *Voortrekker-Stamouers*.⁴² In the third case, following the death of a household head (as confirmed by their genealogical record), we can link the individual to his children, either in BVOE if the farm remained in the family, or in the *Voortrekker-Stamouers* list in the event that the CGHP-person died after 1828 and his children migrated with the *Great Trek*. In the fourth case, we are not concerned with non-linkage since our current research question is contingent on land ownership.

Conversely, some new individuals may have entered the district between 1828-50 as a result of continued migration towards the interior from other districts, or as new immigrants from outside the colony, most notably as a result of the arrival of some 4000 British settlers to the eastern districts of the colony during the 1820s. The latter are easily discernible on the basis of their surnames,⁴³ but we also check individuals who appear in BVOE, but who did *not* appear in the CGHP against the British settler lists⁴⁴. Doing so reveals that recent British arrivals to Graaff-Reinet accounted for 160 of the farm owners in 1850. Those remaining we then assume to have been later arrivals to the districts not of British origin. Table 1 provides an overview of the types of linkages that were made.

A few words on the introduction of bias are warranted. First, while it is usually common for self-reported tax records to underestimate the value of household wealth, we are less concerned with this being a potential source of bias in our sample, since census enumerators personally visited all farms in a district to take account of how much these households owned and produced. The record linkage described above is a more likely source of bias in the resulting sample since we do not successfully link every *opgaafrol-person* to themselves in BVOE. Considering distributional differences in the data between the linked and unlinked observations is one way to assess the presence of bias in the resulting linked sample. A kernel density estimate plot (figure B1) of PCA wealth scores for households in the *opgaafrollen* which we were and were not able to link to BVOE, suggests a higher PCA wealth score for the linked sample relative to the unlinked *opgaafrollen* population. This is

⁴² Visagie, *Voortrekker-Stamouers*.

⁴³ English and Afrikaans surnames are rather easily distinguishable in South Africa.

⁴⁴ We use the 1820 Settler Surname List from <https://www.1820settlers.com/>. This is a consolidation of the settlers lists published in Nash, *Settler handbook*; Morse-Jones, *Roll of the British*; and Hockly, 'British settlers' with additions or changes that have been found since publication of those books.

not surprising since households with a many valuable assets were less likely to migrate compared to households without much wealth, and therefore more likely to appear in 1850.

Table 1. Matched sample statistics

Description	N	Share
Direct matches	516	31%
Inter-generational matches ^a	206	12%
British settler matches	160	10%
Late arrivers ^b	510	31%
Unverifiable matches ^c	274	16%
Total	1666	100%

Notes:

a - sons or grandsons of opgaafrol-persons

b - individuals who do not appear in either the opgaafrollen, are not a direct descendent of an opgaafrol-person, and do not appear on the British settler lists are taken as 'late' arrivers to Graaff-Reinet after the opgaafrollen period i.e., after 1828

c - cases where either no candidates for record linkage were found or where two or more possible candidates for record linkage were found and a true match could not be determined based on the information available.

4. Empirical analyses

Compared to the visible affluence of residents of the south-western Cape districts, in general, settlers in Graaff-Reinet were relatively less well-off. Table 2 shows means (across all years in the CGHP) for a selection of assets. The fact that the dominant economic activity on the frontier was stock farming rather than crop farming commonly practiced in south-western Cape is clearly reflected in these averages. Amongst those who possessed livestock, herds of around 548 heads were common. 22 per cent of the farms in the dataset report having no livestock. These were likely absentee farm owners whose wealth is held upon another property outside the district of Graaff-Reinet. Capital assets appeared to be more widely distributed with only 16 per cent of households reporting none. The holding of slaves was far less common here than in Stellenbosch for example, with less than a quarter of households reporting slave presence. Frontier farmers instead relied more heavily on Khoesan and family labour.⁴⁵ On the correlation between livestock and crop farming, in this district, crop farming was not a viable substitute for livestock rearing. Instead, some farmers cultivated a small number of crops for their own subsistence.

⁴⁵ Cilliers and Green, 'Land-labour hypothesis'; Links, Fourie and Green, 'Was slavery'.

Table 2. Characteristics of frontier farms

	Mean ^a	%	Min	Max
Sheep	535.3	32	1	14121
Cattle	49.2	25	1	2813
Goats	66.0	64	1	4326
All livestock (quantity) ^b	547.9	22	1	14121
All livestock value (Rds) ^c	154.7	49	0.3	13525
Capital goods (quantity) ^d	12.6	16	1	1868
Slaves	3.4	72	1	61
Khoe (number employed)	5.5	56	1	78
Settler children	3.2	42	1	14
Crops reaped ^e	47.7	85	0.375	1729

Notes:

a – Means calculated excluding zeros.

b – Refers to the sum of cattle, sheep, and goats

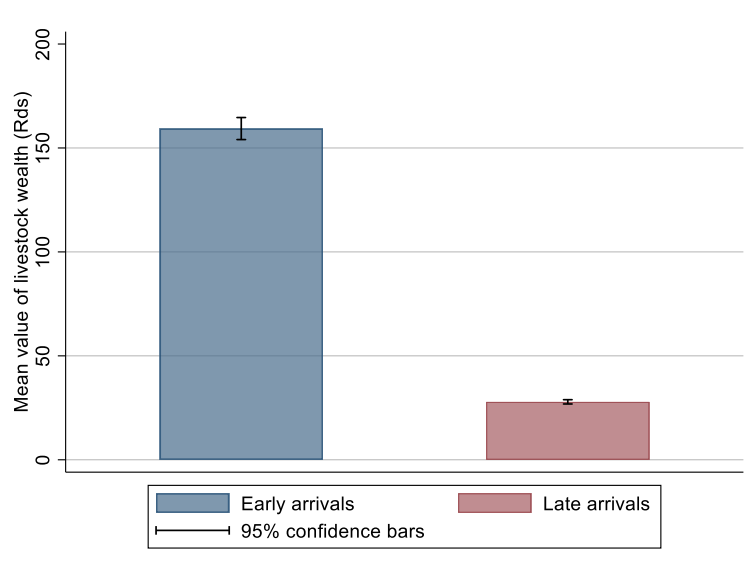
c – Price series (where available) are taken from MOOC-10 series of auction rolls

d – Refers to the sum of wagons, horse wagons, oxen, horses, and carts.

e – Refers to the sum of wheat, barley, oats, and rye. Grains sown and reaped in a given year are reported in muids, a South African dry measure of capacity equivalent to about 109 litres.

If we consider then, the difference between early and late arriving Dutch settlers, taken as settling in the district before or after 1800 respectively, in terms of the real value of livestock wealth as shown in figure 4, we start to see the existence of an early arrival wealth premium. 1800 is in itself an arbitrary date, but one which coincides, more or less, with the closing of the frontier in large parts of Graaff-Reinet (see above).⁴⁶ For all years combined, early arriving Dutch settlers had substantially higher real livestock wealth than that of late arrivals.

Figure 4. Mean value of livestock wealth by arrival cohort



⁴⁶ The results that follow used 1800 as the cut-off year for early and late arrivals, but using 1798, 1802, or 1804 alternatively yielded no significant change to the main result.

This figure, however, only contains the real value of livestock because these are the only assets for which the relevant price series are available, and we are interested in a measure of wealth accumulated which considers all of a household's listed productive assets in its calculation.⁴⁷ We effectively want to sum the real value of all productive assets listed in an individual's tax record (*opgaafrol*) for a given year to track their wealth over time, but we do not have reliable prices and deflators to attain an accurate real value for *all* assets. We therefore use principal component analysis (PCA) a common method for combining a range of correlated variables into a single index, to generate a wealth index which considers all productive assets owned by an individual in a given census year.⁴⁸ We first standardise nominal asset values using z-scores.⁴⁹ This simple transformation procedure avoids giving variables with different measurement units and disproportionate ranges unwarranted weight at the expense of others in the estimation of the PCA.⁵⁰ PCA transforms the asset data into an index where the weight (value) of each asset can be inferred. The results produced by the PCA are called principal components. From the principal components generated by this procedure, the first component is the range of weights that best explains the variance in the projected data and is therefore usually used for the construction of wealth indices. Assets that are more unequally distributed across the sample will have a higher weight in the first principal component.

Figure 5 shows all the assets considered in our PCA according to eigenvalues of the first and second component. A higher value for the first component i.e., the further right an asset appears on the graph, the more valuable it was inferred to be in the calculation of the index. Unsurprisingly, given the dominant economic activity on the frontier, sheep, horse wagons, and cattle were the items that were valued highest. The weights for each indicator from the first principal component are used to generate a household score.⁵¹ We then re-scale the estimated PCA scores to be non-negative for ease of interpretation.

⁴⁷ We are also especially cautious in interpreting results reliant on price data as the extent to which prices determined at estate auctions are representative of actual aggregate market prices for certain products in a given year is unclear.

⁴⁸ Hair, Black and Babin, *Multivariate data analysis*.

⁴⁹
$$Z = \frac{(X - \text{Mean})}{\text{Standard Deviation}}$$

⁵⁰ This method is proposed by Krishnan, 'Socioeconomic index'

⁵¹ In mathematical terms, the weights for each principal component are given by the eigenvectors of the correlation matrix or the covariance matrix, if the data were standardized. The variance for each principal component is represented by the eigenvalue of the corresponding eigenvector.

Figure 5. List of assets according to eigenvalues, first and second component of the PCA

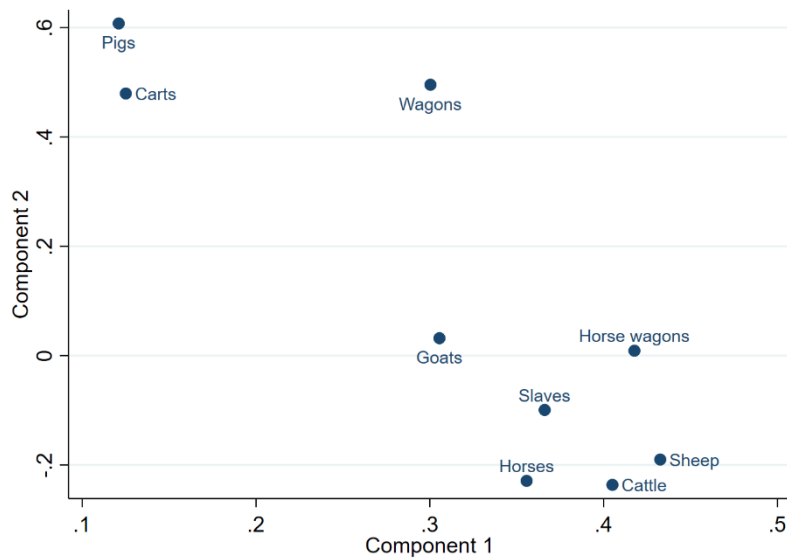
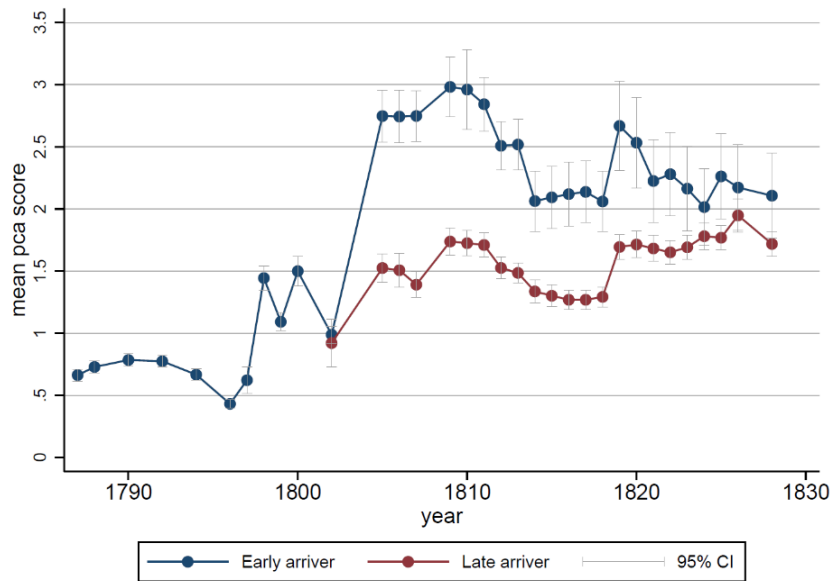


Figure 6 plots the PCA wealth scores for early and late arrivals by arrival year over time. The low entry wealth of early arrivals confirms that poorer Dutch settlers were selecting into migration to the frontier. Their stagnant, and at times, diminishing aggregate wealth over the first decade following the establishment of the district suggests that these pioneers struggled with their new environment in the early settlement years. This is indicative of the high start-up costs, no doubt due to a lack of infrastructure, unfamiliarity with the climate and terrain, and frequent cattle raiding and armed conflicts with indigenous groups. By the end of the 1790's however, it appears that early arrivals were able to start accumulating wealth in earnest, potentially incentivising other households to migrate to the frontier, as speculation, not out of destitution.

Late arrivals as a group entering from 1800, appear to already have the same level of aggregate wealth as the group of early arrivals were able to achieve over the previous decade, suggesting that the frontier was now drawing wealthier individuals from other districts. Potential migrants from outside the district could now see some positive gains to be made as the frontier was about to close and could enjoy some reduced start-up costs, making it a more attractive opportunity. In the decade that followed, we note the different rates of accumulation for early and late arrivals (a steeper slope of the curve for early arrivers). After 1811, the wealth of both groups is hit by the ongoing frontier wars; we see this in the drop in PCA wealth scores but also in its constituent parts - the average number of livestock and capital goods drops considerably for both groups (see Figures B2 and B3). In the final decade of our analysis, there is a convergence in the PCA wealth scores of early and late arrivals.

Throughout the period however, early arrivers maintained both a higher level and rate of accumulation of slaves, compared to later arrivals (figure B4). Given the value and importance of slaves as wealth generating assets in the Cape context, this represents an economically significant advantage. Slaves could not only be used as labour on farms but could also be used as collateral to secure loans.⁵²

Figure 6. Mean principal component (wealth) score by arrival cohort



In addition to the potential differences arising from years in observation, age specific rates of wealth accumulation may be higher for early arrivals compared to late arrivals. We know from previous research that wealth patterns are consistent with a life cycle model of accumulation.⁵³ While figure 4 neatly displays the relative rates of wealth accumulation for both groups by arrival year over time, it does not control for the potentially different age profiles of these two populations. That is, it could be that the group of early arrivals was dominated by older individuals, or indeed that we are only able to observe these individuals from later in their lives because of earlier migration into the area that would only later be formally demarcated as Graaff-Reinet (i.e., pre-CGHP) whereas the late arriving group could have been dominated by younger individuals. This could be linked to the practice of partible inheritance in the colony; to prevent the subdivision of farms into ever smaller and less productive parcels, younger sons were encouraged to take their share of the (equally divided) inheritance in cash. They then moved off the family farm in order to set up their own

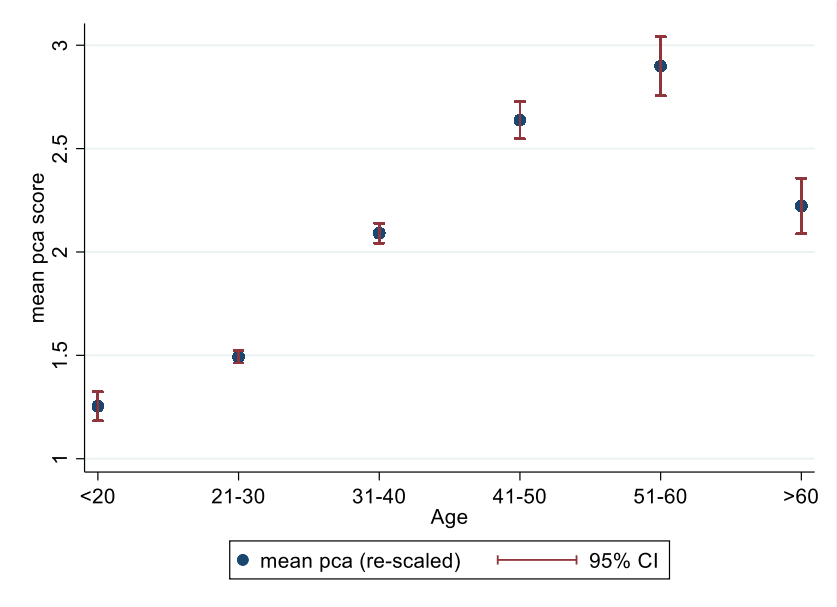
⁵² Martins, *Collateral effect*; Fourie and Swanepoel, ‘Impending ruin’.

⁵³ Kears and Pope, ‘Life cycle’, p. 146.

enterprises in what had been the Cape’s frontier but was now increasingly known as the Cape midlands. The frontier had become a land of opportunity with barriers to entry continually reducing, thanks to the efforts of the early arrivals above all in dispossessing the Khoesan, warding off Xhosa attacks and in setting up a commercial infrastructure of roads and institutions.

For the sample of CGHP linked to SAF, we can plot PCA wealth scores over the life cycle (Figure 7). We can see that for this sample, wealth over the lifetime follows an expected inverted U-shaped pattern. That is, individuals steadily accumulate wealth over their economically active years reaching the peak of their lifetime wealth between the ages of 51-60, after which we see a sharp decline.⁵⁴

Figure 7. Mean PCA wealth score by age of household head, 1786-182



Clearly, a model that did not account for the differential age-profiles of the early and late arriving groups could be mis-specified. To address these concerns, we run a simple panel OLS regression with the following specification:

$$\ln Wealth_{it} = \beta_1(Early\ arriver) + \beta_2(Age)_{it} + \beta_3(Age2)_{it} + \beta_4(HHsize)_{it} + \beta_5(Year) + u_{it} \quad (1)$$

Where $Wealth_{it}$ is the log of the principal component analysis wealth score for household i in year t . β_1 is the main outcome variable of interest and is a dummy taking the value of 0 if the

⁵⁴ Average life length for Cape settlers during this period was around 40 years.

household was an early arriver and 1 if the household was a late arriver to the district. β_2 is the association of household head's age and wealth, while β_3 is included to capture the potentially non-linear associations of household head's age and wealth described above. β_4 is the association of the log of the number of children present in the household. We include the number of children present in the household in a given year because there is a known positive relationship between wealth and household size for this group of settlers.⁵⁵ β_5 are year dummies intended to capture trend in wealth over time, while u_{it} represents un-observable determinants that vary across time and individuals. Recall however, that we have an unbalanced panel with attrition. To eliminate as much as possible of the selection into migration, we restrict the sample to households that are present in the CGHP until the end of the period. Table 3 shows the results of a random effects panel regression, with standard errors clustered at the household level. It shows that early and late arriving settlers exhibited differences in net wealth, after controlling for age, household size, and the trend in wealth over time.

Table 3. Panel regression, dependent variable log of PCA wealth score

Late arrivers	Ref.
Early arrivers	0.2573***
Age	0.0517***
Age2	-0.0005***
HH size	0.1625***
Constant	-2.1745***
Year dummies	YES
Observations	7494

Notes: * $p < 0.005$, ** $p < 0.01$, *** $p < 0.001$

The question then arises whether this premium in terms of wealth accumulation over time can be attributed to the superior land quality enjoyed by the pioneers. For the sample of CGHP linked to SAF and BVOE we can test for differences in land quality (LQ) and land size (LS) between early and late arrivals using a series of OLS regressions. The concept of *land quality* is commonly used to address the physical and/or biological characteristics of soil, distinct from the concept of *soil fertility*, which considers the chemical properties which enable soils to supply essential plant nutrients in the ideal amounts. Land quality typically “integrates characteristics of soil, water, climate, topography and vegetation” in the context of assessing

⁵⁵ Cilliers and Green, ‘Land-labour hypothesis’.

the potential of land for various uses.⁵⁶ We proxy land quality by considering: a biological soil quality index, access to fresh water, and climate volatility.

To obtain our biological soil quality index, we again use PCA. The PCA considers three interdependent indicators of soil quality: (1) cation exchange capacity (CEC) of soil in cmolc/kg, (2) clay content (%), and (3) soil carbon content (fine earth fraction) in g per 18kg.⁵⁷ Cation exchange capacity (CEC) influences the soil's ability to hold onto essential nutrients and provides a buffer against soil acidification. It is a useful measure because it is a fundamental soil characteristic and is difficult to alter significantly. Clay content determines the maximum capacity of soil to store organic carbon. The amount of organic carbon stored in soil is the sum of inputs to soil (plant and animal residues) and losses from soil (decomposition, erosion and offtake in plant and animal production). Higher total organic carbon in soil is an indicator of higher soil quality. Conversely, low levels of total organic carbon can indicate that there might be problems with unstable soil structure or nutrient turnover. High soil quality would be characterized by a high value in all three of the measures.⁵⁸

Fresh water access is measured by mean rainfall, perennial rivers and seasonal streams at the farm level. Mean rainfall is the mean annual precipitation at the farm level. Perennial rivers are the length (in km) of a perennial river running through a farm, and seasonal streams are the length (in km) of seasonal streams running through a farm. For climate volatility we use rainfall variability (rainfall coefficient of variation (CV)) from the precipitation seasonality indicator.⁵⁹ In the regressions presented, we model separately, the five dimensions of LQ: farm-level (i) soil fertility, (ii) mean rainfall, (iii) rainfall variability, (iv) perennial rivers, (v) seasonal streams (equation 2), and farm size in square kilometres (equation 3), respectively, specified as:

$$LQ = \beta_1(\text{Settler group}) + \beta_2(\text{Age})_{it} + \beta_3(\text{Age2})_{it} + \beta_4(\text{HHsize})_{it} + \beta_5(\text{Farms}) + u_{it} \quad (2)$$

$$LS = \beta_1(\text{Settler group}) + \beta_2(\text{Age})_{it} + \beta_3(\text{Age2})_{it} + \beta_4(\text{HHsize})_{it} + \beta_5(\text{Farms}) + u_{it} \quad (3)$$

⁵⁶ Bünemann et al, 'Soil biology', p. 120.

⁵⁷ The indicators were obtained from the soil grids database and can be downloaded from <http://www.isric.org/explore/isric-soil-data-hub>.

⁵⁸ A map of farm boundaries in 1850 with farm-level soil quality PCA index can be found as figure A3 in Appendix A.

⁵⁹ The (raster) data are reported at 1km x 1km at the equator (30-arc seconds). Source: WorldClim 1.4: Current conditions (1960-1990). The code is BIO15. The data can be downloaded from <http://www.worldclim.org/current>.

Where *Settler group*, our main outcome variable of interest is a dummy for whether or not a farm we observe in 1850 belongs/belonged to an early or late arriver. Again, β_2 is the association of the household head's age, β_3 is included to capture the potentially non-linear association of age of the household head, β_4 is the association of the log of the number of children present in the household, β_5 is the association of the number of farms an individual owns, while u_{it} represents un-observable determinants that vary across time and individuals. The results presented in table 4 show that late arrivals' farms were characterised by, on average, land with inferior soil quality (model 1), lower mean rainfall (model 2), higher rainfall variability (model 3) and a lower concentration of perennial rivers (model 4).⁶⁰ The differences in terms of concentration of seasonal streams on farms of early and late arrivals was found to be not significant (model 5). This is not an entirely surprising result given that almost all farms in the district during this period had some form of seasonal stream that would have likely run dry during hot summer months.

Farm size (model 6) was found to have been significantly different between groups, with late arrivals having on average, larger farms. A likely explanation can be found when one considers figures 1 and 2 together; farms differentiated on the basis of settlement group and the bioclimatic variation that characterised the district. Late arrivals dominated the arid north-west region of the district, compared to the relative clustering of early arrivals around the fertile and more densely settled south-east. Since later arrivals settled on relative inferior lands, they likely needed larger farms to obtain production returns close to those of the other landowners. In the second quarter of the nineteenth century the availability of new farms in the region of Graaff-Reinet dried up. The settler farmers who arrived early to the district did so in larger groups and deliberately choose to locate their farms close to one another as a measure to be able to fight back any resistance from the San.⁶¹

⁶⁰ The multicollinearity between the various land quality variables resulted in our decision to estimate the models in table 4 separately.

⁶¹ Adhikari, *South African Genocide*; Laband, *Land wars*; Szalay, *The San*.

Table 4. Results from OLS regressions on the various dimensions of land quality and land size

	(1) Soil quality	(2) Mean rainfall	(3) Rainfall variability	(4) Perennial rivers	(5) Seasonal streams	(6) Farm size
Early arrivals	ref.	ref.	ref.	ref.	ref.	ref.
Late arrivals	-0.888***	-0.183***	4.884***	-26.422*	7.440	23.433**
Age	0.006	-0.001	-0.002	0.462	0.569	0.041
Age2	-0.000	0.000	0.000	-0.004	-0.005	-0.000
HH size	0.002	0.001	-0.034	-1.071	0.021	-0.990
No. of farms	-0.042	0.015**	0.731***	17.630***	-21.191***	-3.366*
Constant	4.356***	6.081***	46.305***	7.902	120.792***	53.110***
Observations	1277	1277	1277	1277	1277	1277

Notes: * $p < 0.005$, ** $p < 0.01$, *** $p < 0.001$

5. Analysis of institutional changes

We have established that those Dutch settler farmers who established farms in Graaff-Reinet before 1800 experienced a premium compared to those who settled in the district after 1800. Unfortunately, the tax censuses do not extend beyond 1828 and we are unable to measure wealth accumulation for those settling in the district after this point. To try to understand the persistence of the early arrival premium we instead test for differences in land quality between farms which belonged to early arrivals (or direct descendants thereof) and those in the possession of farms observed after 1828. A series of one way ANOVAs across the same six dimensions of land quality given above (shown in table 5), reveals that British immigrants settled on smaller tracts of arguably superior land.⁶²

This result can be explained if we consider the institutional changes that took place in Graaff-Reinet between 1835-50. This period saw a dramatic increase in the production and export of wool at the Cape to meet the increased demand in Europe. Indigenous hairy Cape sheep were crossed with imported merino rams to produce a woolled race of sheep well adapted to the conditions of the Cape interior. In consequence, wool exports rose from 373,203 lb. in 1836, to 1,372,483 six years later, and to 5,447,252lb by 1851.⁶³

Moreover, the production shifted decisively eastwards. In 1826 a harbour was opened in Port Elizabeth 750 kilometres east of Cape Town. Until the building of the first railways in the 1860s, all inland transport remained based on the ox-wagons, with up to 1200 a month entering Port Elizabeth at its peak.⁶⁴ This transport remained painfully slow, though the creation of the Central Roads Board in 1843 began the process of building reasonable roads over the steepest passes. Equally, from the late 1840s the city developed as the centre of the colony's banking and financial services. Together these measures reduced transportation costs significantly for wool producers at the eastern frontier. In 1836, 68.8 per cent of the wool exported went through Cape Town; by 1842 this had shrunk to 37.8 per cent and in 1851 to 32.6 per cent.⁶⁵

⁶² The choice of ANOVA as opposed to simply including the British in our OLS regressions presented in Table 4 is due to data limitations. Since we do not have additional controls to include for British settlers (who we only observe in 1850) we use one-way ANOVA to compare land quality and size between our three settler groups (early, late, and British), as this uses the F-test for statistical significance which allows for comparison of multiple means at once. The limitation is that we cannot control for differences between these groups based on household head age or household size, and we therefore acknowledge that the differences observed could be associated with differences in these (or other unobserved) variables.

⁶³ Thom, *Skaapboerdery*, pp 196-7.

⁶⁴ Ingg, 'Liverpool of the Cape'; Mabin, 'Rise and decline'.

⁶⁵ *Ibid.*

Table 5. Multiple comparisons table with Tukey post-hoc test following one-way ANOVA

		Mean	Std. Error	Sig.	95% Confidence interval	
					Lower bound	Upper bound
Soil quality						
Late arrival	Early arrival	-0.31	0.15	0.10	-0.68	0.05
British	Early arrival	0.02	0.20	0.00	0.54	1.49
British	Late arrival	1.33	0.15	0.00	0.99	1.68
Rainfall (in mm)						
Late arrival	Early arrival	-12.09	7.27	0.22	-29.16	4.96
British	Early arrival	44.03	9.51	0.00	21.74	66.34
British	Late arrival	56.14	6.93	0.00	39.88	72.40
Rainfall variability						
Late arrival	Early arrival	5.03	0.76	0.00	3.23	6.82
British	Early arrival	-2.03	0.99	0.10	-4.38	0.31
British	Late arrival	-7.06	0.73	0.00	-8.77	-5.35
Perennial rivers (km per square km farm)						
Late arrival	Early arrival	-38.20	25.47	0.29	-98.10	21.69
British	Early arrival	52.92	30.33	0.19	18.39	124.24
British	Late arrival	91.13	20.10	0.00	43.86	138.40
Seasonal streams (km per square km farm)						
Late arrival	Early arrival	-19.57	11.90	0.23	-47.49	8.36
British	Early arrival	6.38	16.28	0.92	-31.82	44.56
British	Late arrival	25.95	12.34	0.09	-3.02	54.91
Farm size (in Square km)						
Late arrival	Early arrival	8.56	3.74	0.06	-0.22	17.33
British	Early arrival	-10.86	4.89	0.07	-22.33	0.60
British	Late arrival	-19.42	3.56	0.00	-27.78	-11.06

The new concentration on wool farming entailed the investment of capital to a much greater degree than heretofore, both to acquire merino rams and to pay for the sheep to be shorn and the wool to be carried by ox-wagon to the coast.

The acquisition of woolled sheep was subject to a degree of ethnic privilege, in favour of Britons. This began with the arrival of the British settlers, who received merino rams free from the Government farm. In addition, the other main local source of income was contracting for the British army, in which the British settlers had a clear advantage, and, in 1836, they realised a net profit from the sums of money paid out in compensation for the losses in the war with the amaXhosa (Hintza's war).⁶⁶

There is a degree of uncertainty on the question as to how far capital from elsewhere was invested in the Eastern part of the Cape Colony. Arthur Webb argued that "trade and speculation, whether in the form of wool, land, or other commodities relied primarily on the credit and capital generated within the region, and in the creation of which, the local unit banks had a major role to play".⁶⁷ Against this, John Fairbairn, editor of the (Cape Town-based) *South African Commercial Advertiser*, claimed that a "large proportion of the money in Cape Town is derived from mortgages on frontier farms and frontier estates; a large proportion of the trade of Table Bay is connected with the frontier, and great many people have an interest in estates in the eastern province".⁶⁸ Certainly, by the 1830s capital from the Western Cape is known to have been invested in Eastern Cape land.

The operations of the firm of Mosenthal Brothers, who opened their office in Port Elizabeth in 1842, show how things could work. Joseph Mosenthal had lived in the Colony for a few months a couple of years earlier and had developed a strategy that turned out to be most effective. He began by importing a large selection of consumer goods, of high quality, into the Eastern Cape. He stressed, in his advertising that the goods came directly from Great Britain, or where appropriate, from the Netherlands, France or Germany. The Mosenthals were very well capitalized. They began importing merino rams and were later responsible for the introduction of angora goats to South Africa. They knew that their own prosperity was dependent upon the success of the farmers among whom they worked. It was said that by establishing their own agents in Graaff-Reinet, and later in other towns in the Eastern Province and providing selected farmers with the finest quality breeds and lavish credit

⁶⁶ Keegan, *Colonial South Africa*, p. 145.

⁶⁷ Webb, 'Agricultural development', p. 137.

⁶⁸ Webb, 'Agricultural development', p. 137.

facilities⁶⁹ the firm did much to ensure the success of the region's economy. The firm as a whole will not have been exclusively attentive to requests from the British settlers, but it does stand to reason that those who could present themselves as progressive will have found it easier to obtain credit for the restructuring of their enterprises than those without the trappings of Victorian modernity.⁷⁰

The most prominent of the new investors in land and sheep in Graaff-Reinet were a number of English families, most notably the Rubidges and the Southeys. The attention paid to them by historians has benefitted, in particular, from the assiduous record-keeping by, in particular the successive Rubidges to own the farm of Wellwood, to the north of Graaff-Reinet town.⁷¹

Nevertheless, a majority of the British settlers who acquired farms in the old Graaff-Reinet district came to be based in the southern part of what became Somerset district. This group of Britons invested in pastoral farming in times that were significantly different to those of one to two decades earlier. The widespread introduction of commercial credit profoundly changed the region's economy and society. The eastern districts were no longer a place of semi-subsistence pastoral farming, but a region about to become the commercial centre of the colony. Only those with necessary political and financial connections could jump on the ox-wagon. These included people of both British and Cape Dutch descent. Evidence for the change comes from successive valuations of the landed property of the colony, conducted for tax purposes. In the first, taken in 1845, thus as the transition was getting under way, the total value of the Eastern Districts of the colony was £1,809,045, which was 31.1% of the value of the colony as a whole. By the end of the 1850s the value of the Eastern districts was £7,251,091, just about four times the previous amount, and 46.9% of the total value of the colony and a decade later the equivalent figures were £9,530,834 and 51.5%. The process which had begun in the 1830s was still continuing.⁷²

6. Conclusions

The economic role of space and time in an expanding settler frontier society can hardly be overstated. On a macro level the expansion of the frontier enabled extensive growth as more

⁶⁹ Ibid., p. 66.

⁷⁰ *Report from the select committee*, p.72.

⁷¹ Beinart, *Rise of Conservation*, pp. 54-8 and chapter 9.

⁷² Data compiled from *Report upon the Operations of the Central Road Board; Return of the value of Landed Property, 1858-9; Appendix to the Return, Further Appendix to the Return, and, Return showing the value of the Property.*

land was put into productive use. Diminishing returns could be avoided as long as expansion could continue and there was no need to open marginal lands for cultivation. These average macroeconomic trends occlude the experience individual settlers faced on moving into a frontier. The expansion of the frontier was not a smooth continuous process. On the contrary, it was often turbulent and erratic as settlers moved into areas still settled by indigenous people. Given the circumstances, many preferred to settle on marginal lands in frontiers that were closing in order to take advantage of improved infrastructure and greater security compared to the open frontiers. Settlement timing is therefore expected to affect wealth and wealth accumulation. Theoretically, early arrivals could perform better as they could locate their farms on the superior land. However, it is equally plausible that they would be disadvantaged compared to later arrivals because they located their farms in areas which still suffered from limited infrastructure and where the risk of conflicts with the indigenous populations was high.

This paper analyses the link between time of arrival and wealth accumulation at the eastern frontier of the early 19th century Cape Colony. Our findings confirm the existence of such an early arrival premium: early Dutch settlers experienced greater wealth accumulation compared to Dutch settlers who arrived later. However, our analysis shows that the early arrivers did not necessarily hold on to the superior land for generations. Once the frontier at Graaff-Reinet was closed the rules of the game changed in favour of a new group that arrived at least three decades later than the early arrivals. Beginning in the 1820s the district went through profound changes which would in two decades transform the district from a peripheral status to being the commercial centre of a Cape Colony's, based on the exports of wool to the growing market in Europe. The changes manifested themselves in investments in more capital-intensive production. This transformation was to a large extent led by a new group, the British migrants arriving to the district in the 1820s and onwards. With better access to the commercial and political elites this group had the advantage of easier access to credit, which became increasingly important as the district became incorporated in the global capitalist economy. This group bought up pockets of good land and soon became leading actors in the commercial wool production.

While the focus in this paper is one a small part of the Cape Colony at the southern tip of Africa, it provides valuable lessons applicable to a wide variety of studies on geography, institutions and socio-economic change in pre-industrial societies. Our case reveals that one cannot fully capture the changes at the frontier by looking either at geography

or institutions. It is the interplay between these two factors that help us understand the development and change of land ownership at the frontier.

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Appendix A

Figure A1. Graaff-Reinet with its main mountain ranges, perennial rivers and seasonal streams, with annual precipitation (mm). The (raster) data are reported at 1km x 1km at the equator (30-arc seconds). Source: WorldClim 1.4: Current conditions (1960-1990). The code is BIO15. The data can be downloaded from <http://www.worldclim.org/current>.

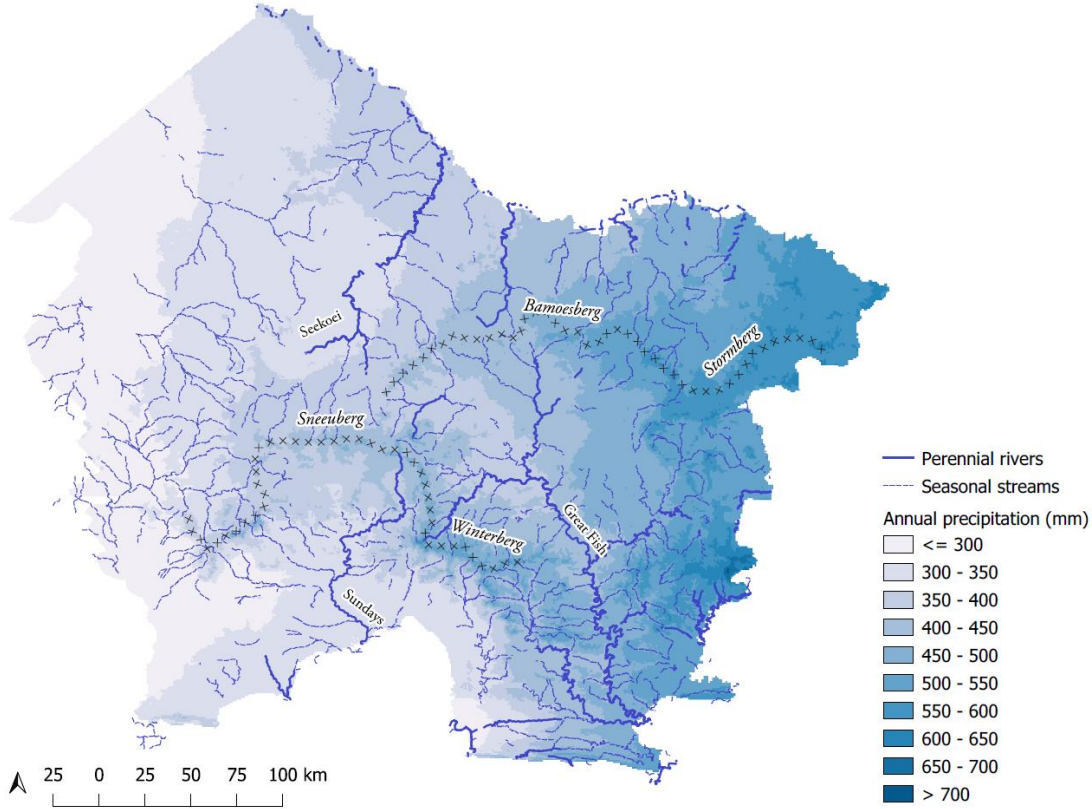


Figure A2. Graaff-Reinet with its main mountain ranges, perennial rivers, and seasonal streams, with rainfall variability. The (raster) data are reported at 1km x 1km at the equator (30-arc seconds). Source: WorldClim 1.4: Current conditions (1960-1990). The code is BIO15. The data can be downloaded from <http://www.worldclim.org/current>

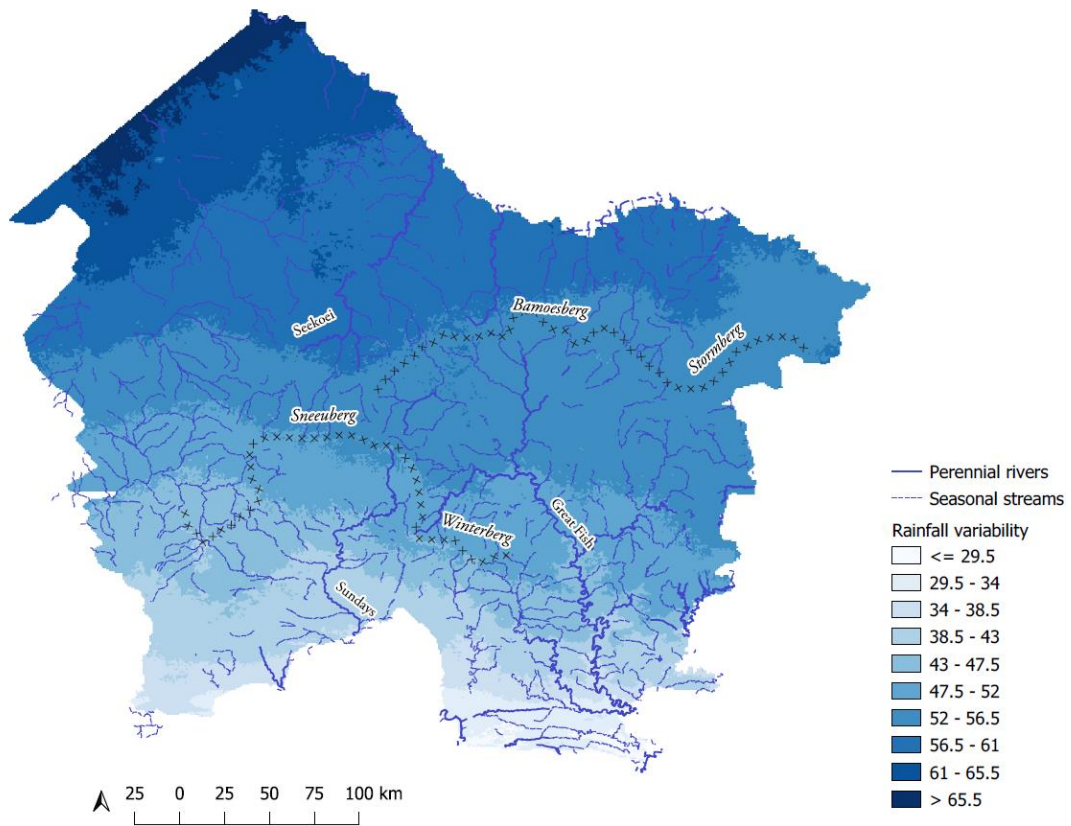
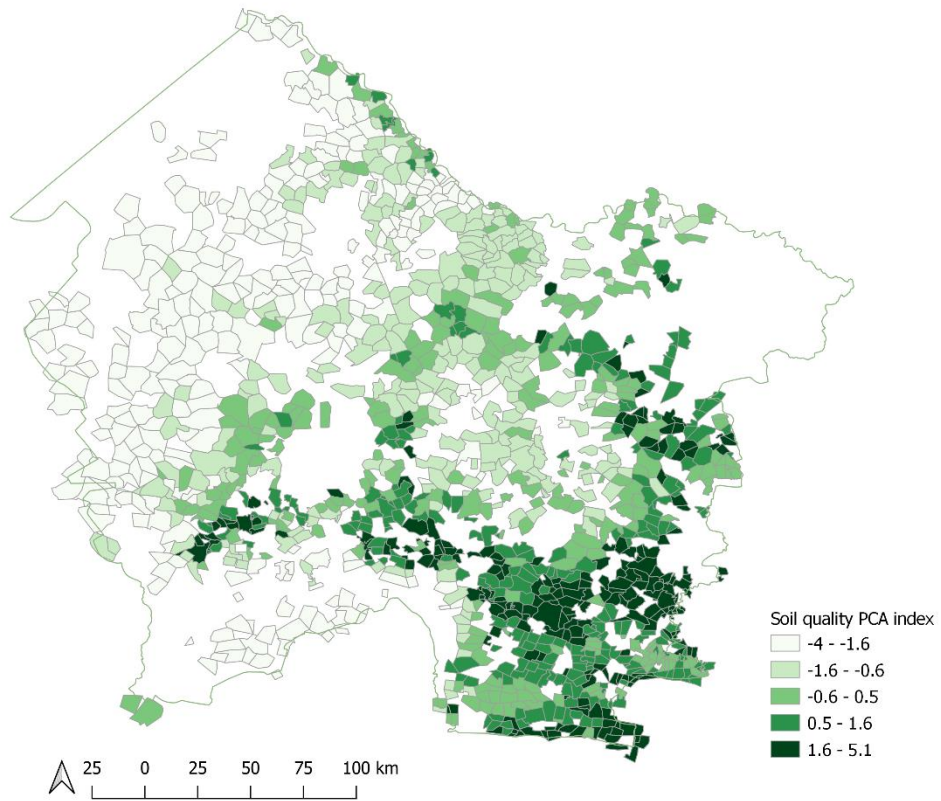


Figure A3. Graaff-Reinet farm boundaries in 1850 with farm-level soil quality PCA index. The soil quality indicators were obtained from the soil grids database and can be downloaded from <http://www.isric.org/explore/isric-soil-data-hub>).



Appendix B

Figure B1. Kernel density estimates of PCA wealth scores for households in the opgaafrollen by linkage type

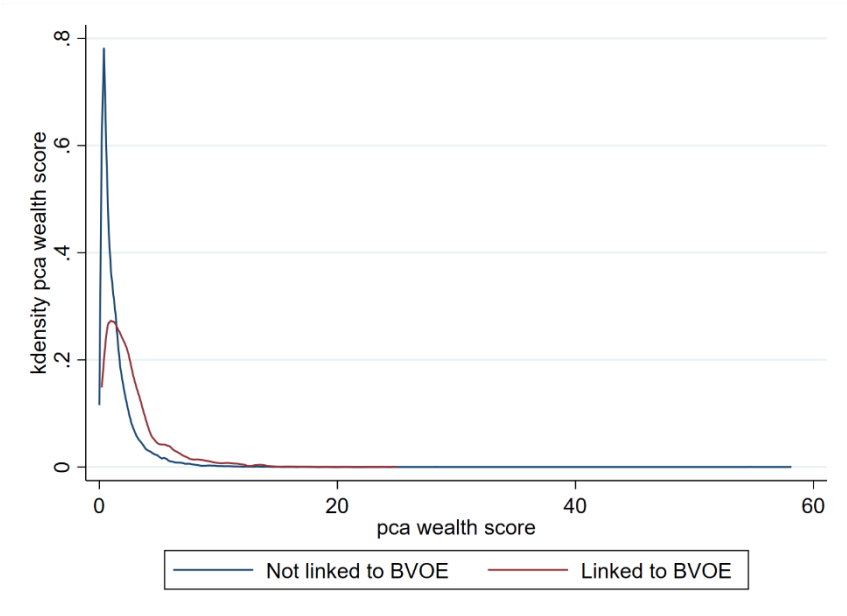


Figure B2. Mean number of livestock (count of cattle, sheep, and goats) by arrival cohort

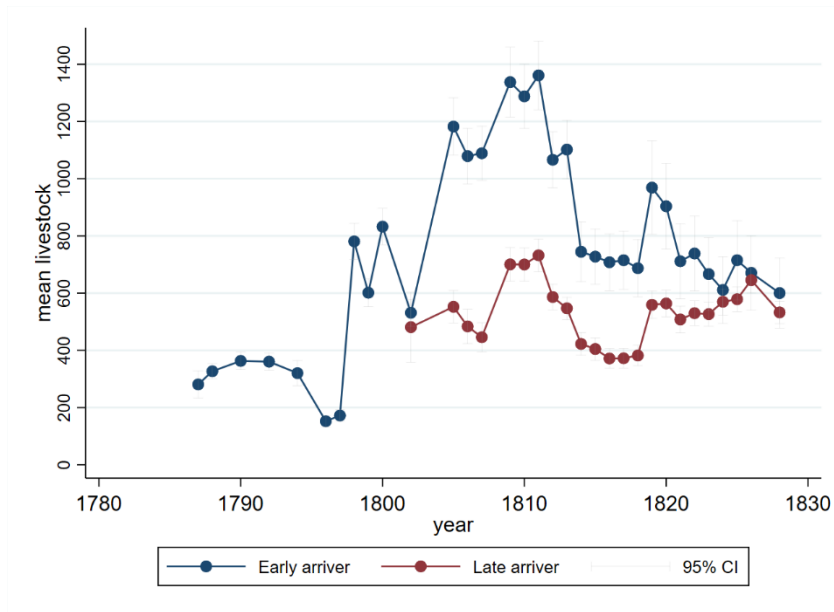


Figure B3. Mean number capital goods (count of horses, horse wagons, wagons, oxen and carts) by arrival cohort

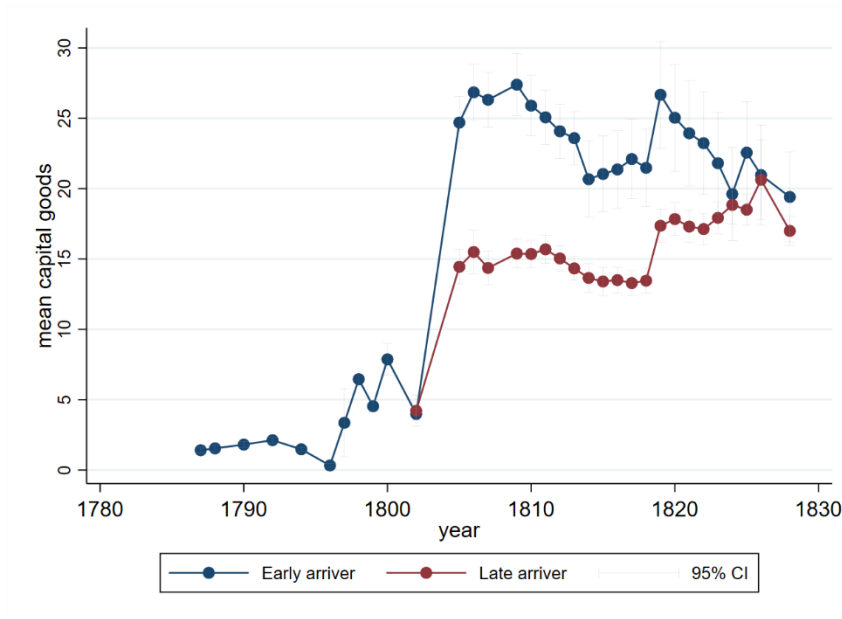
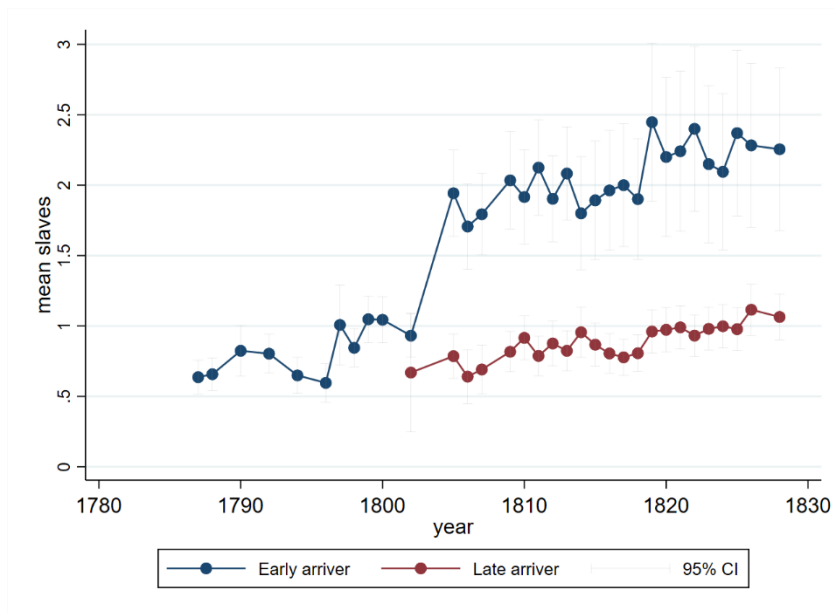


Figure B4. Mean number of slaves by arrival cohort



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