The dynamics of inequality in a newly settled, pre-industrial society: The case of the Cape Colony[1]

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The dynamics of inequality in a newly settled, pre-industrial society: The case of the Cape Colony*

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1 Introduction

Inequality is a major concern in many of the world's developing regions. South Africa is no exception, as the voluminous literature on the subject attests to (see Bhorat and Kanbur 2006, for example). Indeed, modern South Africa is one of the most unequal societies in the world, primarily as a result of institutionalised inequality under colonial segregation and Apartheid, but potentially also stemming from the set of institutions created much earlier under Dutch and British colonial rule (Terreblanche 2002). This paper will investigate inequality in the early colonial period. It is apparent in the literature that inequality is severely persistent; countries that exhibit high inequality from early stages of development generally continue to do so later on, while few policy prescriptions are successful in reversing the trend, even in times of high and sustained economic growth.

These observations have resulted in an emergent literature that uncovers the roots of inequality during a country's early stages of development, and explains the influence of these initial conditions on the subsequent distribution of wealth (Engerman and Sokoloff 2000; Acemoglu, Johnson and Robinson 2001; Frankema 2009). Some dominant insights have emerged from these investigations. One strand of the literature focuses on newly settled societies. In particular, the initial factor endowments of good climate and a large native population seem to create institutions that promulgate persistent inequality. This phenomenon relates particularly to the set of institutions that are enabled by these factors and allows the initially well-positioned in society to attempt to continually secure the balance of economic and political power. The second strand of this literature focuses on the dynamics of inequality in societies that have undergone some development, but have not yet entered a phase of industrialisation. Pre-industrial growth may increase inequality during the early phases of development, in contrast to dominant theories that suggest that this only commences at the onset of industrialisation (Van Zanden, 1995).

The Cape Colony, founded in 1652 at the southern tip of Africa by the Dutch East India Company (*Verenigde Oostindische Companje,* or VOC), presents a case study of a society that is established by a coloniser with a new set of institutions that were unrelated to the status quo. This newly imposed setting potentially had a large impact on the inequality and development trajectories of the territory. This marked change in institutions (particularly within the context of the pre-industrial era) provides

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a context to illuminate the previous literature on the roots of inequality. The availability of tax inventory records from almost the beginning of the settlement period, allows the analysis of the dynamics of the wealth distribution of a society that is firstly on a path of initial flux and subsequent stabilisation during its pioneering phases. Secondly, the extensive sample uncovers how this unique set of newly created institutions bears out not only on starting levels of inequality, but also once this framework stabilises and the economy matures. These particular aspects present a somewhat different set of circumstances to those found in the early years of colonisation in the Americas (the dominant focus of the literature). This allows a partial validation of past observations that also correlate with these territories, but furthermore colours in aspects that were not visible in the institutional contexts of other newly settled societies. In particular, the role of immigration and the mercantilist approach of the VOC come to the fore. The latter is an important institutional feature of the Cape Colony, particularly because it was established by a private company, and not by a national crown.

This paper creates a set of asset indices with principle components' analysis, using data recorded for VOC taxation purposes (the *opgaafrollen*). These constructs are used to estimate measures of asset inequality for the period 1663 to 1757, roughly the first century of Dutch settlement. This is the first formal quantitative analysis of inequality trends for the Cape Colony during the initial period of settlement. It supplements the qualitative literature (based on archival historical evidence) that emphasises the role of an emerging gentry in the distribution of wealth (Guelke and Shell 1983). In a comparative context, the study uses micro-level data to provide long-run quantitative inequality measures for a seventeenth and eighteenth century colony, allowing, for the first time, a dynamic rather than static analysis of inequality trends in a newly settled and pre-industrial society in this period. While theory testing in other societies has been severely limited because of a scarcity of quantitative evidence (Williamson 2009), this study presents a history with evidence, enabling an evaluation of the Engerman-Sokoloff and other hypotheses.

The rest of this paper is structured as follows. Section 2 discusses the theories on the roots of inequality and the impact this has on subsequent economic development. Section 3 sketches the context of the early Cape Colony settlement and its institutions, while Section 4 explores the existing historical evidence (primarily archival and anecdotal) relating to inequality within that context. Section 5 briefly exposes the usefulness and limitations of the *opgaafrollen* data in the analysis of inequality. Section 6 outlines the methodology used to construct asset indices. Section 7 presents the results and an extensive set of robustness checks, while section 8 offers interpretations of the findings within a comparative context. Section 9 concludes.

2 Inequality in pre-industrial, newly settled societies

The question as to why some European colonies developed into prosperous societies (such as North America, Australia and New Zealand) while others remained relatively underdeveloped (the Caribbean, South America, Africa) is prominent in the recent economic history literature (Acemoglu and Robinson 2000; Acemoglu, Johnson and Robinson 2001; Engerman and Sokoloff 2000; 2002).

One explanation posits that high rates of inequality in colonial societies may have been influenced by initial institutions in these newly settled societies, and in turn high inequality significantly influenced the perpetuation of these institutions. The framework which emerged had a bearing on the way in which these societies were able to develop (Engerman and Sokoloff 2000; 2002; 2003; 2005). The roots of the inequality lay, according to Engerman and Sokoloff (2002: 35), not in differences in national heritage or religion, but in the "initial factor endowments (broadly conceived) of the respective colonies". Two initial factors are postulated to have been especially important in generating high inequality: a suitable climate and soil for the cultivation of sugar and other highly valued commodities (where slave labour, in particular, was productively employable), and large concentrations of native people. These two conditions encouraged the formation of a small, elite

immigrant society which maintained a disproportionate share of wealth, human capital and political power. This linkage will be discussed below.

Having attained this power, the elite was "able and inclined" to persist with the status quo, even at the cost of general welfare, by establishing a basic legal framework that protected their share of wealth and power (Engerman and Sokoloff 2002: 17). Thus, the institutions that evolved in these regions tended to contribute to the persistence of inequality, thereby restricting access to economic opportunities for the broader population and in turn limiting growth (Engerman and Sokoloff 2000: 223).

Two policies provide evidence of these institutional arrangements: land allocation and immigration policies. While land was offered relatively freely and in small units in the United States and Canada, land ownership remained highly concentrated in the rest of the Americas (especially Spanish America), with the result that fewer individuals held larger portions of land and great inequality ensued (Engerman and Sokoloff 2000: 224). The establishment of typically smaller farms in the United States and Canada favoured grain farming, in contrast to the economies of scale enjoyed by sugar plantations and other valued commodities in the Caribbean and elsewhere. Furthermore, in contrast to the open immigration policies promulgated in North America, immigration to Spanish America was tightly controlled. Because land in these colonies was initially granted in large blocs to the early wave of settlers, they looked to the Spanish Crown to protect their privileged positions. Engerman and Sokoloff (2002: 18) note that these immigration policies could not have been maintained had a "substantial supply of Indians to work the land and otherwise service the assets owned by the elites and the Spanish Crown" not been available. The size of the native population was therefore a key determinant in the type of immigration policies that followed, and consequently had a bearing on inequality. It is evident that an interaction between initial production factors determines inequality. The first scenario is one with a small potential native workforce in the colony, so that farmers had to work the land themselves, and farms could only remain small as a result. This prevented the emergence of any elitism and subsequent inequality. The second scenario consists of a large native workforce (or of imported slave labour), which allowed farmers to work larger portions of land. This lead to the higher concentration of capital, which in turn allowed an elite to be established and subsequently the incentives arose to form institutions that maintained this status quo. As a result, inequality was high and persistent in the second scenario.[1]

A further explanation for rising inequality was proposed some years ago by Simon Kuznets. Kuznets famously argued that income inequality follows an "inverted-U" curve as a country moves from a low to a high level of development. His conjecture was that inequality would tend to increase during the early phase of capitalist development and only equalise after a sustained period of economic growth when the economy has matured (Kuznets 1955).[2] Yet, Kuznets (and those that extended his work, most notably Lindert and Williamson) applied the theory to industrialising societies only.

In 1995 Jan-Luiten van Zanden found proof that Europe ascended a "super-Kuznets curve even

[1] Williamson (2009) argues that inequality was much lower in Latin America during the early phases of European settlement. In fact, he finds little evidence that suggests inequality was persistent over centuries, as argued by Engerman and Sokoloff, and concludes that the persistence of inequality in Latin America "is a myth". While his results shed some doubt on the severe levels of inequality proposed by earlier research, the transmission mechanism of relatively high initial inequality to institutions that perpetuate inequality is not invalidated (see Frankema (2009) for an exposition of Latin American land inequality). In fact, inequality measures at the Cape are comparatively similar to the results for Spanish America reported in Milanovic, Lindert and Williamson (2008).

[2] Although Kuznets was himself not convinced of the empirical evidence for his hypothesis, a noteworthy group of scholars agree that the Kuznets curve holds for the early industrialized countries, notably Britain and the United States. Williamson, although not the first to do so, proclaims in his book 'Did British Capitalism Breed Inequality' that the "facts support Simon Kuznets' (1955) conjecture that income inequality is likely to show an early rise and later decline as economic development proceeds" (Williamson 1985: 200). Relying on a range of data sources, he concludes that the rise in inequality began in 1760. Although interrupted by the French Wars, inequality increased rapidly after Waterloo. "British inequality seems to have reached a peak somewhere around the 1860s or shortly thereafter. While not spectacular, the egalitarian levelling up to World War I was universal" (Williamson 1985: 200). The evidence for the United States is as compelling (Williamson and Lindert 1980).

before industrialisation (sometime during the sixteenth, seventeenth or eighteenth centuries)" (Van Zanden 1995). Whereas Kuznets had intended his theory to apply to industrial economic growth, Van Zanden's hypothesis claimed that Europe already experienced an increase in economic activity prior to the Industrial Revolution, and that this pre-industrial growth had already resulted in an increase in inequality.

Why is this so? A number of explanations have been posited for the existence of a Kuznets, or super-Kuznets, curve. Firstly, Kuznets himself argued that modern economic growth caused a shift in labour from low productivity sectors – agriculture – to high productivity sectors – industry and services (Kuznets 1955). Initially, nearly all the labour force is employed in agriculture. As agricultural workers move from agriculture to industry, inequality increases. This occurs up to a certain point, when half the population has moved between the sectors. Thereafter, as more agricultural workers move into industry, inequality begins to decline. A parallel argument can be made with the rural and urban population substituting agriculture and industry. Kuznets has, however, emphasised that a specific set of conditions or institutions have to exist for these changes to occur – and he was sceptical of the generalisation of his theory across time and territory (Kuznets 1971).

More recently, another explanation has been put forward. This sees differential wage payments as an important contributing factor to an initial rise in inequality. Early economic growth would tend to increase the wages of skilled workers at a higher rate than unskilled workers, resulting in growing inequality (Williamson 1982). Van Zanden finds this consistent with the period of pre-industrial growth and credits the rise in inequality of pre-industrial Holland to this explanation (Van Zanden 1995).

3 The Cape Colony

The first Europeans to permanently settle in the Cape Colony arrived in 1652 with the aim of building a small refreshment station to replenish resources for passing ships of the Dutch East India Company (VOC) en route along the trading route to the East Indies. The history and institutions of this colony are therefore distinctly related to that of a private company, and not of a national state.

Cape Town was the hub of economic activity in the Cape Colony.Economic and social life in Cape Town revolved around the goods and services required by the passing ships; the town was known as the "tavern of the seas" with nearly every house providing some form of public entertainment or lodging (Schutte 1980). Passing ships provided a large demand for Cape goods and stimulated production in other regions of the Colony (Boshoff and Fourie 2008a; 2008b).

The first commander of the refreshment station at Cape Town, Jan van Riebeeck, soon reported back to the Lords XVII (the directors of the VOC) that the Cape required a free farmer population to ensure the sufficient production of food. This consisted primarily of fresh produce and staples. Consequently, in 1657 nine company officials were deployed as *vrije burghers* (free citizens) on small plots close to the fort in Cape Town. Jan van Riebeeck had envisaged a tight-knit community of farmers pursuing intensive agriculture, while at the same time protecting the borders of the settlement from aggressive intents of the native population. Soon Van Riebeeck realised that such a strategy would not work: the farmers had few labourers available and even less capital; the availability of free land encouraged extensive, pastoral farming (Guelke 1980: 47). Livestock, either purchased from the VOC, or bartered with or stolen from the native Khoikhoi, provided farmers with a means of living that dispensed with labour-intensive practices and would later provide a means of long-distance transportation over the rough terrain of the interior. By 1663, the area Van Riebeeck had hoped would accommodate thousands of farmers had been divided into 15 large farms with a male population of only 16 settlers (Giliomee 2003: 2&9).

Most years were marked by harvest failures and a shortage of food in the Colony. Support

from the Netherlands was often required. Extensive farming forced the VOC to adopt a policy of expansion; Simon van der Stel, who arrived in 1679 as governor, immediately promulgated new areas for settlement: Stellenbosch (1678) and Drakenstein (1688). The number of farmers, receiving relatively large plots of land, grew gradually as the borders of the Colony expanded to the north and the east. By 1687, the free citizen headcount was 700, of which 200 were adult males (De Kock 1924: 27). 151 French Huguenots arrived at the shores of the Cape in 1688. These settlers, with some experience of farming, but little capital, immediately took up viticulture (already started by Van Riebeeck in 1655) in the Drakenstein area. The French population quickly assimilated into the Dutch society, with the French language vanishing within two generations (Botha 1939: 40-49).

The initial allocation of larger plots assisted settlers to establish fairly viable farming operations given the lack of other physical and human capital (stock farming was less labour-intensive). When the Huguenots took up viticulture in the more fertile areas, labour became an important factor of production. While land substituted for capital requirements to some extent, labour was supplied by the Khoikhoi and more importantly through the importation of slaves (already from 1658, but especially after the expansion of the Colony).[3] The latter arrangement therefore compensated for the "large native population" that Engerman and Sokoloff proposed as a precursor to high and persistent inequality.

By 1700, the fertile area west of the first mountain ranges (stretching from modern-day Somerset West to Tulbagh) had been populated by European farmers. Production, for the first time, reached a surplus. This area was the main supplier of wheat and wine to the city and passing ships. Because of property ownership in this region, these farmers could accumulate capital to increase future production. Historians agree that while some farmers' production remained just above subsistence levels, others attained great wealth, as illustrated by the beautiful Cape Dutch mansions still to be found on many of these wine farms (Giliomee 2003: 31). The emergence of this gentry played a decisive role in explaining inequality in the territory, particularly when contrasted with the poverty of the nomadic frontier farmers.

In 1708, the Company requested that immigration to the Colony be discouraged as the objectives of the Company, to supply produce for passing ships, had been met as a result of the extension of the frontier. This echoes what happened in South America, though here it is not apparent that this limit on immigration was lobbied for by an emerging elite. Despite this apparent prosperity that came to the fore, the farmers were unhappy with the economic restrictions at the Cape. The VOC pursued a mercantilist policy; most goods could only be sold directly to the Company, prices were fixed and monopoly contracts for nearly every type of produce were sold to the wealthiest farmers. Farmers were prohibited from selling their produce directly to the ships within the first three days of arrival, even if these ships were not of Dutch origin. No opportunity for export was allowed, as products would compete with VOC exports. Wheat, wine and brandy, in low volumes and mostly of an inferior quality, were the major exports to the East Indies (with some exported to Europe). Severe restrictions were placed on manufacturing and all imports were heavily taxed by the Company.[4]

The natural increase in the population necessitated the expansion of the Cape territory beyond the first mountain ranges. The Company had already allowed grazing outside the Colony's borders, with farmers' sons or trusted servants herding and hunting during the winter months in the interior. In 1713 a new loan-system was introduced beyond the existing borders, whereby farmers were granted large farms on loan for five years. A fee of 24 rix-dollars (one rix-dollar equalled 2.4 guilders) gave holders exclusive control of a minimum of 2420 hectares (6000 acres) of land (Giliomee 2003: 30). While farms could not formally be sold (only the buildings were allowed to be sold), loan licenses were rarely revoked (except in cases where the annual fee was not paid). The opening of the new frontier resulted in a gradual exodus of settlers from the original Cape frontier to the interior. While stock farming in the interior made up one-tenth of all agricultural producers in the Cape by 1716,

[3] Slaves came mostly from Madagascar, Indonesia (Java), India, Angola and Mozambique.

[4] See Ross (1982) for an exposition of the Cape economy institutions.

by 1770 stock farmers formed two-thirds of all farmers in the Colony (Giliomee 2003: 31). The stock farmers of the interior, mostly living a nomadic life on the frontier, had little incentive to settle for long periods of time. Given the absence of property rights in this region and the fact that land was available relatively freely, farmers decided to move on as soon as pasture became depleted. In this way, farmers were limited in the accumulation of capital to only those goods that could be transported by ox back or wagon. It is evident from this historical evidence that interregional inequality would have been a dominant feature of the economy by 1770. This inequality is, however, not measured in this study, as the sample period ends in 1757, by which time the records from the interior were still few.

4 Inequality in the Cape Colony

The set of arrangements outlined above all have an impact on the distribution of wealth in the Colony. The section that follows explores the circumstantial evidence to synthesise the historians' view of inequality during this period.

The first farmers in the Cape Colony were all Company servants released by the Commander of the Cape station.[5] These settlers had few resources at their disposal: first, they had no capital to invest in the new farms. The Company did provide them with some tools and cattle, but all remaining investments had to come from the farmers themselves. The settlers also had little knowledge of the climate, soil and vegetation, and even less expertise in farm operations and techniques.

The availability of labour was another constraint for the farmers. Farmers had to rely on imported slaves and the native Khoikhoi. Because most farmers were former Company servants, many were unskilled and inexperienced in hard farm labour. Many resisted work and moved as soon as possible, either to the city or back to Europe by hiding on boats (Van der Merwe 1938: 50). While the local Khoikhoi did have entrenched knowledge of the local climate and geography (which made them valuable farmhands), they could not be enslaved and could easily move away if life on the farm became too demanding.

The living conditions of these early farmers were poor. Coetzee (1942: 41) notes that the church often collected money to give to needy farmers whose "naked kids were sleeping in the hay with horses and cattle". Due to the tough terrain, capital and labour scarcity and low prices for agricultural products offered by the Company, many farmers remained subsistence farmers, producing only a small surplus in order to purchase necessities from the market.

Yet, historians note that not all farmers remained poor. Giliomee calculates that the gentry, measured as those who owned more than sixteen slaves, totalled seven per cent of the rural population in 1731 (Giliomee 2003: 30). Wealth among the rural Cape farmers increased greatly throughout the early part of the eighteenth century (Guelke and Shell 1983; Terreblanche 2002: 156). In 1755, the Governor and his council issued a *plakkaat* (ordinance, known as the sumptuary law) with the view to "limiting the number of horses, carriages, jewels, slaves, etc., which an individual of this or that rank might possess" (Giliomee 2003: 30). Although similar ordinances had been issued earlier, the High Government in Batavia noted in the preamble to the 1755 ordinance that the "splendour and pomp among various Company servants and burghers ... reached such a peak of scandal" that the issue had to be dealt with more seriously (Ross 1999: 9). This sumptuary law was concerned with the display which was allowed on the horses, carriages and guides, and the number of horses used.

Visitors also noted the expensive taste of some farmers. In 1783 a traveller to the region wrote that on several farms he had observed "nothing except signs of affluence and prosperity, to the extent that, in addition to splendours and magnificence in clothes and carriages, the houses are filled with elegant furniture and the tables decked with silverware and served by tidily clothed slaves" (Naudé 1950). De Kock (1924: 35) argues that such luxurious habits were, in part, a consequence of the

[5] The Commander of the Cape Colony only later received the title of Governor.

social conditions created by slavery. In the Engerman & Sokoloff analytical framework, one might expect that these conditions would have lead to the attempted maintenance of this balance of power. It is precisely this status quo which the sumptuary laws attempted to counter.

Wealth was not universal, not even within the group of Cape rural farmers. Some farmers remained poor, supported by the gentry through generous loans. The inheritance rule, which granted half the estate to the spouse after the death of the landowner and the other half divided between the sons, created conflict within families and resulted in many remaining on land that was too small to cultivate viably. Many of the younger sons had to move away.

The only land that was available for the resettlement of overcrowded farms was in the interior, where the loan system was enforced. Life on the frontier was difficult. Countless travel journals document the abject poverty of many frontier families, where many lived in tents and wagons. Woeke, the first colonial official of Graaff-Reinet, described his living quarters as "a hut ... without door or glass windows, where the wind continuously blows dust inside" (Müller 1980: 26). Carl Peter Thunberg, a Swedish botanist in the interior during the 1770s, noted the use of tanned animal skins for ropes, bags and blankets, and even as clothes for the extremely poor (Thunberg 1986: 52).

While poor, there is ample qualitative evidence of the changing distribution of wealth of the free settler population in the Cape Colony during the first century of Dutch rule. The following sections investigate this trend quantitatively.

5 Data

The *opgaafrollen* were recorded for the purposes of tax collection by the VOC. Detailed household level inventories and records of agricultural and other business activities were captured during most of the first Dutch occupation (1652-1795), and even in the early period of British rule (1795-1803). This information was used to establish each household's tax burden. The data used in this analysis spans the period from 1663 to 1757, roughly the first century of VOC settlement.

Many households specialised in subsistence non-market production because of the strongly centralised role of the VOC in organising markets and transactions. For this reason, monetary income data (where available) is not a good reflection of total well-being. However, the availability of asset indicators in the tax records offers more comprehensive measures of household wealth. This section continues to establish which indicators can most successfully discriminate between wealthy and poorer households, but also considers the limitations of the data.

The *opgaafrollen* will be used to construct asset indices for households. It should be borne in mind that the asset baskets in this data are period-specific and are not comparable to those typically implemented in modern studies (see for instance Filmer & Pritchett, 2001). As a consequence, the selection of indicators is framed within a historical investigation. The taxation procedures of the VOC, as well as other historical evidence, are considered to define what "prosperity" was considered to be in that period.

The available data is silent on the size, type and value of both land and buildings occupied by farmers. These elements typically constitute important items in asset indices, and are furthermore important to directly establish the validity of the Engermann and Sokoloff assertions regarding the initial distribution of capital. The rural Cape farmers received freehold land ("free and full property") from the Colony, although there were some restrictive conditions attached to these agreements (De Kock, 1924: 30). The size was determined by what the farmer could cultivate within the first three years of residency (Van der Merwe, 1938 :63). The system of freehold farms was used until the end of the seventeenth century, when most of the fertile rural Cape area had been occupied. At the start of the eighteenth century, the system of loan-farms was introduced, predominantly for pastoral, stock farmers of the interior. The size of these farms was determined by walking half-an-hour in each direction. These farmers had to pay rent to the Company; from 1714 an annual fee of 12 rix-dollars per farmer was charged, which was increased to 24 rix-dollars in 1732 (De Kock, 1924: 30). In

1732, the quitrent tenure system was also introduced, where small plots of land could be leased for 15 years from the government. This system did not have wide appeal. In 1743, loan freehold was introduced where a loan farm could be converted into a loan freehold farm on perpetual lease from the Company. However, revenues from loans, quitrents and loan freeholds were sporadic, with large-scale evasion and corruption of officials. Unfortunately, there is no attempt in the *opgaafrollen* to record these important measures, possibly because a flat rate rent applied, regardless of size and quality of land. Guelke & Shell (1983) use evidence of aggregate land holdings in their overview of early inequality at the Cape. These are macro measures and cannot be consolidated with the *opgaafrollen,* which constitute a micro dataset. Yet, it would seem that the evidence, as reported by these authors, support the results found below, suggesting that the value of the land and the returns from the land (which are important elements of the asset baskets that the microdata allow us to construct) were closely correlated.

The Cape economy was predominantly based on slave labour. One of the remarkable features of the European population at the Cape was the widespread slave ownership, especially in Cape Town and on wheat and wine farms (Giliomee, 2003: 45; Armstrong & Worden, 1988). While arable farming and slave numbers were few during the early years, by the turn of the century there "developed a close correlation between the number of adult male slaves owned and the output of arable farms" (Armstrong & Worden, 1988: 137). This was especially true for the rural Cape district, especially towards the middle of the eighteenth century. As Armstrong and Worden (1988: 137) note: "Although there were fluctuations, depending on the success of the annual crop as well as the accuracy of census recording, it is apparent that farmers producing both wine and grain had the closest correlations, and hence were the most efficient in exploiting their slaves largely because they made more intensive use of them throughout the year". By 1750, half of European males owned slaves, with 57 per cent of that group owning one to five slaves and another 22 per cent six to ten (Giliomee, 2003: 45). Slaves were therefore an important predictor of farming success, and as a result contributed positively to asset wealth in this period. Figure 1 shows the distribution of slave ownership across various years[6]. It is evident that in the earlier years, there was a high concentration of households with few slaves. This concentration gradually shifted, as households acquired implemented more slaves into the production process. By 1757 it is clear that a number of richer farmers had in excess of 40 slaves, corroborating the evidence of an emerging gentry amongst this cohort. This picture offers a pre-taste of the evolution of overall asset wealth at the Cape, and suggests that the average farmer became substantially wealthier in the first century of settlement.

Agricultural indicators dominate the records.The tithe (10% of gross production accrued to the VOC) was imposed on all grains harvested, though not with any consistency. In addition to freehold farmers, loan farmers were also expected to comply from 1714 (De Kock, 1924: 81). However, many farmers only harvested enough to subsist and were not able to deliver the required portion to the VOC. Furthermore, individual farmers were expected to transport their debt to the company stores in Cape Town, which meant that the incentives to evade grew considerably. Farmers in the interior, in particular, were less inclined to comply with this regulation. As a result, the tithe was later only imposed on grain that was transported into Cape Town for trading purposes. The implication is that this data is likely to undercapture subsistence activities and that many farmers would not appear in the dataset whatsoever. A dual effect is possible: the poorest would have evaded the authorities and not appear in the data (which would reduce inequality) and many others would have under-reported their harvests to pay a smaller tithe (which would increase inequality). It is not certain to what extent this unstable institutional framework has impacted the quality of the data and inequality measures.

The tax records also capture the number of *muiden* of each seed that was sown. This data is likely to have been captured with greater certainty, as it did not represent the unit of taxation.[7] It

[6]The density is plotted on a log scale in order to more clearly illustrate the spread. The distribution of slaves is highly skewed to the right and assumes the lognormal form that modern day income distributions do.

[7]In isolated cases, however, harvests were reported without any evidence of any seed sown. In this case the seed

furthermore resembles the concept of an asset more closely, as it represents "stock" that is reinvested into the venture. This is, however, only a short-term asset, as will be considered below.

Similarly to grains, wine and brandy was taxed at 3 rix-dollars per leaguer upon entry into Cape Town. Again, as was the case with rented land, this was a flat tax, unrelated to the quality or real value of the product (De Kock, 1924: 82). As with the tithe, it means that many farmers may not have been captured in the data. The number of vines planted may be more reflective of the true wealth of farmers, as this is closer to the conventional understanding of a long-term asset, which yields returns over multiple harvesting periods.

In addition to the taxes centrally imposed from Cape Town, local taxes were instituted in the various districts. Poll taxes were collected from individuals in each district, though the enforcement and application of the "ability to pay" criterion varied greatly as a result of the discretion left to settler councils (De Kock, 1924: 84). Ability to pay in the early years of settlement in Stellenbosch and Drakenstein was determined by livestock ownership, which was the most obvious indicator of wealth: the head tax was absorbed into a proportional tax on the numbers of sheep and cattle that were owned. These items are recorded in the dataset (perhaps for the purposes of the local taxes) and therefore serve as important long-term indicators of prosperity that are unlikely to vary considerably over the short-run.

In present-day studies of the distribution of wealth, modes of transport contribute importantly to asset indices. Vehicle ownership is in itself an indicator of the means of self-sufficiency and a means to access the marketplace. However, even within this category, the type and status of vehicles discriminates strongly between different levels of wealth. In pre-industrial societies, horses – and, to some extent, cattle in the Cape Colony – played this role. While this possession was a contributor to wealth directly and facilitated the production process, only the number of horses, and not particular characteristics of the asset, separated the rich from the poor in the data. As mentioned above, limits were eventually placed on the possession of horses, as this represented excess in the Colony.

Pig farming was also prevalent in the Cape, though less than 1% of the sample registers positive values on this indicator. It is therefore proposed that the number of pigs should not carry great weight in the indices, despite high a priori inequality by this measure.

The discussion above focuses largely on agricultural indicators. Should these be the dominant factors determining wealth in the Cape Colony, they will paint a clear picture of inequality. However, this information remains silent on the prosperity of any individual that did not invest in any of the assets mentioned. Consequently, all merchants, traders, administrators and any other non-agricultural workers would have no wealth if gauged by these possessions. Indeed, the records consist of a substantial sample size with zeroes for all of horses, cattle, sheep, pigs, vines and grains. Most of these observations were recorded within the district of Cape Town, where economic activity was more diversified than only agricultural production. One could therefore infer that these individuals constitute a "non-farmer" sub-population. However, zeroes could also result from the incentive to under-report and evade taxation. The inclusion of many zeroes in the analysis could distort inequality measures, with an upward bias caused by an inflated lower tail of the asset distribution. Zeroes have long carried important information in economic theory (as corner solutions in the utility sense) and particularly in the analysis of micro-datasets (Fry et al, 2000; Keen, 1986). Excluding these observations could therefore also distort inequality, as it ignores the decisions not to participate in this type of economic activity. However, as the information on these particular non-farmers' choices is limited, it is not clear how effectively this problem may be circumvented. The only assets in the data that are common to both segments of this society are the possession of slaves, flintlocks, pistols and swords. While the former are well-documented, the weapon grouping is sporadically measured.[8] Consequently, inequality measures are compared for the whole sample and

sown was imputed from a bivariate OLS regression of grain harvest on seed sown for all positive values of both items.

[8] Indeed, many of the asset indices computed below accorded negative weight to these measures. Conventionally possession of assets should contribute positively to wealth, unless a stigma is attached to that commodity. For instance Moser & Felton (2007) indicate that black and white televisions contribute negatively to wealth indices in recent times,

also by excluding those identified as non-farmers by the criteria mentioned above. Later analysis includes this group and also supplements the data with zeroes on all assets for slaves (for which no detailed records in the data are kept).

6 Methodology

Authors studying modern inequality have the choice of using either consumption, income or asset measures found in household surveys, while the *opgaafrollen* constrain us to measuring wealth inequality. The first approach has been the more conventional of the two. However, the exploration of asset inequality has also featured prominently in the recent literature. Theoretical reasons for this shift include the notion that wealth informs decisions to invest in education and other long-term forms of capital: inequalities in initial wealth feed through to inequalities in returns to these long-term investments. Furthermore, asset possession is less sensitive to temporary economic fluctuations, as opposed to consumption and income which may be highly responsive to circumstances relevant to only a particular year. Assets therefore often serve as better indicators of potential *lifetime well-being*. Measurement, however, is also a definitive concern in choosing asset over money-metric measures of inequality. Income and consumption data are known to be plagued by measurement error as a result of privacy concerns, seasonal fluctuations and recall bias. As assets compose fairly stable and visible features of households, they are apparently less likely to be incorrectly measured (McKenzie, 2005).However, assets in modern studies are usually enumerated by carefully designed surveys. Our reliance on pre-industrial tax records (and the incentives for evasion surrounding them) may not offer the same hope of eliminating measurement error as modern studies claim[9]. Nevertheless, the "long-term" aspect of inequality is reinforced by using this unit of measurement. Furthermore, the *opgaafrollen* did not collect the micro-level money-metric data required to analyse inequality in this manner, as the values of these commodities were ignored in the taxation procedures, as noted above.

This paper uses principle components analysis (PCA) using the assets reported in the VOC tax records to create various indices of wealth. The population represented here only includes European settlers and a small number of free slaves that were required to pay taxes. The co-existence of parallel societies with different modes of economic exchange was not recorded by the VOC (such as the Khoikhoi society), and is consequently not analysed. The initial section of this study therefore only considers the status of the settlers that were allowed to farm in Cape Town and the hinterland for their own gain. It is likely that overall inequality in the Cape Colony was far more pronounced, as a consequence of unrecorded details of slaves' welfare. To account for this possible feature, further results are introduced, assuming that slaves were not only asset possessions of the free settlers, but were themselves assetless individuals. The latter assumption means that there is no variation within the slave cohort, as each has been assigned with zero wealth; this strategy, however, provides a better depiction of the bottom tail of the distribution than if this population were ignored altogether.

Principal components analysis has been widely used to construct asset indices using household survey data (Filmer & Pritchett, 2001; McKenzie, 2005). The aim is to reduce the dimensionality of a number of variables that capture asset ownership. The eigenvectors of the data's covariance or correlation matrix are computed and each associated eigenvalue represents the proportion of the variance explained by that principal component. Consequently, the first principal component (with the largest eigenvalue) is used to weight the original variables to create the new index, as

particularly with the inclusion of colour televisions. In this data, it appears that incidence of weapons is low in later years. In 1705 no weapons were recorded whatsoever. This year is therefore excluded from the analysis. It is not clear whether this is a result of poor recording or whether this is indicative of reality. There is no indication in the literature consulted that these items were taxed, and would therefore not be well-captured by officials.

[9]The salient difference is that monetary incomes are poorly measured in modern surveys as they form the unit of taxation, while it is assets that may have been poorly measured in Cape Colony records for precisely the same reasons. Due to the largely subsistence nature of this society, moneymetric measures of wealth are not a likely alternative.

it contains the most information on the original data. Usually researchers choose the correlation matrix to summarise the data, as this circumvents problems resulting from vastly different units of measurement (such as slave numbers and *muids* of wheat sown in the current context). The use of the correlation matrix is equivalent to standardising all variables and conducting principal components analysis with the resulting covariance matrix. However, by definition the predicted asset index is, as a result, a variable of mean zero and standard deviation equal to the associated eigenvalue (McKenzie, 2005). Consequently, the asset index contains many negative values, which does not translate well conceptually into the idea of income and consumption levels. The main problem, however, is that standard inequality measures, such as the Gini coefficient, cannot be computed or interpreted in the regular fashion. Adjustments to the conventional measures can be calculated to accommodate negative values (Chen et al, 1982). This approach is, however, not common in the more recent literature.

The alternative is to use the covariance matrix of the original variables, so that the asset index has a minimum value of zero. However, as McKenzie (2005) notes, principal component analysis assigns the largest weight to the variable with the most variance. Since variance is unit dependent, the variable with the largest absolute values tend to dominate the index, without necessarily indicating real asset value. For instance, in the current context, the number of vines accounts for close to all the variation in the asset index when the covariance matrix is implemented.

To address both problems simultaneously in this study, variables are scaled by their standard deviations (so that the units do not influence which variable carries greatest weight in the index), but the means are not subtracted. A covariance principal components analysis is applied to this data, with the result that the predicted asset index remains non-negative, while the weights that each variable contributes to the index are identical to those found with the fully transformed variable. This enables the calculation of conventional inequality measures with ease. This procedure is equivalent to a PCA on a correlation matrix, followed by a shift of predicted indices upwards to enforce a minimum value at zero.

Because the series of cross-sections used spans nearly a century, it is important to consider how definitions and composition of "wealth" have changed. For this reason, it may be necessary to construct asset indices for each of the cross-sections under consideration. For instance, vine plantations are only reported from 1688, 25 years after these records were first collected. While it plays no role for the first quarter of the period, the volumes of vines planted increase substantially in subsequent years, because of an influx of French settlers and presumably because this activity is considered an important economic asset to farmers.

The construction of principle components indices for each separate year, however, raises issues of comparability. McKenzie (2005) and Moser & Felton (2007) recommend establishing weights by pooling all years' data, so that components account for both intertemporal and interhousehold variation. Sensitivity testing is conducted by performing all analyses using the separate annual indices and an index constructed using pooled data and therefore assigning "aggregate" values to commodities over the entire period.

Following the construction asset indices at the household level, they are converted to per capita amounts, to account for differences between large and small households. All inequality indicators are then calculated by weighting household observations by household size to provide measures of individual inequality rather than capturing differences at the farm level.

The objective of this study is to identify intertemporal changes in inequality, and not necessarily the *level* therof in any given period. To test the robustness of these trends, two measures of inequality are employed. The most well-known indicator of inequality, the Gini coefficient, is supplemented by an analysis of the Theil coefficient. The former is sensitive to inequality in the middle ranges of the distribution, while the second emphasises inequality attributed to a large upper tail (Champernowne, 1974). As is evident below, much of the inequality is driven by changes driven in the extremes of the distribution, necessitating a robustness analysis of this kind.

7 Results

7.1 General

Several principal component analysis (PCA) asset indices were calculated to test the sensitivity of inequality measures to the inclusion and exclusion of several possessions. The characteristics of the different input variables (as well as the historical context, as outlined above) were considered to establish credible constructs. Full details of which variables were used to construct the various asset indices are outlined in Table 2.

The "Short and long term" index includes the full set of variables available in the dataset. Assets are assumed to carry value in the long-run and in the short-run. The "Long Term" index excludes some of the more volatile assets, which are susceptible to seasonal fluctuations and do not hold value for a period longer than the year of harvest. In particular, the crops that are sown are excluded from the analysis, as they resemble temporary inventories that produce a return only once. Vines, however, are included, as they are likely to yield returns over multiple seasons. The reporting of weapons is inconsistent over time (as mentioned above) and in the latter years of the sample contributes negatively to many of the asset indices (particularly those established on an annual basis and towards the end of the sample). For this reason, "Core 1" does not take these items into consideration. As the robustness checks below reveal, this strategy offers more consistent inequality trends. This leaves us with a core group of variables that appear to be consistently indicative of wealth in the Cape Colony. This construct of wealth is also supported by the historical evidence presented above, which suggests that slaves were vital elements of the agricultural production process (and hence represent high value), and that cattle and sheep ownership were used by settler councils to gauge the ability to pay the poll tax. However, to test the sensitivity of the assumption that vines should not be treated similarly to other crops, they are excluded from the "Core 2" index. This is also done to account for the fact that the cultivation of vines only started later in the sample. "Core 3" purposefully excludes pigs, as very few farmers kept these animals. Inequality would be inflated artificially if it was not the elite that undertook these farming activities, but pig farming represented a marginal activity.. Vines are, however, included, to test inequality between affluent wine farmers and the rest of the population. The two alternatives of the core index are also used to calculate inequality measures, to see whether these two commodities unnecessarily drive the trends presented below. The "Common" index is constructed with assets common to both agricultural and non-farmer households. This index includes only slaves and weapons, without any agricultural indicators of wealth, and is used to evaluate the impact of excluding non-farmers from the sample, particularly in light of the fact that most of the variables at our disposal measure agricultural attributes.

Indices were based on the respective first principal components. Scree plots (not shown) reveal that high proportions of the variation in the data were explained by the respective first components[10]. Each asset was weighted positively in the indices (except in isolated cases). This indicates that these components are reflective of asset ownership. Negative weights were in some cases accorded to weapons, particularly when indices for separate years were established. This is indicative of sporadic record keeping, or implied inferiority of this asset grouping in later periods. The result is that many households received a negative score on these particular asset indices for these years. This leads to non-sensible estimates of the Gini and Theil coefficients, the primary measures of inequality adopted here. This phenomenon can be ascribed to the changing distribution of these assets over the entire period and the particularly low levels of reporting in the latter part of the sample (see Table 3). This observation prompts the further investigation of robustness of calculating separate weights in

[10] For the pooled sample a clear "kink" appears after the eigenvalue of the first component for most PCAs conducted. This is not true for the samples that calculated different weights for each year, underlining the rejection of using separate weights for the individual years, when it is more difficult to explain the full variation in the data with one component. The most convincing analyses are for the indices that exclude weapons, suggesting that one PCA component effectively captures most of the variation in the data for the more stable indicators in the sample.

each time period, compared to pooling the data across time, as will be discussed in the next section.

The validity of the PCA asset index approach should be assessed to see whether it might reflect realistic money-metric baskets of goods in the absence of the latter. Table 1 shows the PCA weights of the most robust asset index (as highlighted in the section below), which excludes sporadically measured items (such as weapons and seasonal crops). It is evident that adult male slaves were the most highly valued items in the basket, with female and child slaves carrying lower weights. This is reflective of the high value attached to physically intensive labour. A horse was priced at about 95% of a male slave, while one head of cattle or sheep carried similar value to a female slave. Pigs were of low value in asset baskets, with one pig carrying only 62% the value of a male slave. This is evident in the low prevalence of this item in the sample. Vines were relatively highly valued, with one vine carrying about the same weight as a girl slave. It is evident that "inputs" into the production process (slaves as workers and horses as transportation) were highly valued in the asset baskets. "Consumption" items (sheep, cattle and vines, each of which represented "output") were valued slightly less, and may be indicative of the more short-term characterisation of these assets. In sum, it appears that the PCA distinguishes between the value of goods in a satisfactory manner in the absence of money-metric measures.

7.2 Robustness Checks of Inequality Trends based on Various Samples and Estimation Strategies

Table 1 summarizes all robustness checks conducted in this study. The various indicators are compared across the relevant subsamples and estimation strategies, as outlined above. Selected graphical illustrations illuminate the discussion in the relevant sections below.[11]

7.2.1 *Comparing inequality trends with indices constructed for each year and a pooled sample*

It is evident that establishing different PCA weights for each year delivers estimates of inequality that are broadly consistent with estimates based on PCA weights derived from the sample pooled across all years, particularly for the "Core" indices. However, when weapons are included in the index, sporadic trends in inequality are registered towards the final years of the sample (particularly for the sub-samples that exclude slaves). Furthermore, when weapons are included, the Theil coefficient delivers lower inequality estimates with pooled PCA weights, particularly from the period 1682-1709 and when both slaves and non-farmers are included in the analysis. Figure 2 (a,b and c) illustrates these general observations with the "Common" index, which includes weapons. Figure 2d, using the "Core 1" index, illustrates the remarkable robustness generally observed when weapons are excluded from the construction of the PCA indices. This observation is true, irrespective of sample restrictions. This shows that the "valuation" of non-weapon assets has remained consistent over the sample period.

Conversely, the distribution of weapons was perhaps non-representative in the last years of the sample and could well be indicative of inconsistent reporting patterns rather than real movements in society. For this reason, the indices including weapons should either not be considered, or only be analysed when using pooled weights. Because most other assets appear to have a consistent influence on indices and inequality over the entire period, all further analysis continues with pooled weights rather than annually estimated indices. This also concurs with the recommendations of McKenzie (2005) and Moser & Felton (2007). Though we do not have price data available for these specific assets, the evidence shown by Botha (1923) indicates that prices were remarkably stable

[11] Not all figures are presented in the analysis, but only typical observations are shown for illustrative purposes. All figures are available from the authors on request. Specific observations with respect to omitted graphs can be found in Table 1.

during the eighteenth century, primarily as a result of the mercantilist policies of the VOC. Using pooled weights is, therefore, a valid consideration.

7.2.2 *Comparing inequality trends with indices constructed including and excluding non-farmers*

Recall that in this study being a non-farmer is implied by the fact that no agricultural assets were held by the household under consideration. Note that by this definition slaves are automatically considered to be non-farmers, so that these robustness comparisons are redundant when this subpopulation is included. The discussion therefore proceeds for the free settler population only.

A priori expectations are confirmed, in that inequality is higher (by the Gini measure) when estimates include non-farmers, as a result of the many zeros on agricultural assets. Indeed, it appears that the exclusion of non-farmers introduces only a level difference in inequality estimates across time, (without any substantial distortion of the trends analysed) for the indeces that excluded weapons. This is evident for the "Core 1" index in Figure 3a. This result allows us to conclude that excluding the non-farmer population does not distort any trend analysis, which is the primary focus of this study. The inclusion of weapons introduces slight differences in the initial and final periods of the sample (see Figure 3b, using the "Long Term" index), again pointing to inconsistent measurement of these assets. It is encouraging that the "Common" index (which excluded agricultural assets) displays fairly similar inequality trends for both groups. This suggests that there is no substantial between-group inequality between these samples, so that an analysis of the farmer population (and agricultural indicators) can be extrapolated to the entire population with some confidence (see Figure 3c).

Theil coefficients are not very sensitive to the exclusion of non-farmers from the indices. This is particularly true when agricultural indicators are included in the indices (see Figure 3a and Figure 3b). The reason for this is that non-farmers appear at the bottom of the asset distribution when agricultural indicators are factored into the wealth index; it is furthermore known that the Theil coefficient is more sensitive to changes in the upper tail of a distribution than the lower tail (Champernowne, 1974). When agricultural indices are not accounted for in the asset index (see Figure 3c), trends are again very similar, however weapons introduce some differences (with higher inequality when non-farmers are excluded) in a period around 1700. This again suggests that intergroup inequality is not a serious concern, and that trends are not compromised, except if weapons are introduced.

It is notable that the reported number of flintlocks and swords decline substantially for the farming subsample compared to moderate changes in the non-farming subsample (see Table 2), which underlines the notion that these are inferior goods over the period. The prevalence of pistols increases over time in the farming segment, while it remains fairly stable at low levels for the non-farming segment.

To remove the effect that weapons might have on these conclusions, a slave index is constructed (by assigning PCA weights to the different slave classes). It is evident in Figure 3d that again only a level difference arises with the exclusion of non-farmers for the Gini coefficient, and close movements apply to the Theil coefficient. The similar trends across groups, particularly for this slave index, suggest that changes in inequality over this period are driven by intertemporal differences of inequality *within* the rural Cape farming and non-farming populations. Inequality *between* farmers and non-farmers remains consistent over the period (despite small differences for the "common" index, though this is driven by weapons). Hence, an analysis of within-group inequality of farmers should uncover the dominant trends in the rural Cape European settler population.

Two groups remain in the area west of the first mountains: farmers and non-farmers. Due to the limited truly representative information on the non-farmer segment of the population and because the inequality trends are not compromised, this category is henceforth excluded from the analysis. As a result, our population of analysis is now delineated to the mostly wheat and wine,

rural Cape farming community of the Cape Colony. However, similar time trends can tentatively be extrapolated to the European population at large, as witnessed by the similar directions of changes in inequality when they are included. It must be emphasised, however, that *levels* of inequality cannot be inferred from the limited sample to the population as a whole.

Comparing inequality trends with indices constructed including and excluding slaves

Because the Cape Colony did not only comprise of European settlers, it is necessary to extend the above analysis to include slaves. As noted before, a lack of records hinders the analysis of the indigenous Khoi population. Slaves were included here as individuals that had no assets. Each slave that was owned by a farmer was taken to constitute a separate household without any possessions. This assumption concurs with the understanding of slavery, but is made primarily because only the number of slaves in the colony can be inferred from the data, and not what they possessed. It is evident from Figure 4 that the inclusion of zeroes for slaves only alters the level of Gini-based inequality (with a similar trend), while conclusions for Theil-based inequality remain unchanged. The former observation is true because the Gini coefficient is less sensitive to what happens at the bottom of the tail; the latter holds because the Theil coefficient is completely insensitive to zeroes. This illustration is consistent, regardless of the index used. As shown in Figure 4, the inclusion of slaves as assetless individuals increases inequality in Cape society by roughly 0.2 Gini-points over the period. The difference is likely to be somewhat overstated, as historical evidence suggests that slaves were not necessarily completely assetless (despite not being reflected in our data). An important observation, however, is the apparent widening gap over the course of the eighteenth century. Although this result is admittedly driven solely by the increasing ratio of slaves to settlers and not by assets, it is the between-group inequality presented here which most closely matches the Engerman and Sokoloff hypothesis relating to the institutional persistence of inequality.

7.2.3 *Summary of robustness checks*

It is evident throughout that the inclusion of weapons provides inconsistent results. This is particularly true in the comparison of annual and pooled PCA weights. The stability of the latter compared to the former suggests that pooled weights account best for inconsistent measurement. The exclusion of non-farmers only registers differences associated with differences in weapon reporting. Otherwise, inequality trends are uncompromised, suggesting further analysis with only the farming population. Furthermore, the inclusion of assetless slaves as at the bottom of the asset distribution adds nothing to the analysis. Therefore the analysis continues with both Gini and Theil coefficients, based on indices derived from a pooled dataset and including only the farming settler population. Results can tentatively be extrapolated to the population at large, as there is little evidence in the available data to suggest any systematically different patterns for other segments of society.

7.3 Trends in inequality for the settler population

Using pooled PCA weights and considering only the farming population, Figure 5 exhibits trends in inequality with regards to all relevant asset indices and using both the Gini and Theil Coefficients.

Three general observations follow. Firstly, it is important to note that conclusions about trends based on Gini and Theil coefficients differ negligibly (a comparison of Figure 5 a and b reveals this). Secondly, a noticeable *level* difference in inequality arises, once weapons are omitted from the indices. Trends are, however, similar, if not slightly dampened by the inclusion of weapons. Thirdly, indices that include weapons and volatile short term assets (such as grain seed), deliver more "spiky" inequality trends than those that do not ("Core 1", "Core 2" and "Core 3").

A first glance at the final results reveals a number of first insights. In the initial stages of settlement, inequality is at its lowest level compared to the subsequent period of analysis for most indices investigated.[12] A stable path then emerged until 1682, when inequality accelerated rapidly

[12] The initial drop and correction in inequality displayed by the "Short and Long Term" and "Core 3" indices should

until a turning point roughly around 1700. Thereafter inequality declined steadily until 1738. The indices that include the more volatile assets deliver a stable (perhaps slightly increasing) trend in inequality for the rest of the period. The more robust indices indicate that inequality again rises towards the end of the period of analysis. Given the discussion presented above, the latter indices are preferred for final analysis. The differences in inequality trends based on the three "Core" indices in no way have different interpretation. This suggests that sticking to one of these indices to measure inequality does not alter our understanding of the path of inequality in the first century of Dutch settlement.

It is evident that inequality has not persisted at initial levels throughout the century of analysis, and that there is a definite trend worth analysing in more depth.[13] Figure 5c displays only the "Core 1" index with its 95% confidence interval. This is used to identify whether inequality changed significantly over the period.[14] The four broad periods postulated above are clearly discernable, with significant changes identified by the confidence intervals. The confidence interval is fairly broad during the early years (as a result of small sample sizes). What does, however, emerge is that inequality remained stable at fairly moderate levels (with a Gini of about 0.5) from the beginning of the period of analysis until 1682. This was followed by a period of significant increase to fairly high levels (with the Gini reaching a maximum of 0.65 in 1709, which is beyond the bounds of the initial period). Thereafter a period of decline is witnessed, with the Gini dropping to 0.56 by 1738 (this being a significant change), followed by yet another spurt of increases in inequality to 0.62 by 1757 (which is again significantly higher than in 1738). While there is substantial "churning" in inequality levels, it is evident that they never recovered to sustained "low" levels of inequality. This suggests that while there may be many changes between moderate to high levels, inequality nevertheless persistently remains above a moderate threshold in this context, which provides an indication that at least some portions of society were able to extend the status quo.

The relatively low inequality (with a Gini coefficient of 0.501 based on the "Core 1" measure) initially registered is indicative of a society that is newly established. All households that settled at the Cape arrived with few possessions, suggesting that few differences in the wealth distribution existed. It should also be noted that farming operations were still fairly homogenous during this period, with viticulture not yet established at the Cape, so that there was not much specialisation in the economy that distinguished one family from another. Two processes then emerged and drove inequality, as this society remained in flux. Firstly existing farmers were able to establish their production into viable operations, so that the wealth of first generation immigrants increased. Secondly, fresh arrivals of immigrants arrived at the Cape with few possessions to farm on unsettled land. Both of these features drove inequality upwards, but the dynamics occur at opposite extremes of the distribution.[15]

As the population expanded exogenously, new frontier land was cultivated and new towns were established, which still had to attain the wealth that first generation immigrants had obtained. This suggests that a new society in flux could experience rising inequality during the initial periods of expansion, purely as a result of migration patterns. From the early 1700s, when immigration was discouraged by the VOC, exogenous factors played a lesser role in population dynamics. Population growth shifted to a predominantly endogenous trajectory, which means that the bottom tail of the wealth distribution was not constantly "replenished" by poor immigrants. However, as time progressed, later immigrants were able to converge to the first generation of immigrants, so that

be viewed with caution, particularly given the small sample sizes during this period.

[13] A Phillips-Peron stationarity test on this time series of Gini coefficients based on "Core 1" delivers a McKinnon approximate p-value of 0.1485, hence not rejecting the hypothesis of a unit root. This suggests that this series does change over the entire period.

[14] Should the Gini coefficient move within the confidence band of the previous period, inequality is not considered to have changed significantly. Should, however, the Gini coefficient move above (below) the confidence interval of the previous period, then inequality has risen (dropped) by a significant margin.

[15] It is for this reason that the Theil coefficient was implemented alongside the Gini coefficient, as the latter is less sensitive to differences in the tails of a distribution compared to at the mode.

inequality declined with the stabilisation of the economic structures. Migration and subsequent acclimatisation may therefore have an important role to play in the evolution of inequality.

These dynamics are more clearly visible in Figure 6, where the distributions are depicted. For the "Core 1" index a fleshed out bottom tail emerges in 1678 (the year that Stellenbosch was established) and in 1692 (the first year that the Drakenstein district's French Hugenots appear in the *opgaafrollen* following their arrival in 1688). This weight remains in 1700. Following this, immigration declined and by 1731 the bottom tail diminished substantially, while the weight started to progressively shift towards the upper tail of the distribution, suggesting that there is a convergence process at play once the population grows endogenously.

Immigration restrictions may well be comparable to the attempts by established elites in South America to maintain their advantageous positions (Engerman and Sokoloff, 2002: 18). However, reasons for these moves in the Cape Colony were rather related to concerns that new arrivals could often not subsist on the frontier, and because the existing farmers provided enough crops to sustain the refreshment station. While these restrictions maintained high inequality in South America, it allowed inequality to stabilise at the Cape, with the convergence of the poorest to the mean becoming a reality. This, however, occurred at the same time that the elite was able to strengthen its position for reasons mentioned below.

With the discouragement of immigration, the second process that drove inequality ceased, while the first continued and started to dominate, with the emergence of a gentry class. From 1738 a new trend emerges. Again, Figure 6 illuminates this development most succinctly. The rise in inequality is driven predominantly by an emerging upper tail. By 1757 a small group of households attain asset index values that are well in excess of previous years. This progressive fleshing out of the upper tail can be explained by a number of factors. First, the first generation of immigrants is, by this stage, established in viable farming operations with many farmers already having transferred their assets to sons. Secondly, farming activity became progressively more diversified, with those practising viticulture able to distinguish themselves from the traditional farmers. Thirdly, VOC monopoly and monopsony contracts were granted to selected individuals, for whom it became important to maintain this new balance of power that drove inequality. Together, these factors explain the emergence of a gentry, as indicated in the literature (Guelke and Shell 1983), and were the target of the sumptuary laws implemented in 1755.

Furthermore, the growth of the "non-farmer" proportion of the sample (see Table 2) suggests that we may be dealing with a structural change in the economy at this point in time. A non-agricultural sector was required to service the needs of a maturing economy. This sector may have fuelled the rise of a non-agricultural gentry class. In fact, while contentious, this period may be classified as the beginning of proto-industrialisation at the Cape. If true, the results support the super-Kuznets hypothesis (van Zanden, 1995) that inequality rises during the period of proto-industrialisation. Data that more closely represents this segment of the population is required to uncover these issues more fully: inequality between farmers and non-farmers could start to assume an important role in its contribution to overall inequality towards the end of the period, particularly with the expansion of the frontier during this time. This data is, however, not yet available to the knowledge of the authors.

8 Interpretations and Comparisons

The Cape Colony was characterised by initially moderate inequality, followed by a series of changes which brought inequality to high levels by the end of the first century of European colonisation. Three important trends are observed which also fit the historical evidence. Inequality rises significantly during a period of immigration into the Cape (the arrival of French Huguenots in 1688 is of particular interest here). The initially poor population of consecutive fresh arrivals converged to the mean, but was replaced by new impoverished settlers arriving from abroad, as immigration continued. After

immigration was discouraged in the early 18^{th} century, this cycle of convergence came to completion, so that inequality declined somewhat. By the 1730s, a small elite emerged, forcing the Company to impose sumptuary laws on lavish spending nearly two decades later.

What explains these results? The quantitative and historical evidence support Engerman and Sokoloff's hypothesis: the conditions at the Cape created the right environment for the formation of a slave based economy where a small elite attained economic and political power. Immigration (the decline during the early eighteenth century), land (the system in the interior) and labour (the decision to remain a slave economy) were curtailed to maintain this power balance. Yet, these conditions did not exist when the first settlers arrived. In contrast to other newly settled regions, the climate and environment could initially not support large plantations (as Van Riebeeck realised early after settlement) and had few and sporadically located natives. Yet, the mercantilist policies of the Dutch East India Company *created* fertile conditions for the rise of institutions where one group could attain dominance. This may have been because the Company perceived such an outcome to be most profitable. While the literature presupposes that institutions that foster inequality developed given certain 'initial conditions', the case of the Cape Colony suggests that these 'initial conditions' could also be created, or at least, enhanced, by the government (in this case, the Dutch East India Company). While it can only be speculation, it is likely that the distribution of wealth at the Cape would have shifted considerably had the farmers in the interior received full property rights, manufacturing had been allowed, had trade been free, or if slavery had been abolished a century earlier.

While one can deduce from the results that inequality became more severe during the period under analysis, the Gini and Theil indices used here are not fully comparable (in levels[16]) with those of other settler societies and post-Colonial South Africa, as the source data (the *opgaafrollen*) and the variables it includes are unique to the period and location. However, given this limitation, it does help to relate the experience of the Cape Colony to those of other newly settled regions, in particular, and other pre-industrial countries during this period in general, to provide some perspective on the relative levels of inequality found at the Cape. Milanovic, Lindert and Williamson (2008) provide comparative Gini-coefficients of select societies in history. For example, they calculate a Gini for England and Wales in 1688 of 0.45 and for Holland in 1732 of 0.61. Evidence for newly settled regions is varied, with New Spain in 1780 reaching relatively high inequality of 0.64, compared to the low Gini of 0.33for Bihar, India in 1807. It is presumed that these measures include the native population. When the slaves are included as zero-asset owners in the Cape sample, inequality increases to coefficients above 0.70 over the period. The tentative quantitative comparisons suggest that the inequality at the Cape was at least as high as those found in other newly settled societies such as Spanish America. This, together with the trend analysis which concurs with an adaptation of the Engermann & Sokoloff hypothesis, suggests that other newly settled regions (for which long series of inequality measures are not readily available, as in the current context) may also have indeed experienced similar patterns of moderate to high inequality. The fact that the Cape Colony never recovered from these relatively high levels of inequality infers that indeed the institutions that fostered the creation of an elite were able to maintain the status quo. However, this paper has identified specific pre-conditions that are not necessarily relevant to other settler societies, namely the institutions created by a profit-motivated company rather than an elite representing a national crown. This suggests that similar time series of inequality need to be linked to the specific institutional and demographic shifts that were noted in history for those colonial societies.

The Cape colony was also a pre-industrial society and inequality trends may have resulted from an emerging super-Kuznets curve, as proposed by Van Zanden. Yet, there is little evidence that the

[16] It is even evident that the exclusion of weapons raises *levels* of inequality substantially within the same society. However, regardless of the basket of goods, the *trends* remain consistent. To find comparable baskets of goods in other colonies to compare *levels* of inequality is not feasible, but trend comparisons may be more realistic. It is therefore not clear whether inequality levels are "high" *relative* to other countries and money-metric measures in other periods. What is, however important, is that the evolution of inequality over this period can be compared to the evolution of inequality in other societies.

Cape experienced a period of proto-industrialisation over the first century of settlement. None of the explanations for an increase in inequality are found at the early Cape: wage labour (in the rural areas) was virtually non-existent during the initial period of settlement (invalidating the Williamson hypothesis), migration took place into the interior (which resulted in a larger share of agriculture rather than industry) and industry was prohibited (thus refuting Kuznets' own and the classical reasons for a rise in inequality). Only towards the latter part of the sample period (after the 1740s) may such a structural break have occurred, although corroborative evidence should be found for this in wage and production trends. An extension of the sample period would highlight whether it is valid to compare the Cape Colony with other pre-industrial countries (in particular for Holland, as Van Zanden did), and whether a super-Kuznets curve can be inferred. This later data would reveal whether the increasing trend towards the end of the period is sustained, and would also allow a study of a period when industry was indeed allowed.

South Africa is an extremely unequal society in the modern period, with a Gini coefficient of 0.60 and above characterising the post-Apartheid period. Together with Brazil, it ranks as one of the most unequal societies in the world (Bhorat, *et al.* 2001). It would be dangerous to simply extrapolate the high levels of initial inequality found at the Cape Colony to the high and persistent levels of inequality in present South Africa. Inequality in South Africa today is a legacy of a host of different factors, including the discovery of minerals (diamonds and gold), immigration and migration, wars and depressions, and the more recent segregationist and Apartheid policies that were in place during most of the 20^{th} century. Yet, one feels tempted to draw some parallels between the high levels of inequality during the early phases of European settlement and inequality in modern-day South Africa, especially if the Engerman-Sokoloff hypothesis remains a valid theory to analyse inequality over four centuries. The institutions that evolved from the early settlement period protected the status quo, binding the high levels of inequality at the Cape and establishing similar institutions as the Colony expanded to the East. The indentured labour of the *Voortrekkers*, the segregationist policies under British rule (for example, the Glen Grey Act of 1894) and the Apartheid policies after 1948 were to some extent policies influenced by institutions that evolved during the period of initial settlement. In various guises, social scientists have supported these claims: one factor, according to Terreblanche (2002:393), that "contributed most, directly and indirectly, to the inequalities in [South Africa's] income distribution" was the "racism and racial inequality in the distribution of political, economic, and ideological power" during, in part, the period of "Dutch colonialism". Maybe Charles Feinstein, in discussing the challenges facing the post-Apartheid government, summarizes the effect of the persistent levels of inequality most accurately: "South Africa's past will exert a powerful influence on its present and future for a long time to come" (Feinstein 2005:251).

9 Conclusions

The Engerman-Sokoloff hypothesis suggests that high initial inequality in settler regions would create institutions where inequality persists. The Van Zanden hypothesis holds that inequality will increase in societies during the proto-industrialisation phase. The Cape Colony, given the mercantilist policies and the available quantitative evidence, provides a unique case study of the inequality dynamics in a newly settled, pre-industrial setting. We find that inequality was relatively high during most of the first century, increasing especially after the introduction of viticulture and slaves by the end of the 17^{th} century. Some indications show that between-group inequality (between settlers and slaves) probably increases over the period, supporting the Engerman-Sokoloff hypothesis, though this result should be verified with detailed information on slaves' assets. Yet, unlike other newly settled regions (and partially different to the reasons put forward by Engerman and Sokoloff) the unequal Cape society developed not because of certain "initial endowments" but due to the policies enacted by the Dutch East India Company. These mercantilist policies, including restrictions on trade and prices, the importation of slaves as opposed to encouraging European immigration and the prohibition of

industry, created institutions that protected the status quo and entrenched inequality. This chain of causality is not exactly the same as, but mimics the predictions made by Engerman and Sokoloff, which suggests that institutions specific to the Cape could deliver similar outcomes to other settler colonies, where elites developed for different reasons. These institutions, to some extent, would later evolve into the unequal institutions that promoted segregationist and Apartheid policies, shaping modern-day South African inequality.

This study is a first quantitative attempt at understanding inequality of this understudied period in South African economic history. Many questions remain. The availability of large and detailed data sets should encourage further research in this field and, hopefully, enlighten our understanding of the roots of modern day inequality in South Africa, and of developing countries in general. In particular, the use of asset inequality measures in the absence of other detailed micro data have allowed the verification of various theories regarding inequality *before* the advent of industrialisation, and in this particular case the study of the Cape Colony illuminates these observations by taking the dynamics of a newly settled society into account. The analysis of a country that is a developing economy in modern times shows that the conventional wisdom surrounding the roots of inequality is verified in this setting. However, it is important to note the role of the VOC (as a company, rather than a national authority) in purposefully assisting the persistence of the institutions that drove inequality for profit purposes, despite the absence of the usually hypothesised initial conditions that fuel persistently high inequality.

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APPENDIX

Figure 1 Distribution of slave ownership for the farming population - various years (plotted on a log scale)

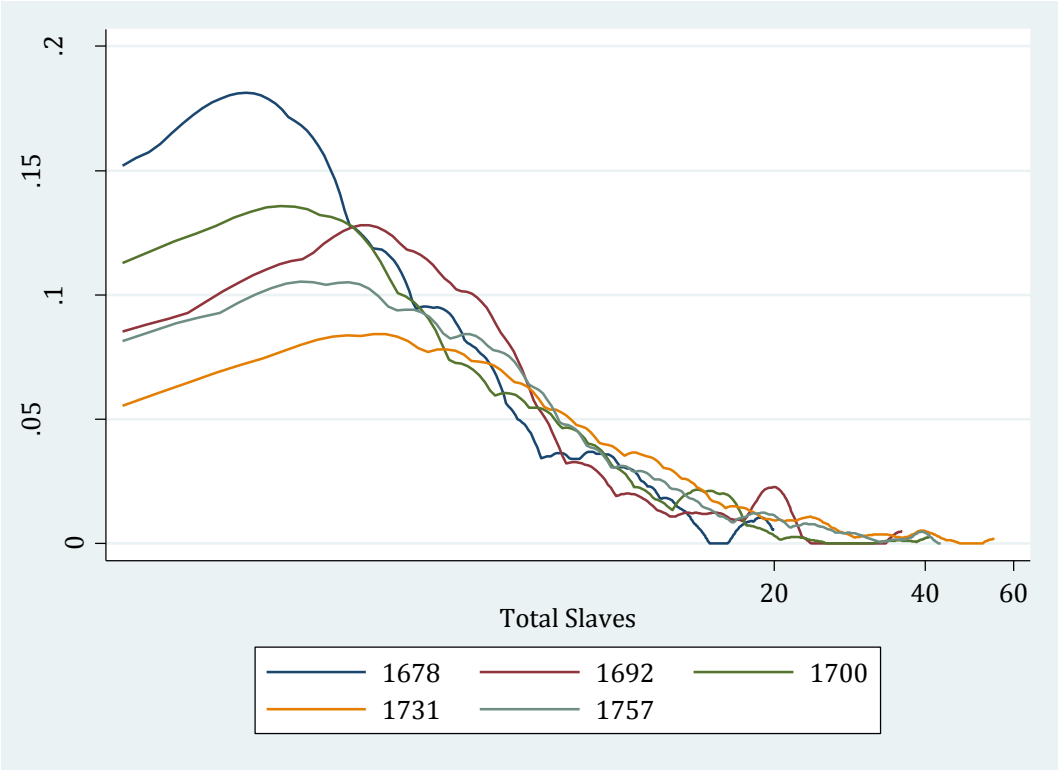

Table 1 PCA Weights for "Core 1"

	PCA weight	Relative to Male Slave
Male Slaves	0.3985	100.00%
Female Slaves	0.3609	90.56%
Boy Slaves	0.3191	80.08%
Girl Slaves	0.3108	77.99%
Horses	0.3773	94.68%
Cattle	0.3341	83.84%
Sheep	0.3292	82.61%
Pigs	0.2485	62.36%
Number of Vines	0.2973	74.60%

Table 2a Composition of PCA indices and comparison inequality trends based on different sample restrictions

		Index						
		Long & Short Term	Long Term	Core 1	Core 2	Core 3	Common	
Variables included in the PCA	Adult Male Slaves	X	X	X	X	X	X	
	Adult Female Slaves	X	X	X	X	X	X	
	Boy Slaves	X	X	X	X	X	X	
	Girl Slaves	X	X	X	X	X	X	
	Horses	X	X	X	X	X		
	Cattle	X	X	X	X	X		
	Sheep	X	X	X	X	X		
	Pigs	X	X	X	X			
	Vines	X	X	X		X		
	Wheat Sown (in muids)	X						
	Rye Sown (in muids)	X						
	Barley Sown (in muids)	X						
	Flintlocks	X	X				X	
	Pistols	X	X				X	
	Swords	X	X				X	**OBSERVATION**
Robustness checks: Inequality from Separate vs Pooled Indices	Gini including non-farmers and including slaves	Similar	Similar	Similar	Similar	Similar	Similar	Robust
	Theil including non-farmers and including slaves	Similar, except for lower levels of common weights in 1682-1709	Similar	Similar	Similar	Similar	Similar, except for lower levels for common weights in 1682-1709	Annual weights sensitive to weapons
	Gini excluding non-farmers and excluding slaves	Similar, except for sporadic indicators for annual weights from 1741	Similar, except for sporadic indicators for annual weights from 1741	Similar	Similar	Similar	Similar, except for sporadic indicators for annual weights from 1741	Annual weights sensitive to weapons from 1741
	Theil excluding non-farmers and excluding slaves	Similar, except for sporadic indicators for annual weights from 1741	Similar, except for sporadic indicators for annual weights from 1741	Similar	Similar	Similar	Similar, except for sporadic indicators for annual weights from 1741	Annual weights sensitive to weapons from 1741
	Gini including non-farmers and excluding slaves	Similar, except for sporadic indicators for annual weights from 1741	Similar, except for sporadic indicators for annual weights from 1741	Similar	Similar	Similar	Similar, except for sporadic indicators for annual weights from 1741	Annual weights sensitive to weapons from 1741
	Theil including non-farmers and excluding slaves	Similar, except for sporadic indicators for annual weights from 1741	Similar, except for sporadic indicators for annual weights from 1741	Similar	Similar	Similar	Annual weights: higher levels around 1700, sporadic from 1741	Annual weights sensitive to weapons from 1741

Table 2b

		Index						
		Long & Short Term	Long Term	Core 1	Core 2	Core 3	Common	**OBSERVATION**
Inequality when excluding "non-farmers" vs entire settler sample (slaves exluded)	Gini (Pooled weights)	Similar, slight differences at beginning and end of sample	Similar, slight differences at beginning and end of sample	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Similar, slight differences at beginning and end of sample	Robust, especially when seasonal items are excluded
	Theil (Pooled weights)	Similar	Similar, slight differences around 1700s	Similar	Similar	Similar	Similar, slight differences around 1700s	Robust, especially when seasonal items are excluded
Inequality when including slaves vs entire settler sample (non-farmers included)	Gini (Pooled weights)	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Level difference, trend uncomprimised	Robust
	Theil (Pooled weights)	Similar	Similar	Similar	Similar	Similar	Similar	Robust

Table 3 Distribution of Total Number of Slaves owned by free settlers - by Sample (Large Figures are means, Standard deviations in Italics, with sample size in cell below. Data is not weighted by household size.)

	Total Slaves			Flintlocks			Swords			Pistols		
Year	**Farmers**	**Non-Farmers**	**Whole Sample**	**Farmers**	**Non-Farmers**	**Whole Sample**	**Farmers**	**Non-Farmers**	**Whole Sample**	**Farmers**	**Non-Farmers**	**Whole Sample**
1663	0.792	0.000	0.373	1.875	0.296	1.039	0.042	0.000	0.020	0.625	0.000	0.294
	1.693	*0.000*	*1.216*	*1.513*	*0.669*	*1.385*	*0.204*	*0.000*	*0.140*	*0.770*	*0.000*	*0.610*
	24	27	51	24	27	51	24	27	51	24	27	51
1670	1.257	0.188	0.922	2.829	0.438	2.078	1.029	0.250	0.784	0.714	0.000	0.490
	2.994	*0.750*	*2.552*	*2.684*	*1.031*	*2.544*	*0.707*	*0.775*	*0.808*	*1.226*	*0.000*	*1.065*
	35	16	51	35	16	51	35	16	51	35	16	51
1678	2.637	0.055	1.646	2.295	0.484	1.599	1.288	0.440	0.962	0.445	0.022	0.283
	3.699	*0.311*	*3.166*	*1.711*	*0.621*	*1.651*	*0.902*	*0.581*	*0.894*	*1.057*	*0.210*	*0.864*
	146	91	237	146	91	237	146	91	237	146	91	237
1682	2.313	0.042	1.804	2.145	0.750	1.832	1.169	0.792	1.084	0.410	0.000	0.318
	3.457	*0.204*	*3.187*	*3.562*	*0.442*	*3.193*	*0.695*	*0.509*	*0.675*	*1.169*	*0.000*	*1.042*
	83	24	107	83	24	107	83	24	107	83	24	107
1685	2.494	0.014	1.365	2.482	0.423	1.545	1.412	0.394	0.949	0.353	0.000	0.192
	3.816	*0.119*	*3.071*	*1.836*	*0.625*	*1.750*	*0.849*	*0.597*	*0.900*	*0.984*	*0.000*	*0.746*
	85	71	156	85	71	156	85	71	156	85	71	156
1688	1.758	0.096	1.145	1.528	0.596	1.184	0.441	0.032	0.290	0.578	0.383	0.506
	3.786	*0.442*	*3.122*	*1.757*	*0.515*	*1.498*	*0.850*	*0.177*	*0.711*	*0.946*	*0.489*	*0.813*
	161	94	255	161	94	255	161	94	255	161	94	255
1692	1.365	0.176	0.829	1.784	0.758	1.322	0.932	0.681	0.819	0.468	0.027	0.270
	4.281	*0.809*	*3.270*	*1.677*	*0.670*	*1.416*	*1.101*	*0.602*	*0.918*	*0.765*	*0.195*	*0.621*
	222	182	404	222	182	404	222	182	404	222	182	404
1695	1.996	0.056	1.217	1.735	0.883	1.393	1.269	0.894	1.118	0.534	0.039	0.335
	4.833	*0.312*	*3.860*	*1.884*	*0.339*	*1.530*	*0.785*	*0.342*	*0.670*	*0.809*	*0.194*	*0.682*
	268	180	448	268	180	448	268	180	448	268	180	448
1700	2.989	0.315	1.966	1.328	0.976	1.194	1.277	0.970	1.159	0.542	0.048	0.353
	5.690	*1.263*	*4.718*	*1.226*	*0.218*	*0.987*	*0.939*	*0.203*	*0.763*	*0.697*	*0.240*	*0.616*
	271	168	439	271	168	439	271	168	439	271	168	439
1702	2.467	0.190	1.457	1.717	0.899	1.354	1.137	0.877	1.022	0.539	0.049	0.321
	4.942	*0.712*	*3.883*	*2.326*	*0.388*	*1.799*	*0.699*	*0.340*	*0.583*	*0.645*	*0.215*	*0.558*
	336	268	604	336	268	604	336	268	604	336	268	604
1709	4.185	0.436	2.472	1.777	0.975	1.410	1.252	0.962	1.119	0.657	0.054	0.381
	7.290	*1.320*	*5.754*	*2.271*	*0.177*	*1.724*	*0.939*	*0.192*	*0.719*	*0.707*	*0.227*	*0.620*
	373	314	687	373	314	687	373	314	687	373	314	687
1712	4.360	0.435	2.716	1.679	0.914	1.359	1.165	0.914	1.060	0.551	0.051	0.341
	7.859	*1.172*	*6.339*	*2.016*	*0.292*	*1.593*	*0.817*	*0.280*	*0.660*	*0.679*	*0.221*	*0.591*
	405	292	697	405	292	697	405	292	697	405	292	697
1716	8.164	1.005	4.070	1.356	0.703	0.982	1.137	0.697	0.886	0.582	0.062	0.284
	9.026	*1.973*	*7.039*	*1.717*	*0.531*	*1.234*	*1.112*	*0.503*	*0.848*	*0.651*	*0.241*	*0.530*
	146	195	341	146	195	341	146	195	341	146	195	341
1719	5.647	0.591	3.253	1.490	0.823	1.174	1.157	0.820	0.997	0.625	0.109	0.381
	8.121	*1.601*	*6.502*	*1.618*	*0.429*	*1.255*	*1.051*	*0.431*	*0.835*	*0.653*	*0.321*	*0.583*

	408	367	775	408	367	775	408	367	775	408	367	775
1723	2.645	0.836	2.120	0.892	0.748	0.850	0.876	0.744	0.838	0.700	0.098	0.525
	3.677	*1.985*	*3.378*	*0.550*	*0.439*	*0.525*	*0.534*	*0.451*	*0.514*	*0.514*	*0.298*	*0.536*
	1193	488	1681	1193	488	1681	1193	488	1681	1193	488	1681
1731	6.268	1.545	4.494	0.975	0.619	0.841	0.949	0.622	0.826	0.642	0.041	0.416
	9.138	*2.988*	*7.791*	*0.772*	*0.498*	*0.704*	*0.664*	*0.498*	*0.627*	*0.646*	*0.239*	*0.606*
	567	341	908	567	341	908	567	341	908	567	341	908
1738	6.892	1.702	4.902	0.883	0.582	0.768	0.877	0.582	0.764	0.561	0.047	0.364
	9.337	*3.602*	*8.066*	*0.505*	*0.494*	*0.522*	*0.415*	*0.494*	*0.469*	*0.520*	*0.212*	*0.496*
	685	426	1111	685	426	1111	685	426	1111	685	426	1111
1741	5.924	1.281	4.107	0.912	0.633	0.803	0.912	0.633	0.803	0.672	0.061	0.433
	9.539	*2.835*	*7.977*	*0.284*	*0.482*	*0.398*	*0.284*	*0.482*	*0.398*	*0.470*	*0.240*	*0.496*
	759	488	1247	759	488	1247	759	488	1247	759	488	1247
1752	3.409	0.836	2.857	0.835	0.836	0.835	0.828	0.836	0.830	0.794	0.096	0.644
	6.389	*2.120*	*5.843*	*0.371*	*0.371*	*0.371*	*0.378*	*0.371*	*0.376*	*0.404*	*0.295*	*0.479*
	802	219	1021	802	219	1021	802	219	1021	802	219	1021
1757	4.371	1.233	3.233	0.880	0.645	0.795	0.880	0.645	0.795	0.753	0.039	0.494
	7.221	*2.709*	*6.177*	*0.325*	*0.479*	*0.404*	*0.325*	*0.479*	*0.404*	*0.431*	*0.193*	*0.500*
	1139	648	1787	1139	648	1787	1139	648	1787	1139	648	1787
Total	4.203	0.839	2.936	1.190	0.737	1.019	0.975	0.718	0.878	0.645	0.064	0.426
	7.237	*2.245*	*6.099*	*1.317*	*0.474*	*1.101*	*0.674*	*0.470*	*0.618*	*0.616*	*0.250*	*0.582*
	8108	4899	13007	8108	4899	13007	8108	4899	13007	8108	4899	13007

Figure 2 Comparison of inequality trends using indeces with annual and pooled weights: “Common” index as an example of the inclusion of weapons, and “Core3” as an example of the exclusion of weapons

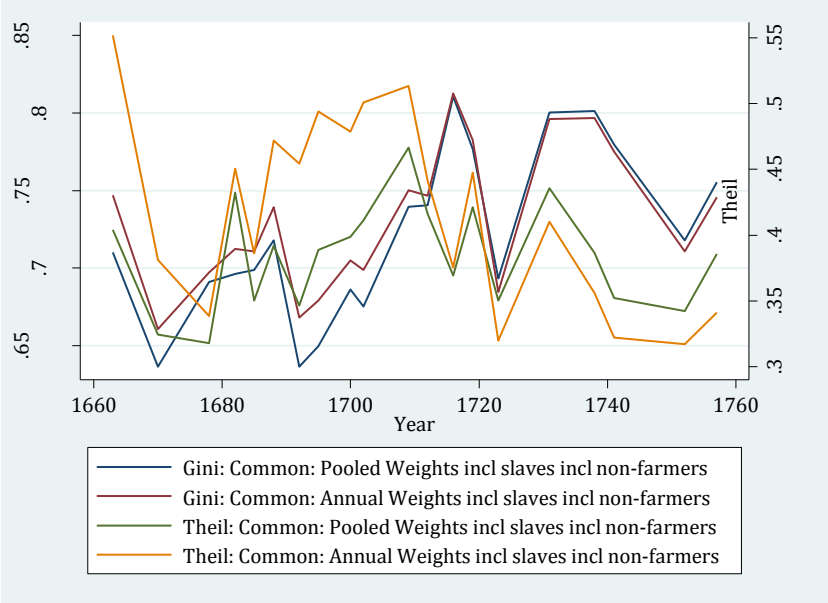

Figure 2a Common: Including Slaves and Including Non-Farmers

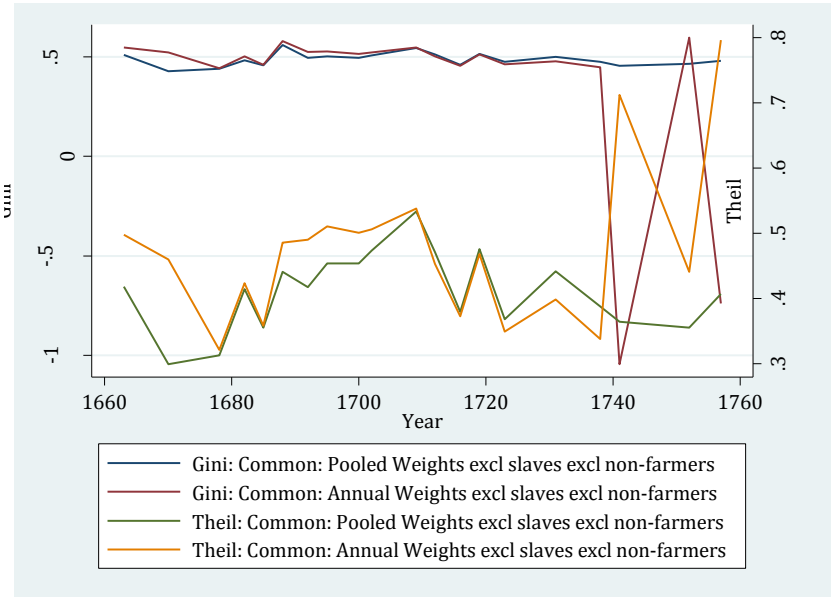

Figure **2**b Common: Excluding Slaves and Excluding Non-Farmers

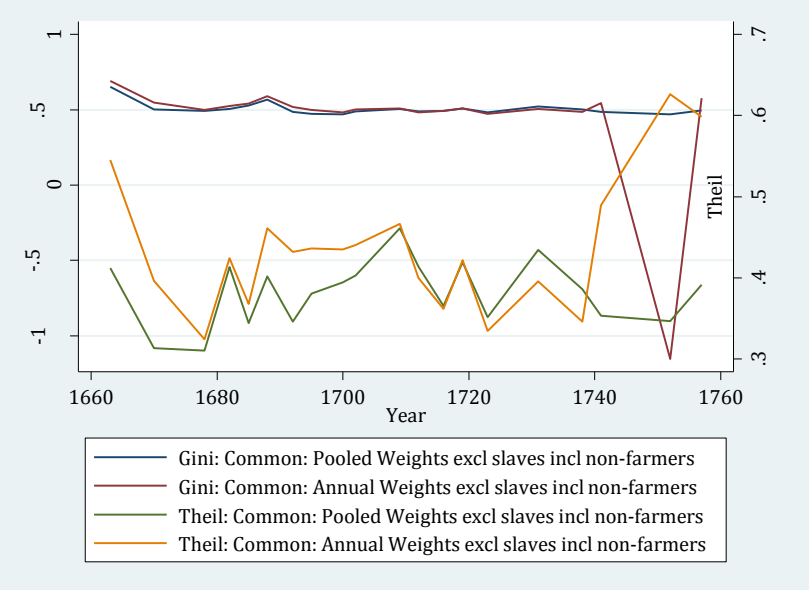

Figure 2c **Common: Including Non-Farmers and Excluding Slaves**

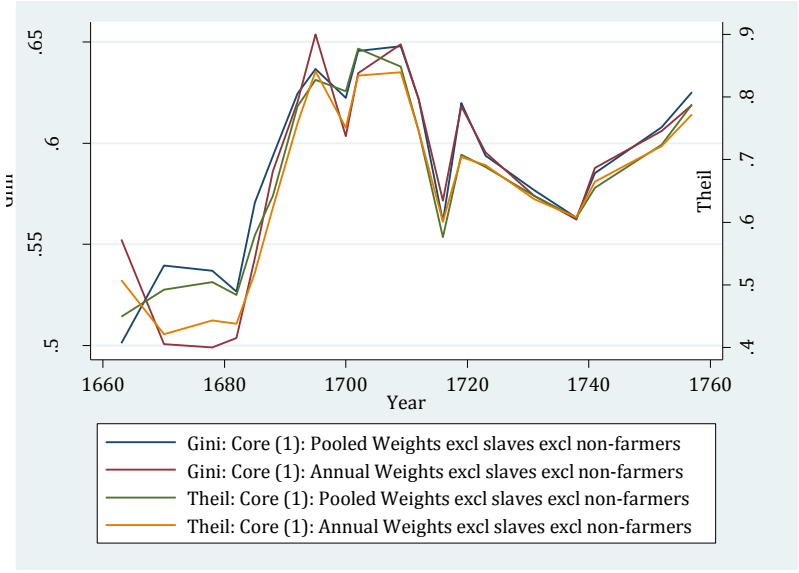

Figure 2d **Core 1: Excluding Non-Farmers and Excluding Slaves**

Figure 3 Comparison of inequality trends using indeces including and excluding non-farmers: “Common” index to evaluate between group inequality; “Core3” as an example of the exclusion of weapons; “Core 1” as an example of the inclusion of weapons

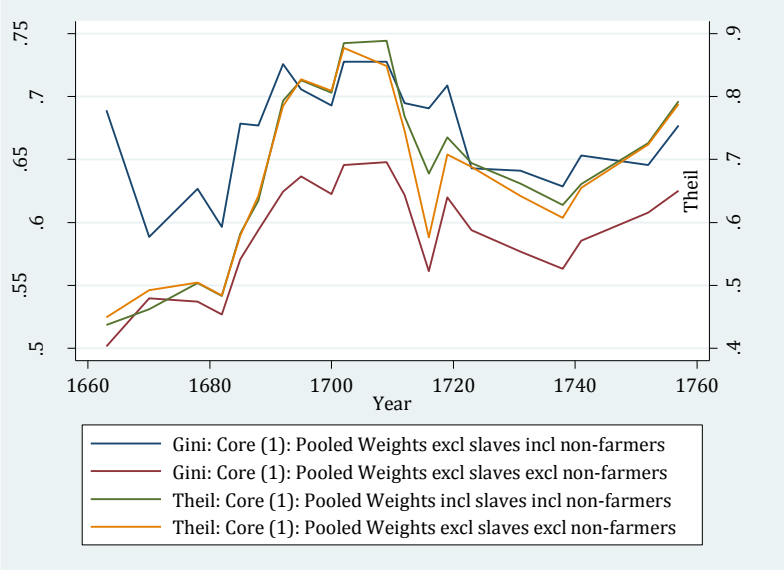

Figure **3**a “Core 1”: Pooled Weights

Figure **3**b “Long-term”: Pooled Weights

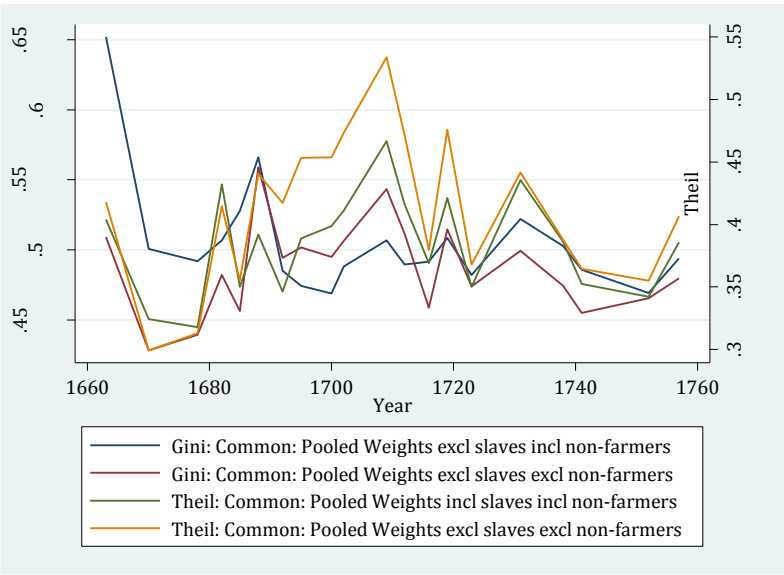

Figure **3**c “Common”: Pooled Weights

Figure **3**d “Slave Index”: Pooled Weights

Figure 4 Comparison of inequality trends using indeces including and excluding slaves as assetless households

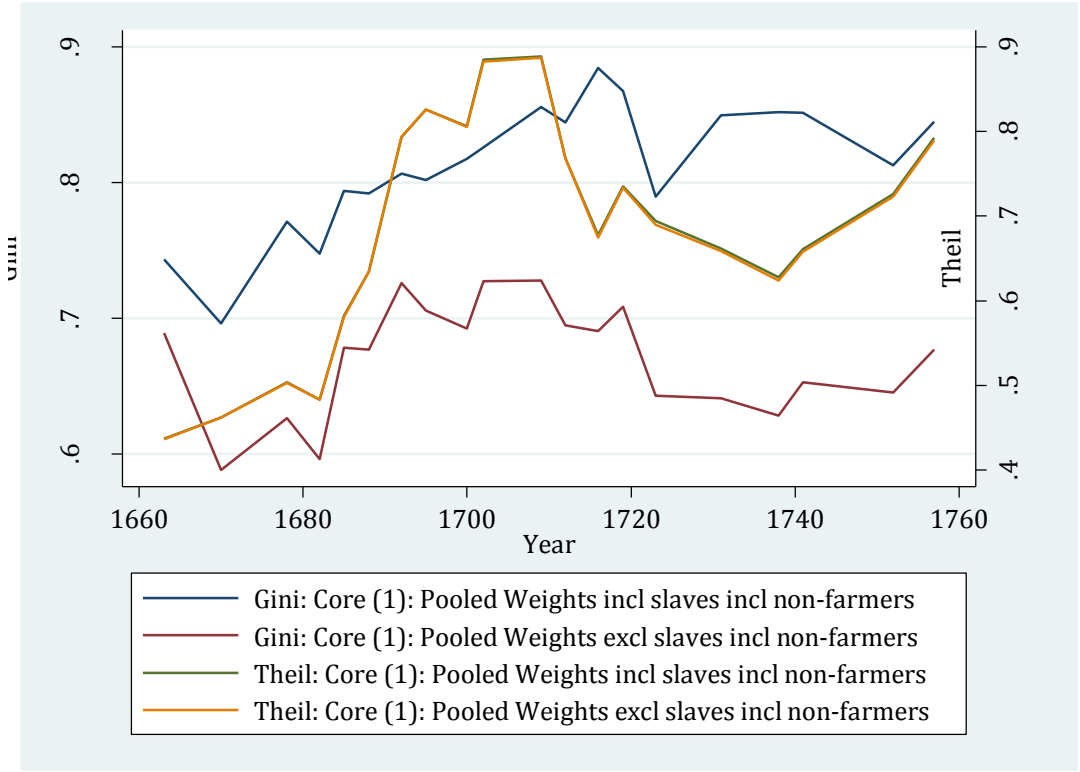

Figure 5 Inequality trends based on Pooled Weights for the settler population only

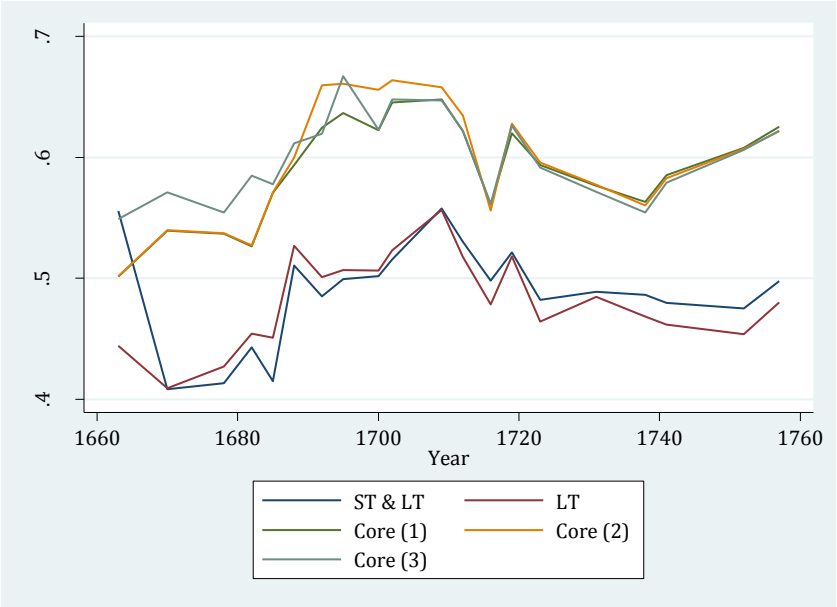

Figure 5a Gini Coefficient

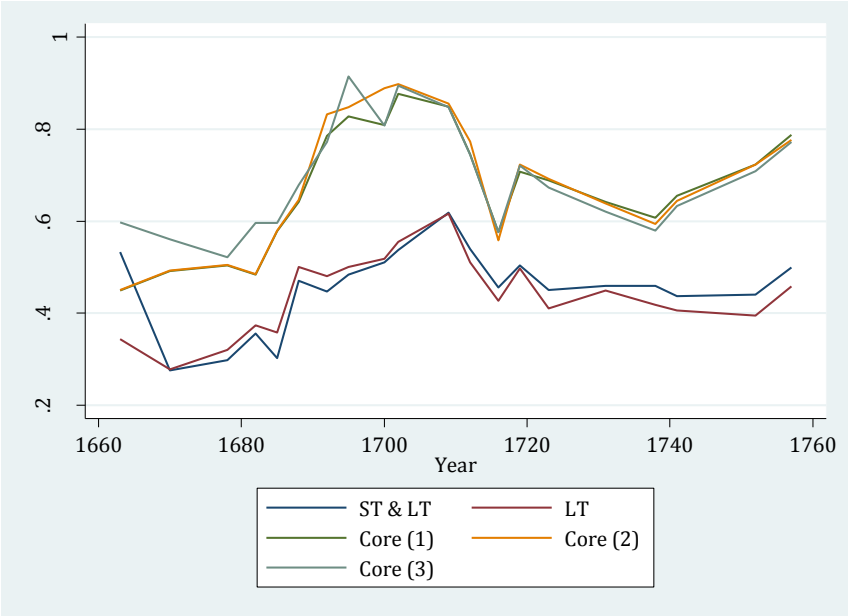

Figure 5b Theil Coefficient

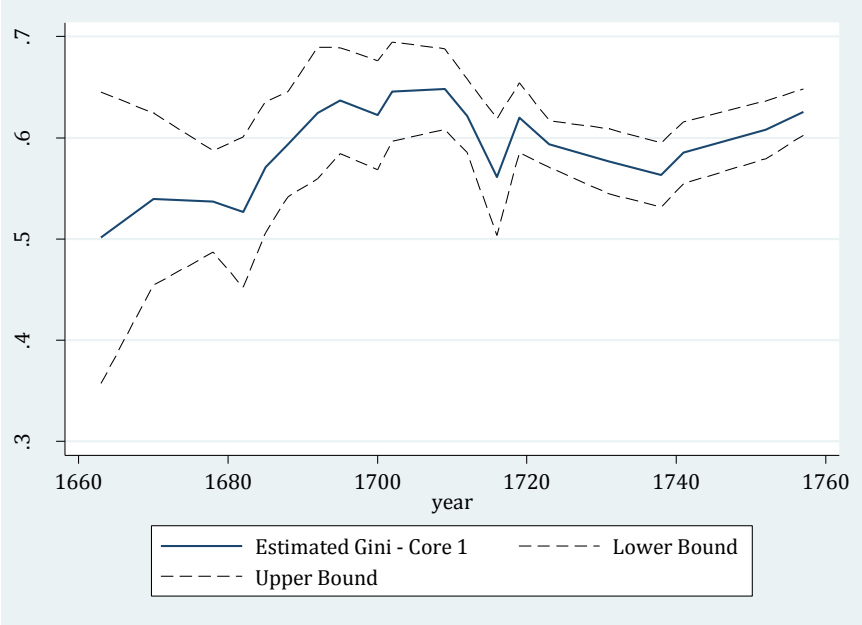

Figure 5c Gini coefficient based on “Core 1” with 95% confidence interval

Figure 6 Distributional Analysis - Core 1